

# Apprenticeship and Industry Training

---

## Sprinkler Systems Installer Apprenticeship Course Outline

3701.2 (2001)

**Government  
of Alberta** ■



ALL RIGHTS RESERVED:

© 2007, Her Majesty the Queen in right of the Province of Alberta, as represented by the Minister of Alberta Advanced Education and Technology, 10th floor, Commerce Place, Edmonton, Alberta, Canada, T5J 4L5. All rights reserved. No part of this material may be reproduced in any form or by any means, without the prior written consent of the Minister of Advanced Education and Technology Province of Alberta, Canada. Revised 2011.

**Sprinkler Systems Installer  
Table of Contents**

**Apprenticeship .....2**  
**Apprenticeship and Industry Training System .....2**  
**Apprenticeship Safety .....4**  
**Technical Training.....6**  
**Procedures for Recommending Revisions to the Course Outline.....6**  
**Apprenticeship Route toward Certification .....7**  
**Sprinkler Systems Installer Training Profile .....8**

**Course Outline**

**First Period Technical Training..... 13**  
**Second Period Technical Training..... 44**  
**Third Period Technical Training..... 65**

## **Apprenticeship**

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding an employer. Employers hire apprentices, pay their wages and provide on-the-job training and work experience. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyman or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution – usually a college or technical institute.

To become certified journeymen, apprentices must learn theory and skills, and they must pass examinations. Requirements for certification—including the content and delivery of technical training—are developed and updated by the Alberta Apprenticeship and Industry Training Board on the recommendation of Sprinkler Systems Installer Provincial Apprenticeship Committee.

The graduate of the Sprinkler Systems Installer apprenticeship program is a certified journeyman who will be able to:

- through competent application of skill and knowledge, be proficient in all phases of sprinkler systems installation and maintenance
- know the characteristics and installation requirements of fire protection equipment
- read and interpret plans and specifications
- calculate material quantities
- be proficient in the safe use and maintenance of hand tools, machines and equipment required to become a competent journeyman
- be thoroughly familiar with the safety requirements of sprinkler installations
- relate to job situations regarding other trades that precede or follow
- recognize that supervisory and management opportunities in the sprinkler industry are often available to trained and certified journeymen who demonstrate above average capabilities and motivation
- perform assigned tasks in accordance with quality and production standards required by industry

## **Apprenticeship and Industry Training System**

### **Industry-Driven**

Alberta's apprenticeship and industry training system is an industry-driven system that ensures a highly skilled, internationally competitive workforce in more than 50 designated trades and occupations. This workforce supports the economic progress of Alberta and its competitive role in the global market. Industry (employers and employees) establishes training and certification standards and provides direction to the system through an industry committee network and the Alberta Apprenticeship and Industry Training Board. The Alberta government provides the legislative framework and administrative support for the apprenticeship and industry training system.

### **Alberta Apprenticeship and Industry Training Board**

The Alberta Apprenticeship and Industry Training Board provides a leadership role in developing Alberta's highly skilled and trained workforce. The board's primary responsibility is to establish the standards and requirements for training and certification in programs under the Apprenticeship and Industry Training Act. The board also provides advice to the Minister of Advanced Education and Technology on the needs of Alberta's labour market for skilled and trained workers, and the designation of trades and occupations.

The thirteen-member board consists of a chair, eight members representing trades and four members representing other industries. There are equal numbers of employer and employee representatives.

### **Industry Committee Network**

Alberta's apprenticeship and industry training system relies on a network of industry committees, including local and provincial apprenticeship committees in the designated trades, and occupational committees in the designated occupations. The network also includes other committees such as provisional committees that are established before the designation of a new trade or occupation comes into effect. All trade committees are composed of equal numbers of employer and employee representatives. The industry committee network is the foundation of Alberta's apprenticeship and industry training system.

### **Local Apprenticeship Committees (LAC)**

Wherever there is activity in a trade, the board can set up a local apprenticeship committee. The board appoints equal numbers of employee and employer representatives for terms of up to three years. The committee appoints a member as presiding officer. Local apprenticeship committees:

- monitor apprenticeship programs and the progress of apprentices in their trade, at the local level
- make recommendations to their trade's provincial apprenticeship committee (PAC) about apprenticeship and certification in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- make recommendations to the board about the appointment of members to their trade's PAC
- help settle certain kinds of disagreements between apprentices and their employers
- carry out functions assigned by their trade's PAC or the board

### **Provincial Apprenticeship Committees (PAC)**

The board establishes a provincial apprenticeship committee for each trade. It appoints an equal number of employer and employee representatives, and, on the PAC's recommendation, a presiding officer - each for a maximum of two terms of up to three years. Most PACs have nine members but can have as many as twenty-one. Provincial apprenticeship committees:

- Make recommendations to the board about:
  - standards and requirements for training and certification in their trade
  - courses and examinations in their trade
  - apprenticeship and certification
  - designation of trades and occupations
  - regulations and orders under the Apprenticeship and Industry Training Act
- monitor the activities of local apprenticeship committees in their trade
- determine whether training of various kinds is equivalent to training provided in an apprenticeship program in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- consult with other committees under the Apprenticeship and Industry Training Act about apprenticeship programs, training and certification and facilitate cooperation between different trades and occupations
- consult with organizations, associations and people who have an interest in their trade and with employers and employees in their trade
- may participate in resolving certain disagreements between employers and employees
- carry out functions assigned by the board

### **Sprinkler Systems Installer PAC Members at the Time of Publication**

Mr. J. Gardiner .....	Edmonton .....	Presiding Officer
Mr. J. Anderson .....	Calgary .....	Employer
Mr. R. Mowatt .....	Calgary .....	Employer
Mr. D. Pollard .....	Calgary .....	Employer
Mr. R. Senkiw .....	Edmonton .....	Employer
Mr. S. Vollmer .....	Edmonton .....	Employer
Mr. S. Degruyter .....	Calgary .....	Employee
Mr. J. Stasiuk .....	Calgary .....	Employee
Mr. N. MacPherson .....	Edmonton .....	Employee
Mr. B. Pollock .....	Edmonton .....	Employee
Mr. K. Stewart .....	Edmonton .....	Employee

## Alberta Government

Alberta Advanced Education and Technology works with industry, employer and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and employers
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

## Technical Institutes and Colleges

The technical institutes and colleges are key participants in Alberta's apprenticeship and industry training system. They work with the board, industry committees and Alberta Advanced Education and Technology to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs. They develop lesson plans from the course outlines established by industry and provide technical training to apprentices.

## Apprenticeship Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, employers, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

## Alberta Apprenticeship and Industry Training Board Safety Policy

The Alberta Apprenticeship and Industry Training Board (board) fully supports safe learning and working environments and emphasizes the importance of safety awareness and education throughout apprenticeship training- in both on-the- job training and technical training. The board also recognizes that safety awareness and education begins on the first day of on-the-job training and thereby is the initial and ongoing responsibility of the employer and the apprentice as required under workplace health and safety training. However the board encourages that safe workplace behaviour is modeled not only during on-the-job training but also during all aspects of technical training, in particular, shop or lab instruction. Therefore the board recognizes that safety awareness and training in apprenticeship technical training reinforces, but does not replace, employer safety training that is required under workplace health and safety legislation.

The board has established a policy with respect to safety awareness and training:

**The board promotes and supports safe workplaces, which embody a culture of safety for all apprentices, employers and employees. Employer required safety training is the responsibility of the employer and the apprentice, as required under legislation other than the *Apprenticeship and Industry Training Act*.**

The board's complete document on its 'Apprenticeship Safety Training Policy' is available at [www.tradesecrets.gov.ab.ca](http://www.tradesecrets.gov.ab.ca); access the website and conduct a search for 'safety training policy'.

Implementation of the policy includes three common safety learning outcomes and objectives for all trade course outlines. These common learning outcomes ensure that each course outline utilizes common language consistent with workplace health and safety terminology. Under the title of 'Standard Workplace Safety', this first section of each trade course outline enables the delivery of generic safety training; technical training providers will provide trade specific examples related to the content delivery of course outline safety training.

**Addendum**

As immediate implementation of the board’s safety policy includes common safety learning outcomes and objectives for all course outlines, this trade’s PAC will be inserting these safety outcomes into the main body of their course outline at a later date. In the meantime the addendum below immediately places the safety outcomes and their objectives into this course outline thereby enabling technical training providers to deliver the content of these safety outcomes.

**STANDARD WORKPLACE SAFETY**

**A. Safety Legislation, Regulations & Industry Policy in the Trades .....**

**Outcome:** *Describe legislation, regulations and practices intended to ensure a safe work place in this trade.*

- 1. Demonstrate the ability to apply the Occupational Health and Safety Act, Regulation and Code.
- 2. Explain the role of the employer and employee in regard to Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations, and related advisory bodies and agencies.
- 3. Explain industry practices for hazard assessment and control procedures.
- 4. Describe the responsibilities of workers and employers to apply emergency procedures.
- 5. Describe positive tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
- 6. Describe the roles and responsibilities of employers and employees with respect to the selection and use of personal protective equipment (PPE).
- 7. Select, use and maintain appropriate PPE for worksite applications.

**B. Climbing, Lifting, Rigging and Hoisting .....**

**Outcome:** *Describe the use of personal protective equipment (PPE) and safe practices for climbing, lifting, rigging and hoisting in this trade.*

- 1. Select, use and maintain specialized PPE for climbing, lifting and load moving equipment.
- 2. Describe manual lifting procedures using correct body mechanics.
- 3. Describe rigging hardware and the safety factor associated with each item.
- 4. Select the correct equipment for rigging typical loads.
- 5. Describe hoisting and load moving procedures.

**C. Hazardous Materials & Fire Protection .....**

**Outcome:** *Describe the safety practices for hazardous materials and fire protection in this trade.*

- 1. Describe the roles, responsibilities features and practices related to the workplace hazardous materials information system (WHMIS) program.
- 2. Describe the three key elements of WHMIS.
- 3. Describe handling, storing and transporting procedures when dealing with hazardous material.
- 4. Describe safe venting procedures when working with hazardous materials.
- 5. Describe fire hazards, classes, procedures and equipment related to fire protection.

## **Workplace Health and Safety**

A tradesperson is often exposed to more hazards than any other person in the work force and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Workplace Health and Safety (Alberta Employment, Immigration and Industry) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at [www.worksafely.org](http://www.worksafely.org)

## **Technical Training**

Apprenticeship technical training is delivered by the technical institutes and many colleges in the public post-secondary system throughout Alberta. The colleges and institutes are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All training providers place great emphasis on safe technical practices that complement safe workplace practices and help to develop a skilled, safe workforce.

The following institutions deliver Sprinkler Systems Installer apprenticeship technical training:  
Red Deer College

## **Procedures for Recommending Revisions to the Course Outline**

Advanced Education and Technology has prepared this course outline in partnership with the Sprinkler Systems Installer Provincial Apprenticeship Committee.

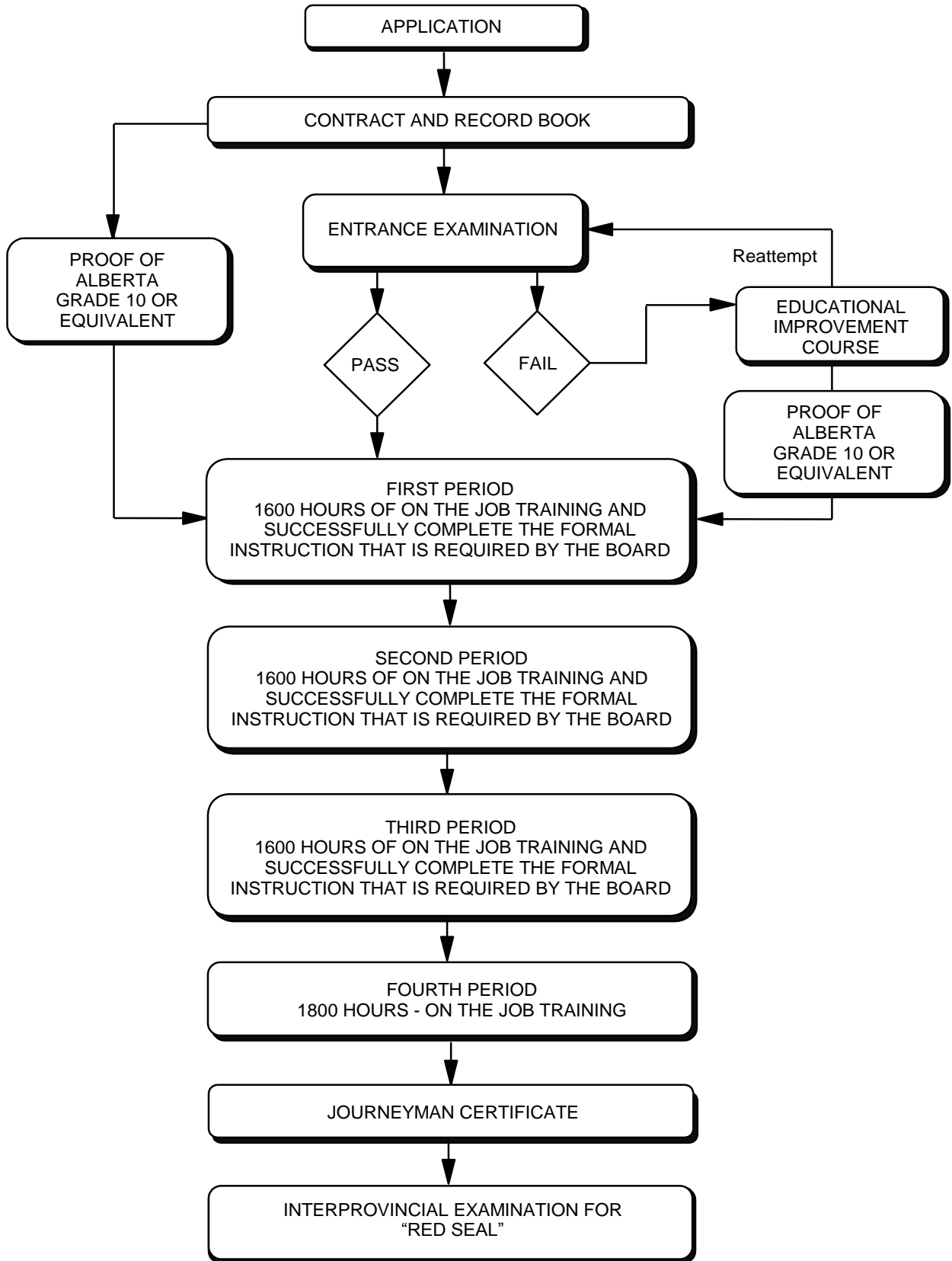
This course outline was approved on September 25, 2000 by the Alberta Apprenticeship and Industry Training Board on a recommendation from the Provincial Apprenticeship Committee. The valuable input provided by representatives of industry and the institutions that provide the technical training is acknowledged.

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

Sprinkler Systems Installer Provincial Apprenticeship Committee  
c/o Industry Programs and Standards  
Apprenticeship and Industry Training  
Advanced Education and Technology  
10th floor, Commerce Place  
10155 102 Street NW  
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used. Recommendations for change will be placed on the agenda for regular meetings of the Sprinkler Systems Installer Provincial Apprenticeship Committee.

### Apprenticeship Route toward Certification



**Sprinkler Systems Installer Training Profile**  
**First Period**  
**(7 Weeks 30 Hours per Week – Total of 210 Hours)**

**SECTION ONE**

**SAFETY AND W.H.M.I.S.**  
 27 HOURS



**A**

Safety  
 7 Hours

**B**

Introduction to Workplace  
 Hazardous Materials  
 Information Systems  
 (WHMIS)  
 2 Hours

**C**

Rigging Lifting and Climbing  
 Equipment  
 18 Hours

**SECTION TWO**

**GENERAL PIPING AND  
 MATERIALS**  
 36 HOURS



**A**

Steel Pipe  
 4 Hours

**B**

Threaded Pipe  
 5 Hours

**C**

Plastic Pipe  
 4 Hours

**D**

Tube and Tubing  
 2 Hours

**E**

Soldering  
 4 Hours

**F**

Valves  
 6 Hours

**G**

Hangers  
 5 Hours

**H**

Flanged Pipe  
 2 Hours

**I**

Grooved Pipe and Fittings  
 and Non Grooved "Grip  
 Style" Fitting  
 4 Hours

**SECTION THREE**

**SPRINKLER SYSTEMS AND  
 ALARMS**  
 48 HOURS



**A**

Introduction to the Sprinkler  
 Systems Industry  
 2 Hours

**B**

Automatic Sprinkler Heads  
 20 Hours

**C**

Wet Pipe Sprinkler Systems  
 8 Hours

**D**

Dry Pipe Sprinkler Systems  
 12 Hours

**E**

Antifreeze Sprinkler Systems  
 6 Hours

**SECTION FOUR**

**PRACTICAL APPLICATIONS**  
 53 HOURS



**A**

Hand and Power Tools  
 8 Hours

**B**

Threaded Pipe Joining  
 Techniques  
 6 Hours

**C**

Soldering  
 4 Hours

**D**

Plastic Pipe Joining  
 6 Hours

**E**

Powder Activated Tools  
 (Theory and Practical)  
 6 Hours

**F**

Trim Alarm Valves  
 10 Hours

**G**

Trim Dry Pipe Valves  
 10 Hours

**H**

Tour  
 3 Hours

**SECTION FIVE**

**TRADE MATHEMATICS AND  
 SCIENCE**  
 24 HOURS



**A**

Simple Arithmetic  
 4 Hours

**B**

Number Conversions  
 4 Hours

**C**

Linear, Perimeter and Areas  
 4 Hours

**SECTION SIX**

**BLUEPRINT READING,  
DRAWING AND SKETCHING**  
**22 HOURS**



**D**  
Percentage Calculations  
3 Hours

**E**  
Segments of a Circle  
1 Hour

**F**  
Properties of Water  
2 Hours

**G**  
Pressure and the  
Atmosphere  
6 Hours

**A**  
Introduction Into Sketching  
Use of Drawing Instruments  
2 Hours

**B**  
Alphabet of Lines  
2 Hours

**C**  
Fundamentals of  
Orthographic Projection  
2 Hours

**D**  
Views of a Building  
2 Hours

**E**  
Dimensioning and Scaling  
2 Hours

**F**  
Symbols and Abbreviations  
2 Hours

**G**  
Sections  
4 Hours

**H**  
Single Line Pipe Drawings  
4 Hours

**I**  
Applied Blueprint Reading  
2 Hours

**Second Period**  
**(7 Weeks 30 Hours per Week – Total of 210 Hours)**

**SECTION ONE**

<b>PIPING, SIZING AND EXTINGUISHERS</b> 24 HOURS	⇒	<b>A</b>	<b>B</b>	<b>C</b>
		Portable Fire Extinguishers 4 Hours	Piping Materials and Sizes 4 Hours	Piping Arrangements 7 Hours
		<b>D</b>	<b>E</b>	
		Protection From Freezing 4 Hours	Drainage of Mains, Branches and Valves 5 Hours	

**SECTION TWO**

<b>SPRINKLER HEADS</b> 42 HOURS	⇒	<b>A</b>	<b>B</b>	
		Installation Requirements for Sprinkler Heads 30 Hours	Residential Sprinkler Systems 12 Hours	

**SECTION THREE**

<b>HYDRANTS, STAND PIPES AND WATER SUPPLY</b> 44 HOURS	⇒	<b>A</b>	<b>B</b>	<b>C</b>
		Fire Hydrants and Associated Equipment 14 Hours	Stand Pipe and Hose Systems 14 Hours	Water Supply and Fire Department Connections 16 Hours

**SECTION FOUR**

<b>PRACTICAL APPLICATIONS</b> 46 HOURS	⇒	<b>A</b>	<b>B</b>	<b>C</b>
		Introduction to Welding Safety 12 Hours	Brazing Copper Joints 4 Hours	Threaded Pipe Offset Project 10Hours
		<b>D</b>	<b>E</b>	
		Trim Alarm Valves 10 Hours	Trim Dry Pipe Valves 10 Hours	

**SECTION FIVE**

<b>TRADE MATHEMATICS AND SCIENCE</b> 34 HOURS	⇒	<b>A</b>	<b>B</b>	<b>C</b>
		Review 2 Hours	Pressure and Density 10 Hours	Buoyancy, Water Properties and Flow 4 Hours
		<b>D</b>	<b>E</b>	<b>F</b>
		Volumes and Capacities 8 Hours	Grade and Hanger Calculation 2 Hours	Triangles 2 Hours
		<b>G</b>		
		Piping Offsets 6 Hours		

**SECTION SIX**

<b>BLUEPRINT READING, DRAWING AND SKETCHING</b> 20 HOURS	⇒	<b>A</b>	<b>B</b>	<b>C</b>
		Single Line Pipe Drawings 4 Hours	Divisions of Blueprints 2 Hours	Views and Drawings of a Building 2 Hours
		<b>D</b>	<b>E</b>	
		Elevations (Imperial and SI) 2 Hours	Applied Blueprint Reading, Drawing and Sketching 10 Hours	

**Third Period  
(7 Weeks 30 Hours per Week – Total of 210 Hours)**

**SECTION ONE**

**FIRE PUMPS AND LIMITED WATER SUPPLY**  
34 HOURS



**A**

Introduction to Fire Pumps  
28 Hours

**B**

Limited Water Supply  
6 Hours

**SECTION TWO**

**SPECIAL HAZARD SYSTEMS**  
58 HOURS



**A**

Dry and Wet Chemical Systems  
4 Hours

**B**

Fixed Water Spray Systems  
6 Hours

**C**

Water Spray Nozzles  
2 Hours

**D**

Introduction to Foam Extinguishing Systems  
8 Hours

**E**

Outside Exposure Systems  
4 Hours

**F**

Introduction to Carbon Dioxide Systems  
8 Hours

**G**

Pre-action and Deluge Systems  
16 Hours

**H**

Cross Connection Control Awareness  
2 Hours

**I**

Clean Agent Extinguishing System  
6 Hours

**J**

Water Mist  
2 Hours

**SECTION THREE**

**BASIC HYDRAULIC CALCULATIONS, MAINTENANCE AND REPORTS**  
34 HOURS



**A**

Basic Hydraulic Calculations  
6 Hours

**B**

Inspection, Testing and Maintenance of Water Based Sprinkler Systems  
16 Hours

**C**

Reports and Workmanship  
6 Hours

**D**

Introduction to Alberta Building Code  
6 Hours

**SECTION FOUR**

**PRACTICAL APPLICATIONS**  
62 HOURS



**A**

Small Diameter Pipe, Tube and Tubing Cold Bending  
6 Hours

**B**

Compression Fitting Project  
4 Hours

**C**

Introduction to Fire Alarm Panels  
6 Hours

**D**

Trim Alarm Valves  
8 Hours

**E**

Trim Dry Pipe Valves  
8 Hours

**F**

Trim Deluge Valves  
14 Hours

**G**

Trim Pre-action Valves  
16 Hours

**SECTION FIVE**

**TRADE MATHEMATICS AND SCIENCE**  
16 HOURS



**A**

Review  
4 Hours

**B**

Piping Offsets  
6 Hours

**C**

Introduction to Electricity  
6 Hours

**SECTION SIX**

**BLUEPRINT READING,  
DRAWING AND SKETCHING**  
**6 HOURS**



**A**

Blueprint Interpretation  
6 Hours

NOTE: The hours stated are for guidance and should be adhered to as closely as possible. However, adjustments must be made for rate of apprentice learning, statutory holidays, registration and examinations for the training establishment and Apprenticeship and Industry Training.

**FIRST PERIOD TECHNICAL TRAINING  
SPRINKLER SYSTEMS INSTALLER TRADE  
COURSE OUTLINE**

*UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.*

**SECTION ONE: ..... SAFETY AND W.H.M.I.S. .... 27 HOURS**

**A. Safety ..... 7 Hours**

- |  |   |
|--|---|
| <p>1. Safety must be emphasized throughout the program</p> | <p>1. Identify most common dangers and injuries in the pipe trades area of construction.</p> <p>2. List and demonstrate methods of eliminating or minimizing risks, when working in hazardous locations.</p> <p>3. Recognize dangers of electrocutions and list ways to eliminate risks.</p> <p>4. Demonstrate proper methods of lifting to minimize back injury.</p> <p>5. List types and use safety clothing and personal safety equipment.</p> <p>6. List hazards caused due to poor housekeeping habits and demonstrate safe habits.</p>  |
| <p>2. Occupational Health and Safety Act</p>               | <p>1. List, describe and implement from the Act, regulations pertaining to:</p> <ul style="list-style-type: none"> <li>a) personal safety</li> <li>b) general safety</li> <li>c) maintenance of equipment</li> <li>d) housekeeping</li> <li>e) overhead power lines</li> <li>f) lockout procedures</li> <li>g) general safety requirements</li> <li>h) personal protective equipment</li> <li>i) scaffolding</li> <li>j) ladders</li> <li>k) excavations and trenches</li> </ul> <ul style="list-style-type: none"> <li>i) v cuts</li> <li>ii) straight cuts</li> <li>iii) shoring</li> <li>iv) excavating permits</li> </ul> <p>l) hazardous locations</p> |
| <p>3. St. John First Aid</p>                               | <p>1. Describe procedures for obtaining St. John First Aid Standard certification.</p> <p>2. State the hours required for St. John First Aid Standard certification.</p>  |

**B. Introduction to Workplace Hazardous Materials Information Systems (WHMIS).....2 Hours**

NOTE: Introductory film available regarding WHMIS from O.H.S.

1. Describe what WHMIS is, its rationale and major elements.
2. List and describe some of the health effects hazardous materials may cause that are used in the pipe trades.
3. List and explain the classes of the Hazardous Products Act.
4. Define what is meant by a WHMIS label and distinguish between supplier and workplace labels and other means of identification.
5. Describe what is meant by the following classifications:
  - a) prohibited product
  - b) restricted product
  - c) controlled product
6. Explain what a Material Safety Data Sheet (MSDS) is, its purpose and limitations.
7. Describe the roles and responsibilities of employer, supplier and worker in the education of workers regarding WHMIS.

**C. Rigging, Lifting and Climbing Equipment ..... 18 Hours**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Types of rope           <ol style="list-style-type: none"> <li>a) natural</li> <li>b) synthetic</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>1. Recognize and name different types of fibre rope.</li> <li>2. State the characteristics of different types of fibre rope.</li> <li>3. State safe working loads of different types of fibre rope.</li> <li>4. State useful and detrimental applications of different types of fibre rope for lifting and pulling operations.</li> <li>5. State which type of rope is commonly used in the Sprinkler trade and why.</li> <li>6. State the advantages and disadvantages of natural and synthetic ropes.</li> </ol> |
| <ol style="list-style-type: none"> <li>2. Parts of a rope</li> </ol>   | <ol style="list-style-type: none"> <li>1. List and describe the common parts of a fibre rope.</li> <li>2. State characteristics and uses of parts of a fibre rope.</li> </ol>   |
| <ol style="list-style-type: none"> <li>3. Care of synthetic and natural fibre rope</li> </ol>  | <ol style="list-style-type: none"> <li>1. State proper care and maintenance of ropes with regard to:           <ol style="list-style-type: none"> <li>a) storage</li> <li>b) drying</li> <li>c) testing</li> <li>d) strength</li> <li>e) cleanliness</li> <li>f) kinks</li> <li>g) overloads</li> </ol> </li> </ol>   |

- |  |   |
|--|---|
| <p>4. Basic knots and hitches</p> <p>a) square knot</p> <p>b) round turn and half hitch</p> <p>c) clove hitch</p> <p>d) timber hitch</p> | <p>1. Recognize and name popular knots and hitches used on fibre ropes.</p> <p>2. State applications of popular knots and hitches used on fibre ropes.</p> <p>3. State safety factors for various knots and hitches.</p> <p>4. Tie knots and hitches.</p> <p>5. Use knots and hitches in correct applications for lifting and pulling operations, and for use as a safety harness.</p> <p>6. State and demonstrate safe methods of tying loads on trucks.</p> |
| <p>5. Wire ropes</p>   | <p>1. Recognize and name different types of wire ropes.</p> <p>2. State characteristics of different types of wire rope.</p> <p>3. State safe working loads of different types of wire rope.</p> <p>4. State useful and detrimental applications of different types of wire rope for lifting and pulling operations.</p>  |
| <p>6. Parts of wire rope</p>   | <p>1. List and describe the common parts of wire rope.</p> <p>2. State characteristics and uses of parts of a wire rope.</p>  |
| <p>7. Care of wire rope</p>  | <p>1. State proper care and maintenance of wire ropes and slings with regard to:</p> <p>a) storage</p> <p>b) drying</p> <p>c) testing</p> <p>d) strength</p> <p>e) cleanliness</p> <p>f) kinks</p> <p>g) overloads</p>  |
| <p>8. Chain falls, come-alongs, turfing and snatch blocks</p>  | <p>1. Recognize and name the differences between chain falls, come-alongs, turfing and snatch blocks.</p> <p>2. State useful and detrimental applications of each.</p> <p>3. State the safe working load of each.</p> <p>4. State correct methods of securing when using chain falls, come-alongs, turfing and snatch blocks.</p> <p>5. List and describe maintenance of chain falls, come-alongs, turfing and snatch blocks.</p>                             |
| <p>9. Crane and hand signals</p>   | <p>1. Display correct crane operator hand signals.</p>  |

1. Recognize and name different styles of steps and ladders used in the construction industry.
2. Erect ladders and steps in a safe manner.
3. State regulations pertaining to the correct use of ladders in the construction industry.
4. Recognize and name different types of scaffolds and platforms used in the construction industry.
5. State how to erect scaffolds and platforms in a safe manner with regard to safety rails and toe boards.
6. State and apply regulations pertaining to the correct use of scaffolds and platforms in the construction industry.

7. Show video on correct use and application of swing stages and power lifts.
8. Describe correct safety practices used when working with ladders, steps and scaffolds with regard to:
  - a) personal safety
  - b) personnel safety
  - c) jobsite safety
  - d) public safety

**SECTION TWO:..... GENERAL PIPING AND MATERIALS ..... 36 HOURS**

**A. Steel Pipe ..... 4 Hours**

- |  |   |
|--|---|
| <ol style="list-style-type: none"><li>1. Materials<ol style="list-style-type: none"><li>a) types</li></ol></li></ol> | <ol style="list-style-type: none"><li>1. List and describe the composition of steel pipe used by the Sprinkler Systems Installer.</li></ol> |
|--|---|

- b) schedule numbers and grades 1. List and describe schedule numbers and grades of steel pipe.
- c) pressure ratings 1. Describe pressure ratings of different pipe schedules and grades.
- d) pipe sizes and lengths 1. Recognize and state pipe sizes and standard lengths.
- e) end finishes 1. Recognize and state common end finishes for steel pipe.
- f) protective coatings and linings 1. Recognize and describe different protective coatings and linings applied to piping used by the Sprinkler Systems Installer.
- g) code interpretation 1. Explain codes, regulations and manufacturer's specifications pertaining to steel pipe including:
  - a) NFPA
  - b) ASME
  - c) ASTM
  - d) ANSI
  - e) NFPA and other applicable codes

**B. Threaded Pipe ..... 5 Hours**

1. Threading ..... 3 Hours

- a) pipe threading using
  - i) hand tools
  - ii) power tools
 1. List and describe correct tools needed for cutting a pipe thread using hand and power tools.  
 2. Describe the difference between bolt and pipe threading.  
 3. List and describe correct procedures when threading pipe using hand operated and power tools.
- b) nipple chucks
  - i) hand tools
  - ii) power tools
 1. List and describe correct use of a nipple chuck using hand threading tools.  
 2. List and describe procedures for using hand operated pipe dies to cut close nipples.  
 3. List and describe correct use of a nipple chuck using a power vise.
- c) thread cutting lubricants
 1. List and describe thread cutting lubricants.  
 2. Interpret manufacturer's information and regulations where necessary.  
 3. State application and purpose of thread cutting lubricants.
- d) installation techniques
 1. List and describe correct installation procedures used for threaded pipe.

2. Threaded fittings ..... 1 1/2 Hours

- a) types
  - 1. Recognize, name and size threaded pipe fittings used on steel pipe:
    - a) malleable
    - b) cast iron
    - c) steel
    - d) galvanized
  
- b) pressure ratings
  - 1. Describe pressure ratings of pipe fittings:
    - a) non-pressure
    - b) standard
    - c) heavy
    - d) extra heavy
    - e) pressure rated
  
- c) non ferrous threaded fittings
  - 1. Recognize and name threaded fittings used on non ferrous pipe.
  
- d) code interpretation
  - 1. Interpret ASME and other code regulations pertaining to threaded pipe and fittings.
  - 2. Interpret manufacturer's information and regulations where necessary.
  
- 3. Fabrication techniques..... 1/2 Hour
  - a) fabrication process
    - 1. List and describe correct fabrication processes for threaded pipe:
      - a) measure
      - b) mark
      - c) cut
      - d) ream (importance)
      - e) thread (the taper and quality)

**C. Plastic Pipe ..... 4 Hours**

- 1. Materials
  - a) types
    - 1. List and describe ULC approved, types and materials used for plastics pipe in the Sprinkler Systems industry and state their uses.
    - 2. Identify colour coding of plastic pipe.
  - b) pressure and temperature ratings
    - 1. Describe pressure and temperature ratings of different plastic piping materials.
  - c) sizes
    - 1. Recognize and state pipe sizes.
  - d) code interpretation
    - 1. Interpret codes, regulations and manufacturer's instructions pertaining to plastic piping materials.
  
- 2. Fittings
  - a) types
    - 1. Recognize, name and size different plastic fittings used in the piping industry.
  - b) code interpretation
    - 1. Interpret the codes, regulations and manufacturer's information pertaining to plastic pipe jointing and installation.

- |   |   |
|---|---|
| <p>3. Solvent welding</p> <p>a) fabrication process and materials</p> | <p>1. List and describe WHMIS requirements pertaining to solvent welded plastic pipe and cements.</p> <p>2. List and describe correct fabrication processes for solvent welding plastic pipe and fittings.</p> <p>3. List and describe the common pipe materials that are joined using solvent welding.</p> <p>4. Describe fittings used in solvent welding using correct names.</p>  |
| <p>b) assembly</p>  | <p>1. Identify "set", "test" and "cure" times for solvent welded plastic pipe joints at different temperature conditions.</p> <p>2. Describe how to make solvent welded plastic pipe joints at different temperature conditions.</p> <p>3. Describe how to correctly and safely test plastic piping installations.</p> <p>4. Identify hangers used with plastic pipe.</p> <p>5. Describe correct hanger installation, spacing and location techniques for supporting and securing plastic pipe.</p> |
| <p>c) tools required</p>  | <p>1. List tools required to assemble solvent welded plastic pipe.</p>  |

**D. Tube and Tubing .....2 Hours**

- |  |  |
|--|--|
| <p>1. Materials</p> <p>a) non ferrous<br/>i)copper</p> | <p>1. List and describe types and materials used for non ferrous tube and tubing used in the Sprinkler Systems Installer trade and state the application of each material.</p>   |
| <p>b) grades</p>                                       | <p>1. List and describe grades of tube and tubing available.</p>   |
| <p>c) pressure ratings</p>                             | <p>1. Describe pressure ratings of different tube and tubing grades.</p>   |
| <p>d) copper tube</p>                                  | <p>1. List and describe colour coding of copper tube and their applications.</p> <p>2. State what lengths that copper tube is manufactured.</p> <p>3. State differences and applications of straight lengths and annealed coils.</p> <p>4. Describe specialized applications of copper tube.</p> |
| <p>e) sizes</p>  | <p>1. Recognize and state tube and tubing sizes.</p> <p>2. State how tube, tubing, piping is sized and ordered.</p>  |

**E. Soldering.....4 Hours**

1. Soldering joints
  - a) soldered tube and tubing fittings
    1. Recognize, name and size soldered tube and tubing fittings and state where each would be used in the Sprinkler Systems industry.
  - b) pressure and temperature ratings
    1. Describe pressure ratings of soldered fittings.
    2. Describe different types, temperature and pressure ratings of soldered joints.
    3. List and describe the effects of temperature changes on the pressure rating of soft soldered joints on tube and tubing.
  - c) fluxes
    1. List and describe fluxes that are used for soft soldering.
    2. Describe the purpose of flux.
    3. Describe the effects of flux.
2. Solders types
  - a) identification
    1. List and describe different solders used.
    2. Describe how different solders are identified.
  - b) pressure and temperature ratings
    1. List and describe pressure and temperature ratings of various solders.
  - c) jointing techniques for all sizes
    1. List and describe correct fabrication processes for soft soldered tube and tubing jointing:
      - a) measure
      - b) mark
      - c) cut
      - d) ream
      - e) clean
      - f) flux
      - g) heat
      - h) solder
      - i) wipe
  - d) tools required
    1. List and describe correct tools and soldering equipment needed for making and assembling a soft soldered joint on tube or tubing in all sizes.
  - e) soft soldering techniques
    1. List and describe correct and safe procedures to be used when soft soldering tube and tubing.
3. Heating of solder joints
  - a) type of torches
    1. List and describe the different torches available:
      - a) acetylene
      - b) propane
      - c) butane
      - d) disposable and refillable tanks
      - e) high heat output type
      - f) numbering system of tips

- b) torch and tip selection
  - 1. Describe the importance of selecting the correct torch and tip for the job.
  - 2. Describe the importance of even heat distribution when soldering a joint.
- c) code interpretation
  - 1. Interpret code, regulations and manufacturer's instructions when assembling and heating solder joints.

**F. Valves ..... 6 Hours**

- 1. Materials
  - a) types of valves
    - 1. Recognize and name types of approved valves and used in sprinkler systems:
      - a) ball
      - b) butterfly
      - c) check
      - d) gate
      - e) globe
      - f) control
      - g) pressure reducing valves
      - h) test and drain valves
    - 2. Describe major design variations and construction features of the valves.
    - 3. State which are indicating valves and explain their operation.
    - 4. State major applications of various valves.
    - 5. State range of sizes available for various valves.
  - b) pressure ratings
    - 1. Identify, list and describe pressure markings and ratings of various types of valves.
  - c) installation
    - 1. Describe correct installation procedures for valves.
  - d) valve service
    - 1. List and describe common maintenance problems.
    - 2. List and describe correct service and maintenance procedures for valves.
  - e) code interpretation
    - 1. Interpret codes, regulations and manufacturer's instructions pertaining to valves and their installation.

**G. Hangers ..... 5 Hours**

- 1. Materials
  - a) types of hangers and supports
    - 1. Recognize and name pipe, tube and tubing hangers used by the Sprinkler Systems Installer.

- b) uses of different hangers
  1. State use of different hangers.
  2. State how to control swaying of pipe.
- c) protective coatings used on hangers
  1. List and describe protective materials applied to hangers.
  2. State reasons for using protective coatings on hangers with reference to corrosion and electrolysis.
- d) spacing
  1. List maximum distances between hangers on different sizes of lines in both SI and imperial units.
  2. Calculate hanger spacing.
- e) fasteners and inserts
  1. Recognize and name different fasteners and inserts used to secure pipe, tube and tubing hangers.
  2. Describe correct fasteners and inserts installation techniques.
  3. Recognize differences screws, head types, numbering system and applications.
  4. Identify different types, sizes and application of hanger rod.
- f) installation techniques
  1. List and describe correct installation processes for pipe, tube and tubing hangers and supports.
  2. List and describe correct tools needed when installing hangers and fasteners.

**H. Flanged Pipe ..... 2 Hours**

1. Materials
  - a) fittings
    - i) materials and types
      1. Identify different styles of flanges.
      2. Recognize, name and size flanged pipe fittings used on various pipe materials and gaskets used on various sprinkler systems.
      3. Recognize and list flange and gasket materials.
      4. Interpret required markings on flanges.
      5. Interpret specifications for gaskets.
      6. Interpret manufacturer's optional markings on flanges.
      7. Interpret manufacturer's data for gaskets.
    - ii) pressure and temperature rating
      1. Describe pressure and temperature ratings.
      2. State size when 150 lb. flanges change from 4 hole to 8 hole.

- b) gaskets
  - 1. Identify gaskets used in sprinkler systems.
  - 2. Use tables of flange sizes to determine sizes of manufactured gaskets.
- c) pipe flanging
  - 1. List and describe correct tools and equipment needed for preparing and tightening flanged pipe joints.
  - 2. Demonstrate correct procedure for tightening flanged joints.
- d) code interpretation
  - 1. Interpret codes, regulations and manufacturer's specifications pertaining to flanged pipe fittings and gasket materials.

**I. Grooved Pipe and Fittings and Non Grooved "Grip Style" Fitting ..... 4 Hours**

- 1. Fittings
  - a) materials and types
    - 1. Recognize, name and size grooved pipe and non grooved grip style fittings used on various pipe materials.
    - 2. Recognize suitable grooved and grip style pipe materials.
    - 3. Interpret required markings on grooved and grip style fittings.
    - 4. Interpret manufacturer's optional markings on fittings.
    - 5. Identify grooved and grip style pipe fitting symbols used on blueprints, spools and other piping drawings.
  - b) pressure and temperature ratings
    - 1. Describe pressure and temperature ratings of pipe fittings and gaskets.
  - c) gasket selection
    - 1. Identify colour coding of gaskets.
  - d) installation techniques
    - 1. List and describe the correct installation procedures used for the installation of grooved and grip style pipe and fittings.
  - e) code interpretation
    - 1. Interpret codes, regulations and manufacturer's specifications pertaining to proper gasket selection and the installation of pipe and fittings.
- 2. Fabrication process
  - 1. List and describe correct fabrication processes for grooved pipe and non grooved grip style piping:
    - a) measure
    - b) mark
    - c) cut
    - d) ream
    - e) groove
    - f) joint

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>3. Pipe grooving using:           <ul style="list-style-type: none"> <li>a) hand tools</li> <li>b) power tools               <ul style="list-style-type: none"> <li>i) cut grooves</li> <li>ii) roll grooves</li> </ul> </li> <li>c) machines</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>1. List and describe correct tools and equipment needed for preparing a grooved pipe joint for jointing.</li> <li>2. List and describe correct power groover maintenance.</li> <li>3. List and describe correct procedures to be used when grooving pipe using power operated tools.</li> </ul> |
|---|--|

**SECTION THREE:.....SPRINKLER SYSTEMS AND ALARMS..... 48 HOURS**

**A. Introduction to the Sprinkler Systems Industry .....2 Hours**

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1. Historical foundations</li> </ul>                  | <ul style="list-style-type: none"> <li>1. Describe the heritage of the sprinkler systems industry.</li> <li>2. Describe the social importance of the modern sprinkler systems.</li> </ul>  |
| <ul style="list-style-type: none"> <li>2. Job and career opportunities</li> </ul>            | <ul style="list-style-type: none"> <li>1. List and describe the scope of the sprinkler systems industry.</li> <li>2. List and describe possible career opportunities available in the sprinkler systems industry.</li> </ul>   |
| <ul style="list-style-type: none"> <li>3. Trade regulations and regulatory bodies</li> </ul> | <ul style="list-style-type: none"> <li>1. Read and interpret the Alberta Trade Regulations for the trade of Sprinkler Systems Installer.</li> <li>2. List regulatory bodies of the sprinkler industry:           <ul style="list-style-type: none"> <li>a) NFPA</li> <li>b) FM</li> <li>c) ULC</li> </ul> </li> </ul>  |
| <ul style="list-style-type: none"> <li>4. Advantages</li> </ul>                              | <ul style="list-style-type: none"> <li>1. List the advantages that sprinkler systems provide in a building.</li> </ul>   |
| <ul style="list-style-type: none"> <li>5. Failures</li> </ul>                                | <ul style="list-style-type: none"> <li>1. List and explain the major causes of sprinkler systems failure.</li> </ul>   |
| <ul style="list-style-type: none"> <li>6. Systems</li> </ul>                                 | <ul style="list-style-type: none"> <li>1. Describe the various fire protection system that would be installed:           <ul style="list-style-type: none"> <li>a) wet pipe system</li> <li>b) dry pipe system</li> <li>c) deluge system</li> <li>d) pre-action system</li> <li>e) limited water system</li> <li>f) special types               <ul style="list-style-type: none"> <li>i) CO<sub>2</sub></li> <li>ii) dry chemical</li> <li>iii) foam</li> <li>iv) others</li> </ul> </li> </ul> </li> </ul> |
| <ul style="list-style-type: none"> <li>7. Components</li> </ul>                              | <ul style="list-style-type: none"> <li>1. Identify major components of the various systems.</li> </ul>   |

**B. Automatic Sprinkler Heads .....20 Hours**

1. Materials and approval
  1. State materials used in the manufacture of sprinkler heads.
  2. List approval required for sprinkler heads.
2. Types of heads
  1. List and describe the various types of sprinkler heads approved for use:
    - a) solder
    - b) bulb
    - c) open
    - d) nozzle
    - e) on/off
3. Variations of heads
  1. Identify various design differences of sprinkler heads and state their application:
    - a) upright
    - b) pendant
    - c) sidewall
    - d) dry pendant
    - e) fast response
    - f) residential
    - g) extended coverage
    - h) E.S.F.R.
    - i) large drop
  2. Explain the variation in orifice sizes.
  3. List and describe coatings and finishes used on sprinkler heads.
4. Installation of sprinkler heads
  1. List and describe installation procedures of sprinkler heads:
    - a) care and storage of heads
    - b) wrenches and other tools required
    - c) selection of correct head
    - d) other considerations
5. Ceiling temperature
  1. List and describe how maximum ceiling temperature is established.
6. Temperature ratings and colour coding
  1. List the temperature ratings of sprinkler heads and state how the rating is identified.
  2. Identify colour codes of heads and state the temperature ratings.
  3. Identify glass bulb colour of heads and state the temperature ratings.
7. Decorative heads
  1. State regulations regarding colour identification of decorative-type sprinkler heads.
8. Clearances
  1. State minimum distances of sprinkler heads from:
    - a) heating coils
    - b) lights
    - c) steam lines
    - d) store windows
    - e) unit heaters
    - f) radiators
    - g) other sources of heat

- |                                      |   |
|--------------------------------------|---|
| 9. Spray patterns of sprinkler heads | <ol style="list-style-type: none"> <li>1. List the sprinkler heads used in the industry and identify the spray pattern of each.</li> <li>2. Explain the terms:               <ol style="list-style-type: none"> <li>a) effective throw</li> <li>b) profile</li> </ol> </li> </ol>   |
| 10. Protection of sprinkler heads    | <ol style="list-style-type: none"> <li>1. Identify where heads may require wire guards.</li> <li>2. Describe the effects of paint and excessive dust or dirt on sprinkler heads.</li> <li>3. List and describe how sprinkler heads are protected from corrosion.</li> <li>4. Explain why sprinkler heads and systems must be protected against freezing.</li> </ol> |

**C. Wet Pipe Sprinkler Systems ..... 8 Hours**

- |                                     |   |
|-------------------------------------|---|
| 1. Definition and code requirements | <ol style="list-style-type: none"> <li>1. Define a wet pipe sprinkler system and state how it operates.</li> <li>2. Identify codes, regulations and manufacturer's specifications regarding wet pipe sprinkler systems.</li> </ol>  |
| 2. Advantages and disadvantages     | <ol style="list-style-type: none"> <li>1. List and describe the advantages and disadvantages of a wet pipe sprinkler system.</li> </ol>   |
| 3. Where installed                  | <ol style="list-style-type: none"> <li>1. List and define the types of buildings that would require a wet pipe sprinkler system.</li> </ol>   |
| 4. Water supply                     | <ol style="list-style-type: none"> <li>1. List and explain water supply available for this system.</li> </ol>   |
| 5. Sizing                           | <ol style="list-style-type: none"> <li>1. Explain briefly the difference between a pipe schedule system compared to a hydraulically calculated system.</li> <li>2. Explain briefly why a hydraulically calculated system should not be altered without proper approval.</li> <li>3. State the requirements for engineers approval for this sprinkler system.</li> </ol> |
| 6. Control valves                   | <ol style="list-style-type: none"> <li>1. Identify the control valves that are approved for this system and state:               <ol style="list-style-type: none"> <li>a) installation requirements</li> <li>b) location</li> <li>c) type</li> <li>d) other considerations</li> </ol> </li> </ol>  |

7. Alarm check valves
  1. Identify approved alarm check valves for this system and state:
    - a) installation requirements
    - b) location
    - c) type
    - d) other considerations
  2. Explain how the alarm check valve operates.
8. Protection against false alarm
  1. List and describe methods of preventing false alarms:
    - a) excess pressure pumps
    - b) retarding chamber
    - c) other approved methods
  2. Identify the correct location for each piece of equipment.
9. Fire department connections
  1. List and describe requirements for the installation of fire department connections.
  1. List and describe the requirements for the installation of the inspectors test connections.

1. List and describe correct tools required to complete the installation of a wet pipe sprinkler system.

1. List and explain requirements for testing the system.

**D. Dry Pipe Sprinkler Systems ..... 12 Hours**

- |                                     |  |
|-------------------------------------|--|
| 1. Definition and code requirements | 1. Define a dry pipe sprinkler system and state how it operates.<br>2. Identify codes, regulations and manufacturer's specifications regarding dry pipe sprinkler systems.     |
| 2. Advantages and disadvantages     | 1. List and describe the advantages and disadvantages of a dry pipe sprinkler system.  |
| 3. Where installed                  | 1. List and describe types of buildings that would require a dry pipe sprinkler system.  |
| 4. Water supply                     | 1. List and explain water supply available for this system.<br>2. Explain briefly the difference between a pipe schedule system compared to a hydraulically calculated system. |
| 5. Sizing                           | 1. Explain briefly why a hydraulically, calculated system should not be altered without proper approval.   |

2. State the requirements for engineers approval for this system.
6. Control valves
  1. Identify control valves that are approved for this system and state:
    - a) installation requirements
    - b) location
    - c) type
    - d) method of operation
    - e) other considerations
7. Dry pipe valve
  1. Identify dry pipe valve for this system and state:
    - a) installation requirements
    - b) location
    - c) type
    - d) method of operation
    - e) other consideration
8. Quick-opening devices
  1. State requirements for the installation of quick-opening devices:
    - a) accelerators
    - b) exhausters
  2. State the function of these devices.
9. Air supply
  1. List and explain the air supply requirements for the system including:
    - a) limitations
    - b) method of air supply
    - c) air dryers
    - d) owners air
    - e) storage tanks
    - f) capacity of compressor
    - g) maximum air pressure
    - h) use of nitrogen
  1. List and describe the function of the auxiliary drain.
  2. List and describe requirements for the installation of fire department connections.

1. Explain requirements for the installation of the inspector test connections.

1. List and describe correct tools required to complete the installation of a dry pipe sprinkler system.

1. List and explain requirements for leak testing the system.

**E. Antifreeze Sprinkler Systems ..... 6 Hours**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Definitions and code requirements</li> </ol> | <ol style="list-style-type: none"> <li>1. Define antifreeze sprinkler system and state how it operates.</li> <li>2. Identify codes, regulations and manufacturer's specifications regarding antifreeze sprinkler systems.</li> </ol>  |
| <ol style="list-style-type: none"> <li>2. Advantages and disadvantages</li> </ol>      | <ol style="list-style-type: none"> <li>1. List and describe the advantages and disadvantages of antifreeze sprinkler systems.</li> </ol>  |
| <ol style="list-style-type: none"> <li>3. Where installed</li> </ol>                   | <ol style="list-style-type: none"> <li>1. List and describe types of buildings that would require antifreeze sprinkler systems.</li> </ol>  |
| <ol style="list-style-type: none"> <li>4. Antifreeze solutions</li> </ol>              | <ol style="list-style-type: none"> <li>1. State the antifreeze solutions used in systems and explain:               <ol style="list-style-type: none"> <li>a) why glycol cannot be used in its undiluted form</li> <li>b) how often antifreeze solutions must be tested</li> <li>c) the freezing point of antifreeze solutions</li> <li>d) the types of antifreeze to be used when the system is connected to a<br/>public water supply</li> <li>e) the use of MSDS when working with antifreeze</li> </ol> </li> </ol> |
| <ol style="list-style-type: none"> <li>5. Installation requirements</li> </ol>         | <ol style="list-style-type: none"> <li>1. List installation requirements for an antifreeze sprinkler system including:               <ol style="list-style-type: none"> <li>a) total capacity</li> <li>b) isolation of system</li> <li>c) antifreeze loop</li> </ol> </li> </ol>  |
| <ol style="list-style-type: none"> <li>6. Cross connection control</li> </ol>          | <ol style="list-style-type: none"> <li>1. List cross connection control requirements for this system.</li> </ol>  |
| <ol style="list-style-type: none"> <li>7. Control valves</li> </ol>                    | <ol style="list-style-type: none"> <li>1. Identify the control valves that are required for this system and state the installation requirements.</li> </ol>   |
| <ol style="list-style-type: none"> <li>8. Inspectors test connections</li> </ol>       | <ol style="list-style-type: none"> <li>1. Explain requirements for the installation of the inspection test connections.</li> </ol>  |
| <ol style="list-style-type: none"> <li>9. Tools required</li> </ol>                    | <ol style="list-style-type: none"> <li>1. List and describe correct tools required to complete the installation of the system.</li> </ol>   |

1. List and explain requirements for leak testing the system.

1. List and describe common maintenance procedures associated with this system.

1. Describe safety practices to be followed when installing antifreeze and systems with regard to:
  - a) personal safety
  - b) personnel safety
  - c) jobsite safety
  - d) public safety

**SECTION FOUR:.....PRACTICAL APPLICATIONS..... 53 HOURS**

**A. Hand and Power Tools ..... 8 Hours**

1. Safe use of tools ..... 7 Hours

- a) hand and power tools
  1. Recognize and name hand and power tools used in the Sprinkler Systems Installer trade.
  2. Explain what each tool is designed to do.
  3. Select the proper tool and proper size for the desired task.

- b) use of tools
  - 1. Demonstrate correct and safe use of all hand and power tools throughout the program.
  - 2. Replace worn or defective parts of hand and power tools as necessary.
  - 3. Sharpen and dress cutting tools where necessary.
  - 4. List and describe workmanship, safety and correct operational procedures associated with hand and power tools.
- c) O.H.S.
  - 1. State the regulations contained in the Alberta Occupational Health and Safety Act, General Safety Regulations, pertaining to the use of power and electrical tools.
  - 2. When using and maintaining tools, demonstrate correct safety practices at all times with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

2. Freeze packs.....1 Hour

- a) use of freeze packs
  - 1. List and describe the advantages and uses of freeze packs in the sprinkler industry.
  - 2. Describe how freeze packs are installed and how ice plugs form in pipes.
  - 3. List sizes of freeze packs available.
- b) demonstration
  - 1. Attend a demonstration of the application of a freeze pack.
- c) safety
  - 1. Describe correct safety practices used when working with freeze packs with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

**B. Threaded Pipe Jointing Techniques .....6 Hours**

- 1. Threaded pipe
  - 1. Identify by name, grade, size, pipe, fittings and tools used for conveying gases and liquids.
  - 2. Use hand and power tools to thread pipe in a correct and safe manner with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

- 2. Hand threaded techniques
  - 1. Demonstrate safe use of drophead dies:
    - a) remove and inspect dies
    - b) replace dies
    - c) set dies to cut correct depth of thread
    - d) demonstrate correct maintenance procedures
    - e) identify difference between pipe threaders and bolt threaders
  
- 3. Power threading
  - 1. Demonstrate safe use of power threaders:
    - a) controls of power threaders
    - b) remove and inspect diehead and dies
    - c) replace dies
    - d) set dies to correctly cut tapered thread
    - e) cut running thread
    - f) cut close nipples by use of nipple chuck
    - g) demonstrate correction maintenance procedures
  
- 4. Project
  - 1. Cut and thread pipe to required dimensions using correct processes.
  - 2. State leak test requirements for threaded pipe installations in accordance with applicable regulations and requirements.

**C. Soldering.....4 Hours**

- 1. Soft soldered joints
  - 1. Identify by name, grade, size and material the tube, fittings and tools used for soft soldered applications in the Sprinkler Systems Installer trade.
  - 2. Use both hand and power tools to prepare and assemble soft soldered joints in a correct and safe manner with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety
  - 3. Cut, prepare and flux soft solder joints to required dimensions using correct processes.
  - 4. Assemble and soft solder joints using correct processes.
  - 5.
    - a) choose the correct tip for the project
    - b) use different types of torches when soldering project
    - c) use different types of solder as instructed.
  - 6. Solder at least one joint using the electrical resistance method.
  - 7. Leak test soft soldered joints as required.

**D. Plastic Pipe Joining .....6 Hours**

- 1. CPVC joining
  - 1. Identify by name, grade, size and state application of plastic pipe used by the Sprinkler Systems Installer.

- 2. Check for approval authorities.
  - 3. Identify by name correct fittings to be used with plastic pipe.
  - 4. Identify by name correct hand tools to be used when assembling plastic pipe.
2. Safety
- 1. Follow correct safety practices including WHMIS, when joining plastic pipe with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety
3. Correct procedures
- 1. Use hand tools to prepare and assemble, CPVC.
  - 2. Demonstrate correct fabrication process for solvent welding plastic pipe and fittings:
    - a) measure
    - b) mark
    - c) cut
    - d) prepare pipe and fittings
    - e) assemble
  - 3. Perform connections using CPVC solvent cement.
  - 4. Identify, set and cure times.
  - 5. Interpret manufacturer's information and regulations where necessary for plastic solvent welding.
  - 6. Assemble and leak test joints in accordance with codes, regulations and manufacturer's requirements.

**E. Powder Activated Tools (Theory and Practical) ..... 6 Hours**

- 1. Types of powder activated tools
  - 1. List and describe common powder activated tools used in the construction industry.
  - 2. State differences between high and low velocity powder activated tools.
  - 3. List and describe differences between light duty and heavy duty powder activated tools and fastening components.
  - 4. State application of colour coding as it applies to powder activated tools.
  - 5. List applications of the various fasteners used with powder activated tools.
- 2. Uses and applications
  - 1. State correct use of powder activated tools.

- 3. Preventative maintenance
  - 1. List and describe correct preventative maintenance needed to keep powder activated tools in safe working order.
  - 2. Perform preventative maintenance on powder activated tools.
- 4. Safety practices
  - 1. Describe correct safety practices employed when using powder activated tools:
    - personal safety
    - personnel safety
    - jobsite safety
    - public safety
- 5. Regulations
  - 1. List and describe regulations pertaining to the use and application of powder activated tools in the construction industry.
- 6. Use powder activated tools
  - 1. Use powder activated tools in a safe and workman like manner to install hangers, appliance supports and components as necessary.

**F. Trim Alarm Valves..... 10 Hours**

- 1. Identification
  - 1. Correctly identify alarm valve to be trimmed.
  - 2. List and identify design variations of types of alarm valves.
  - 3. List and identify the type of alarms that an alarm valve operates.
- 2. Tools required
  - 1. Identify and select correct tools required to complete the project.
- 3. Installation
  - 1. State where alarm valves are usually located.
  - 2. Identify trim and accessories required to complete the installation.
  - 3. Following correct procedures trim alarm valve.

**G. Trim Dry Pipe Valves ..... 10 Hours**

- 1. Identification
  - 1. Correctly identify dry pipe valve to be trimmed.
  - 2. List and identify various types of dry pipe valves.
  - 3. List and identify the type of alarms the dry pipe valve will operate.
  - 4. Identify the quick open devices being used.
- 2. Tools required
  - 1. Identify and select correct tools required to complete the project.
- 3. Installation
  - 1. State where dry pipe valves are usually located.
  - 2. Identify trim and accessories required to complete the installation.
  - 3. Following correct procedures trim dry pipe valve.

H. Tour ..... 3 Hours

T  
o  
u  
r  
  
o  
f  
  
w  
h  
o  
l  
e  
s  
a  
l  
e  
r  
  
o  
r  
  
f  
a  
c  
i  
l  
i  
t  
y  
  
t  
h  
a  
t  
  
w  
o  
u  
l  
d  
  
b  
e  
  
i  
n  
f  
o  
r  
m  
a  
t  
i  
v  
e  
  
f  
o  
r

**SECTION FIVE: ..... TRADE MATHEMATICS AND SCIENCE ..... 24 HOURS**

**A. Simple Arithmetic..... 4 Hours**

- |  |  |
|--|--|
| 1. Whole numbers                                 | 1. Add, subtract, multiply and divide numbers. |
| 2. Decimal numbers                               | 1. Add, subtract, multiply and divide numbers. |
| 3. Fractions                                     | 1. Add, subtract, multiply and divide numbers. |
| 4. Introduction to the use of a basic calculator | 1. Add, subtract, multiply and divide numbers. |
| 5. Mixed numbers                                 | 1. Add, subtract, multiply and divide numbers. |

**B. Number Conversions..... 4 Hours**

1. Convert fractional values to decimal values (from fractional one sixteenth).
2. Convert decimal values to fractional values.
3. Convert fractional inches to decimal inches (from fractional sixteenths).
4. Convert decimal inches to fractional inches.
5. Interconvert metres, centimetres and millimetres.

**C. Linear, Perimeter and Area ..... 4 Hours**

- |  |   |
|--|---|
| 1. Linear measurements   | 1. State the formulas for calculating the perimeter of flat plane.                                    |
| a) perimeters  |   |
| i)rectangles   | 2. Calculate perimeter of regular shaped figures, in both imperial and SI units.                      |
| ii)squares   |   |
| iii)circles  |   |
| 2. Area measurements   | 1. State the formula for calculating the area of a flat plane.  |
| a) areas of flat planes  |   |
| i)rectangles   | 2. Calculate areas of regular shaped figures, In both imperial and SI units.                          |
| ii)squares   |   |
| iii)circles  |   |
| b) surface areas of regular shaped solids, tanks and cylinders | 1. State the formulas for calculating the surface area of regular shaped solids, tanks and cylinders. |

- i)rectangular tanks
- ii)flat ended cylinders

- 2. Calculate surface area of regular shaped tanks and cylinders, in both imperial and SI units.

**D. Percentage Calculations ..... 3 Hours**

- 1. Percentages
  - 1. Calculate percent of known values.
  - 2. Calculate real values from percent values.
- 2. Trade mathematics
  - a) pricing
    - 1. Costing materials.
    - 2. Calculate discounts.
    - 3. Calculate wage rates.

**E. Segments of a Circle..... 1 Hour**

- 1. State the angle of fittings as it relates to segments of a circle.

**F. Properties of Water ..... 2 Hours**

- 1. Definitions
  - a) terminology
    - 1. Define and explain the terms:
      - a) adhesion
      - b) cohesion
      - c) surface tension
      - d) capillarity
  - b) applications
    - 1. Explain the applications of the principles of: adhesion, cohesion, surface tension and capillarity in Sprinkler Systems Installer trade with reference to soldering, brazing and use of fluxes.
- 2. Density
  - a) terminology
    - 1. Define and explain the term density.
- 3. Chemical and physical properties of water
  - 1. State the relative density of water.
  - 2. State the effects of freezing and heating water.

**G. Pressure and the Atmosphere..... 6 Hours**

- 1. Relative density
  - a) terminology
    - 1. Define and explain the meaning of the term relative density.

- b) water pressure
  - 1. Define and explain the effects of pressure on water.
  - 2. Explain the transmission of pressure within pipes and tanks.
- 2. Atmosphere
  - a) properties of atmosphere
    - 1. List and describe the properties of atmosphere as it relates to the trade of Sprinkler Systems Installer.
  - b) atmosphere pressure
    - 1. State the pressure of the atmosphere at sea level in both SI and metric units.
    - 2. Describe the effects of altitude on atmospheric pressure.
    - 3. Interconvert gauge and absolute pressures in both SI and imperial units.

**SECTION SIX: ..... BLUEPRINT READING, DRAWING AND SKETCHING ..... 22 HOURS**

**A. Introduction Into Sketching Use of Drawing Instruments ..... 2 Hours**

- 1. Identify and explain use of sketching and drafting equipment.

**B. Alphabet of Lines ..... 2 Hours**

- 1. Recognize typical lines found on a blueprint of a typical wet pipe system:
  - a) visible line
  - b) hidden line
  - c) centre line
  - d) dimension line
  - e) extension line
  - f) section cutting line
  - g) material section line

**C. Fundamentals of Orthographic Projection ..... 2 Hours**

- 1. Recognize three basic views.
- 2. Draw and label three basic views of an object.

**D. Views of a Building ..... 2 Hours**

- 1. With the aid of a blueprint list the views of a building:
  - a) plan
  - b) elevation

- 2. Orientate elevation views with respect to:
  - a) front elevation
  - b) rear elevation
  - c) right elevation
  - d) left elevation
  
- 3. Orientate elevation views with respect to:
  - a) north
  - b) south
  - c) east
  - d) west

**E. Dimensioning and Scaling .....2 Hours**

- 1. Recognize and interpret architectural dimensions.
- 2. Read and interpret SI scale rule.
- 3. Read and interpret the Architect scale rule.
- 4. List and explain the typical scales used for:
  - a) floor plans
  - b) elevations
  - c) sections
  - d) details

**F. Symbols and Abbreviations.....2 Hours**

- 1. Recognize, interpret and explain typical symbols found on typical sprinkler system blueprints.
- 2. List and describe common symbols including:
  - a) pipe fittings and valves

**G. Sections .....4 Hours**

- 1. Recognize and draw sections of simple objects.

**H. Single Line Pipe Drawings .....4 Hours**

- 1. Draw and label in a legible manner, orthographic single line piping drawings using 90 degree elbows and tees.
- 2. Draw and label in a legible manner, isometric single line piping drawings using 90 degree elbows and tees.

**I. Applied Blueprint Reading .....2 Hours**

1. Interpret blueprint symbols used in typical sprinkler systems.
2. Interpret specifications on blueprints.
3. Interpret a Site Plan in both SI and imperial units.
4. Interpret blueprints of a typical wet pipe system.

**SECOND PERIOD TECHNICAL TRAINING  
Sprinkler Systems Installer TRADE  
COURSE OUTLINE**

**UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.**

Due to the nature of the work of the Sprinkler Systems Installer, it is imperative that safety be taught on a continuous basis throughout the entirety of this course.

Special emphasis should be placed on weak areas of theory and shop which are evident from progressive tests and examinations administered throughout the course. The time required for such examinations and tests, shall be allowed for in each area of instruction.

<b>TOPICS</b>	<b>OBJECTIVES</b>
<b>Upon successful completion of this unit, the apprentice will be able to:</b>	
<b>SECTION ONE:..... PIPING, SIZING AND EXTINGUISHERS.....</b>	<b>24 HOURS</b>
<b>A. Portable Fire Extinguishers .....</b>	<b>4 Hours</b>
1. Definitions	1. List and define common approved types of portable fire extinguishers: a) water type b) carbon dioxide c) dry chemical d) multi purpose e) others
2. Uses	1. State class or classes of fires that each extinguisher is recommended for.
3. Characteristics	1. Explain the characteristics of each type of extinguisher.
4. Operation	1. Explain the operation of each type of fire extinguisher.
5. Testing and maintenance	1. State the testing and maintenance requirements of each type of fire extinguisher.
<b>B. Piping Materials and Sizes.....</b>	<b>4 Hours</b>
1. Introduction	1. Identify codes and regulations pertaining to approved piping materials and sizing for sprinkler systems.  2. Describe the effect of electrolysis on piping materials.
2. Terms	1. List and define terms used in the Sprinkler Systems Installer trade: a) risers b) feed mains

- c) cross mains
- d) branch lines
- e) grids
- f) others

3. Pipe schedules
1. List and describe the procedures for pipe schedules:
    - a) according to occupance
    - b) for steel pipe
    - c) for copper pipe
    - d) others
  2. Describe pipe sizing procedures factors when:
    - a) 9 sprinklers are required on a branch line
    - b) 10 sprinklers are required on a branch line
    - c) long runs with friction loss
    - d) distance between sprinkler heads exceeds 12 feet
  3. Explain the difference in schedules for above and below ceilings.
  4. Explain scheduling for a deluge system.
  5. Describe friction loss as it applies to pipe sizing.

**C. Piping Arrangements ..... 7 Hours**

1. Introduction
  1. Identify codes and regulations pertaining to piping arrangements.
2. Special conditions
  1. List and explain conditions that require special piping arrangements.
3. Branch lines
  1. List and describe procedures for piping branch lines.
4. Flushing connections
  1. Describe requirements and procedures for installing flushing nipples.
5. Sizing of caps
  1. Explain the requirements for sizing caps.
6. Return bends for pendant sprinklers
  1. List and describe piping arrangements for return bends for pendant sprinklers.
7. Pipe sleeves
  1. From drawing, identify the location for pipe sleeves.
  2. Explain the installation procedures for pipe sleeves.
8. Hand hose connections
  1. Identify codes and regulations pertaining to hand hose connections.
  2. List and describe piping arrangements for hand held hose connections.
9. System test pipes
  1. List and explain codes and regulations pertaining to system test pipes for dry and wet systems.
  2. List and describe piping arrangements for system test pipes for dry and wet systems.

1. List and describe periodic testing and maintenance procedures for special piping arrangements.

**D. Protection From Freezing ..... 4 Hours**

- |                 |   |
|-----------------|---|
| 1. Introduction | 1. Explain hazards and damage that can occur if systems or controls are subject to freezing.  |
| 2. Codes        | 1. Identify codes and other regulations regarding freeze protection of sprinkler controls and systems.<br>2. State methods of protecting supply piping from possible freezing.  |
| 3. Antifreeze   | 1. Explain types of building where antifreeze systems would be installed.<br>2. State requirements for cross connection control.<br>3. State procedures for following MSDS information.<br>4. State the safety requirements for the use and handling of antifreeze and other systems additives. |

- 4. Non-freeze systems
  - 1. Identify types of buildings that would require combined wet and dry systems.
  - 2. Describe the use of dry or pre-action systems in freezing buildings.
- 5. Testing and maintenance
  - 1. List and describe periodic testing and maintenance procedures for non-freeze systems.
  - 2. List tools and materials for installation and testing of non-freeze systems.

**E. Drainage of Mains, Branches and Valves ..... 5 Hours**

- 1. Introduction
  - 1. Explain the reasons for drainage of sprinkler systems.
- 2. Grading of piping
  - 1. List and describe codes pertaining to the correct grades for:
    - a) wet systems
    - b) dry systems
  - 2. State recommended grades for various piping components
- 3. Main drain
  - 1. Define code requirements for main drains.
  - 2. Describe installation requirements.
- 4. Auxiliary drain
  - 1. Define code requirements for auxiliary drains for various sprinkler systems:
    - a) wet pipe
    - b) dry pipe
    - c) deluge and pre-action
    - d) tie-in drains
  - 2. List and describe the importance, location and sizing of auxiliary drains.
- 5. Installation
  - 1. List and describe installation requirements for both main and auxiliary drains.
  - 2. List tools and materials for the installation of drains.
- 6. Testing and maintenance
  - 1. List and describe periodic testing and maintenance procedures for both main and auxiliary drains.
- 7. Safety
  - 1. List and describe safety requirements for section one with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

**SECTION TWO: ..... SPRINKLER HEADS .....42 HOURS**

**A. Installation Requirements for Sprinkler Heads ..... 30 Hours**

- |                             |  |
|-----------------------------|--|
| 1. Introduction             | <ol style="list-style-type: none"> <li>1. State the importance of correct locations for sprinkler heads.</li> <li>2. Identify N.F.P.A. and other applicable regulations regarding the location of sprinkler heads.</li> <li>3. Identify sprinkler head symbols used on blueprints, spools and other piping drawings.</li> </ol>  |
| 2. Head selection           | <ol style="list-style-type: none"> <li>1. List and define factors that determine head selection.</li> <li>2. Identify manufacturer's specification for head selection.</li> </ol>  |
| 3. Head location            | <ol style="list-style-type: none"> <li>1. List and define location requirements of sprinkler heads in relation to:               <ol style="list-style-type: none"> <li>a) bays</li> <li>b) beams</li> <li>c) girders</li> <li>d) joists</li> <li>e) open bar joists</li> <li>f) open ceilings</li> <li>g) trusses</li> </ol> </li> <li>2. State required distances between sprinkler heads for specific locations including:               <ol style="list-style-type: none"> <li>a) extra hazard</li> <li>b) light hazard</li> <li>c) ordinary hazard</li> </ol> </li> </ol> |
| 4. Sprinkler deflectors     | <ol style="list-style-type: none"> <li>1. State where sprinkler deflectors should be located in relation to:               <ol style="list-style-type: none"> <li>a) beams</li> <li>b) ceilings</li> <li>c) low-pitched roofs</li> <li>d) partitions</li> <li>e) peaks</li> <li>f) roofs</li> <li>g) stair and ramps</li> </ol> </li> <li>2. State clearances required between high piled storage materials and sprinkler deflectors.</li> </ol>   |
| 5. Sidewall sprinkler heads | <ol style="list-style-type: none"> <li>1. List and describe installation requirements for sidewall sprinkler heads.</li> </ol>   |
| 6. Special situations       | <ol style="list-style-type: none"> <li>1. List and explain installation requirements of sprinkler heads for the following situations:               <ol style="list-style-type: none"> <li>a) concealed spaces</li> <li>b) vertical shafts</li> <li>c) stairways</li> <li>d) vertical openings</li> <li>e) building service shafts</li> </ol> </li> </ol>  |

- f) elevator hoists ways and machine rooms
- g) spaces in underground floors
- h) exterior docks and platforms
- i) exterior roofs or canopies
- j) dwelling units
- k) library stockrooms
- l) electrical equipment
- m) open grid ceilings
- n) drop-out ceilings

- |                                    |   |
|------------------------------------|---|
| 7. Installation of sprinkler heads | 1. List and describe installation procedures of sprinkler heads: <ul style="list-style-type: none"> <li>a) care and storage of heads</li> <li>b) special tools required</li> <li>c) selection of correct head</li> <li>d) other considerations</li> </ul> |
|------------------------------------|---|

**B. Residential Sprinkler Systems ..... 12 Hours**

- |                                 |   |
|---------------------------------|---|
| 1. Codes                        | 1. Identify N.F.P.A. and other regulations regarding residential sprinkler systems.   |
| 2. Advantages and disadvantages | 1. List and describe the advantages and disadvantages of a residential sprinkler system.  |
| 3. Materials                    | 1. List approved piping materials used for this system.   |
| 4. Water supply                 | 1. List and define water supply requirements for residential systems.<br>2. Explain briefly, sizing requirements.   |
| 5. Control valves               | 1. Identify control valves approved for residential systems.  |
| 6. Alarm requirements           | 1. Identify approved alarm requirements for residential systems and state: <ul style="list-style-type: none"> <li>a) installation requirements</li> <li>b) locations</li> <li>c) types</li> <li>d) alarm tests</li> <li>e) other considerations</li> </ul> 2. Explain how alarms operate. |
| 7. Sprinkler heads              | 1. Identify approved sprinkler heads for residential systems.<br>2. State general spacing and installation requirements.  |
| 8. Tools required               | 1. List and identify correct tools required to correctly install a residential sprinkler system.  |
| 9. Testing                      | 1. Explain hydrostatic testing requirements.  |

1. List and describe common maintenance procedures associated with this system.

1. List and describe safety practices to be followed when installing sprinkler heads and residential sprinkler system with regard to:
  - a) personal safety
  - b) personnel safety
  - c) jobsite safety
  - d) public safety

**SECTION THREE: .....HYDRANTS, STAND PIPES AND WATER SUPPLY .....44 HOURS**

**A. Fire Hydrants and Associated Equipment ..... 14 Hours**

- |                                       |  |
|---------------------------------------|--|
| 1. Codes                              | 1. Identify N.F.P.A. and other applicable regulations regarding fire hydrants and equipment.   |
| 2. Materials                          | 1. List approved materials that hydrants and related equipment are constructed from.   |
| 3. Purpose of hydrants                | 1. Describe the purpose of hydrants and state where they would be installed.   |
| 4. Types of hydrants                  | 1. List and describe the various types of hydrants: <ol style="list-style-type: none"><li>a) wall type</li><li>b) yard type</li><li>c) roof type</li></ol> |
| 5. Sizes of hydrants and hose outlets | 1. State sizes of connections to main and hydrants.<br>2. List requirements and sizes of hose outlets and thread types.                                    |
| 6. Installation requirements          | 1. List tools and materials required for the installation of hydrants and related equipment.<br>2. State requirements regarding the spacing of hydrants.   |

- 3. Describe the type of control valve, valve box and cover required.
- 4. List and describe requirements pertaining to the setting and support of hydrants.
- 5. State precaution to be followed regarding drainage and frost protection.
- 7. Hydrant houses
  - 1. Identify common types of hydrant houses and list installation requirements.
  - 2. List and describe the type of equipment located inside a hydrant house.
- 8. Hose cabinets
  - 1. State the installation requirements for hose cabinets.
  - 2. List and describe the type of equipment located inside a hose cabinet.
- 9. Safety practices
  - 1. List and describe safety practices to be used when installing and servicing fire hydrants and associated equipment, including excavations.

**B. Stand Pipe and Hose Systems ..... 14 Hours**

- 1. Definitions
  - 1. Define stand pipe systems and state how they operate.
- 2. Where installed
  - 1. List and describe types of buildings that would require stand pipe systems.
- 3. Classes of stand pipe systems
  - 1. List and describe various classes of stand pipe systems.
- 4. Wet and dry stand pipes
  - 1. State the differences between wet and dry stand pipe systems.
  - 2. Describe where systems would be installed.
- 5. Sizing
  - 1. State how wet and dry stand pipe systems are sized.
  - 2. Identify applicable flow rates.
- 6. Code requirements
  - 1. Identify N.F.P.A., other codes, regulations and manufacturer's information regarding the installation of wet and dry stand pipe systems.
- 7. Location of stand pipes
  - 1. State factors that determine the location of piping used in stand pipe systems.
- 8. Installation of system
  - 1. List and describe installation procedures for stand pipe systems.

- |                     |  |
|---------------------|--|
| 9. Hose connections | <ol style="list-style-type: none"> <li>1. List and describe factors that determine the location of hose cabinets.</li> <li>2. Identify fittings and valve types used on stand pipe and hose systems.</li> <li>3. State sizes required for hose connections.</li> </ol> |
|---------------------|--|

**C. Water Supply and Fire Department Connections..... 16 Hours**

- |                                      |   |
|--------------------------------------|---|
| 1. Sources of water supply           | <ol style="list-style-type: none"> <li>1. List and describe types of water supply used for sprinkler and hose systems:               <ol style="list-style-type: none"> <li>a) municipal</li> <li>b) tanks</li> <li>c) pumps</li> </ol> </li> </ol>   |
| 2. Code requirements                 | <ol style="list-style-type: none"> <li>1. Identify code requirements and other regulations pertaining to water supply.</li> </ol>   |
| 3. Testing water pressure            | <ol style="list-style-type: none"> <li>1. Describe tests to calculate water pressure.</li> </ol>  |
| 4. Connection to public water main   | <ol style="list-style-type: none"> <li>1. List and describe procedure for connecting to city water main.</li> <li>2. State tools required.</li> <li>3. State materials list required for a typical public water main connection and service to building.</li> <li>4. State procedures to control thrust.</li> <li>5. Define safety requirements required when working in trenches.</li> <li>6. State testing requirements and flushing procedures prior to connection of system to water supply.</li> </ol> |
| 5. Water supply to sprinkler systems | <ol style="list-style-type: none"> <li>1. Identify connection to water supply inside the building for sprinkler systems:               <ol style="list-style-type: none"> <li>a) dry pipe</li> <li>b) wet pipe</li> <li>c) stand pipes</li> <li>d) limited water</li> <li>e) pre-action</li> <li>f) others</li> </ol> </li> </ol>   |
| a) connection to water supply        |   |
| b) identify components               | <ol style="list-style-type: none"> <li>1. Sketch and identify components and connections for the previously listed systems.</li> </ol>  |
| c) tools and materials               | <ol style="list-style-type: none"> <li>1. Compile a typical tools and materials list for the installation of piping and fittings for water supply to each system.</li> </ol>  |
| 6. Domestic water connection         | <ol style="list-style-type: none"> <li>1. List and explain requirements for domestic water connection in relation to sprinkler valves.</li> <li>2. State requirements for cross connection control.</li> </ol>  |

- 7. Fire department connections
  - a) purpose
    - 1. State the purpose of fire pumper connections.
    - 2. Define "Siamese Connection".
  - b) requirements
    - 1. List code requirements for the installation and sizing of fire department connections.
    - 2. List and define requirements regarding valves and check valves.
  - c) control valves
    - 1. List and explain requirements pertaining to the placement of control valves on fire department piping connections.
  - d) drainage
    - 1. State requirements for drainage of fire department connection.
  - e) pumper connections
    - 1. Explain the support required for hose connections.
    - 2. Define requirements regarding location and height of fire department connections.
    - 3. List and describe requirements for connection in remote locations.
    - 4. Identify correct installations regarding fire department connections.
    - 5. List tools and materials required.
  - f) safety
    - 1. List and describe safety requirements associated with section three with regard to:
      - a) personal safety
      - b) personnel safety
      - c) jobsite safety
      - d) public safety

**SECTION FOUR: .....PRACTICAL APPLICATIONS .....46 HOURS**

**A. Introduction to Welding Safety ..... 12 Hours**

- 1. Personal protective clothing
  - 1. List and explain protective clothing best suited for welding or when assisting a welder.
  - 2. List and explain clothing materials that should not be worn when welding.
- 2. Eye protection
  - 1. Explain the need for correct eye protection to be worn at all times when welding or when assisting a welder.
  - 2. Explain the meaning of "welding flash" and how it can be avoided and if it does occur, what first aid is available.
  - 3. List and explain different tint shades of eye protection and recommended applications.

3. Harmful rays
    1. List and explain harmful light rays:
      - a) visible light rays
      - b) ultraviolet rays
      - c) infrared rays
    2. Describe the effects of harmful rays on the eyes.
  4. Flying particles
    1. List and describe dangers of flying particles from:
      - a) chipping
      - b) grinding
      - c) hot metal from flame cutting
  5. Burns
    1. Describe correct methods of handling hot metals.
    2. Explain dangers of careless use of a welding, heating or cutting torch.
    3. List and explain different degrees of burns.
  6. Fires
    1. List and explain "fire triangle":
      - a) fuel
      - b) oxygen
      - c) ignition
    2. State how fires may occur when welding or cutting.
    3. State precautions to be followed to safe guard against possible fires.
    4. Explain dangers of gas filled cigarette lighters when welding or cutting.
  7. Explosions
    1. List and explain situations that may cause explosions when welding or cutting.
    2. State problems of possible explosions that are associated with gases used in flame cutting and gas welding.
    3. State safety precautions that should be followed when working with vessels that may contain flammable gases.
  8. Harmful vapours
    1. List and describe harmful vapours that may occur whilst welding or flame cutting.
    2. State effect of harmful vapours on the human body.
    3. List and describe what precautions should be taken to avoid inhaling harmful vapours.
- a) safety practices
1. List and describe correct safety practices to avoid burn, fires, explosions and harmful vapours with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

9. Gas welding equipment
- a) terminology
    - 1. Identify and explain all of the various components associated with gas welding equipment.
  - b) cylinders
    - 1. List and compare various cylinders used for storing welding gases.
    - 2. State major differences in design, construction and identification.
    - 3. State various components of cylinders.
    - 4. List and explain:
      - a) safety devices
      - b) storage procedures
      - c) safe handling and securing of cylinders
    - 5. Explain the term "maximum draw rate".
  - c) regulators
    - i) single stage
    - ii) two stage
    - 1. Explain differences between a single stage and a two stage regulator.
    - 2. State operations of a single stage and a two stage regulator.
    - 3. List applications of a single stage and a two stage regulator.
    - 4. List and describe precautions to be taken with regulators regarding:
      - a) installing
      - b) grease
      - c) repairing
      - d) maximum working pressure
      - e) opening cylinder valve
  - d) hoses
    - 1. Explain differences between the various welding hoses and connections.
    - 2. State the correct method of repairing a hose.
    - 3. List and describe safety precautions in order to protect the hoses.
  - e) torches and tips
    - 1. Explain the operation of a welding and a cutting torch.
    - 2. List and identify the numbering system of welding tips and state when various tips are used.
    - 3. Identify various heating tips and state their uses.
    - 4. State the importance of correct tip selection.
    - 5. List and explain maintenance procedures of various tips.
  - f) lighting and balancing the torch
    - i) procedure
      - 1. Demonstrate and state the correct procedures for:
        - a) lighting
        - b) balancing

ii)safety practices

1. Describe correct safety practices when handling and operating gas welding equipment with regard to:
  - a) jobsite safety
  - b) personal safety
  - c) personnel safety
  - d) public safety
  
1. Demonstrate correct oxy-fuel cutting procedures.

**B. Brazing Copper Joints ..... 4 Hours**

1. Brazed joints

1. Identify by name, grade, size and material used for brazed joints in pipe trades.
2. State approved application of brazed joints used in the Sprinkler Systems Installer trade.
3. Identify the equipment pertaining to brazing.
4. Select required tip and balance the torch.
5. Identify the proper type and state the purpose of flux.
6. Use different fillers for braze joints with regard to:
  - a) personal
  - b) personnel safety
  
  - c) jobsite safety
  - d) public safety
7. Leak test brazed joints in accordance with codes, regulations and manufacturer's specifications.

**C. Threaded Pipe Offset Project ..... 10 Hours**

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1. Threading               <ul style="list-style-type: none"> <li>a) pipe threading using                   <ul style="list-style-type: none"> <li>i)hand tools</li> <li>ii)power tools</li> </ul> </li> <li>b) power threading</li> <li>c) threaded offset project</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>1. List and describe correct tools and procedures needed for cutting a pipe thread using hand and power tools.</li> <li>2. Describe correct safety practices to be used when threading pipe in regard to:               <ul style="list-style-type: none"> <li>a) personal safety</li> <li>b) personnel safety</li> <li>c) jobsite safety</li> <li>d) public safety</li> </ul> </li> <li>1. Demonstrate correct use of power threaders:               <ul style="list-style-type: none"> <li>a) controls of power threaders</li> <li>b) remove and inspect diehead and dies</li> <li>c) replace dies</li> <li>d) set dies and correctly cut tapered thread</li> <li>e) demonstrate correct maintenance procedures</li> </ul> </li> <li>1. Cut and thread pipe to required dimensions using correct procedures.</li> <li>2. Describe testing procedures in accordance with regulations and codes.</li> </ul> |
|---|--|

**D. Trim Alarm Valves ..... 10 Hours**

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1. Identification</li> <li>2. Tools required</li> <li>3. Installation</li> </ul> | <ul style="list-style-type: none"> <li>1. Correctly identify alarm valve to be trimmed.</li> <li>2. List and identify design variations of types of alarm valves.</li> <li>3. List and identify the type of alarms that an alarm valve operates.</li> <li>1. Identify and select correct tools required to complete the project.</li> <li>1. State where alarm valves are usually located.</li> <li>2. Identify trim and accessories required to complete the installation.</li> <li>3. Following correct procedures trim alarm valve.</li> </ul> |
|---|---|

**E. Trim Dry Pipe Valves ..... 10 Hours**

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1. Identification</li> <li>2. Tools required</li> </ul> | <ul style="list-style-type: none"> <li>1. Correctly identify dry pipe valve to be trimmed.</li> <li>2. List and identify various types of dry pipe valves.</li> <li>3. List and identify the type of alarms the dry pipe valve will operate.</li> <li>4. Identify the quick opening devices being used.</li> <li>1. Identify and select correct tools required to complete the project.</li> </ul> |
|--|--|

- 3. Installation
  - 1. State where dry pipe valves are usually located.
  - 2. Identify trim and accessories required to complete the installation.
  - 3. Following correct procedures trim dry pipe valve.
  - 4. State NFPA requirements and other applicable codes.
- 4. Safety
  - 1. Follow correct safety practices when performing all practical projects with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

**SECTION FIVE:..... TRADE MATHEMATICS AND SCIENCE.....34 HOURS**

**A. Review..... 2 Hours**

- 1. Review first period math and science as necessary.

**B. Pressure and Density ..... 10 Hours**

- 1. Pressure
  - a) terminology
    - 1. Define and explain the meaning of the terms relative to pressure and force.
    - 2. Define Pascal's law.
  - b) density of water
    - 1. State the density of water as:
      - a) kilograms/cubic metre
      - b) kilograms/litres
      - c) pounds per cubic foot
      - d) pounds per imperial gallon
      - e) pounds per U.S. gallon
  - c) density of air
    - 1. State the density of air.
    - 2. Calculate the mass of the contents of various shaped solids and storage vessels using densities.
- 2. Relative density
  - a) terminology
    - 1. Define and explain the meaning of the term relative density.
  - b) relative density of water
    - 1. State the relative density of water.
  - c) water pressure
    - 1. Define and explain the effects of pressure on water.
    - 2. Explain the transmission of pressure within pipes and tanks.
    - 3. Calculate head pressure in pipes and tanks.

- 3. Calculate rates of flow
- 4. Calculate total force.
- 1. Calculate rate of flow through a pipe at a given pressure.

**C. Water Properties and Flow ..... 4 Hours**

- 1. Chemical properties of water
  - 1. List and define the chemical properties of water.
  - 2. List and explain the effects of temperature on water with regard to:
    - a) density
    - b) solubility
    - c) chemical reactions
    - d) expansion
- 2. Flow of water
  - 1. List and describe all terms pertaining to flow of water:
    - a) laminar
    - b) turbulent
    - c) velocity
    - d) friction
    - e) pressure
    - f) pressure drop
    - g) equivalent length
    - h) flow rate
- 3. Venturi
  - 1. Define the term venturi.
  - 2. State the application of the venturi in pipe trades.
  - 3. List and explain the effect of flow through a venturi.
  - 4. List and describe the effects of volume, flow and pressure through a venturi.
- 4. Head pressure
  - 1. Define head pressure as it relates to pumps.

**D. Volumes and Capacities ..... 8 Hours**

- 1. Volume measurements
    - a) volume of regular shaped solids, tanks and cylinders
      - i) cubes
      - ii) flat ended cylinders
  - 2. Capacity measurements
    - a) capacity
      - i) cubes
      - ii) flat ended cylinders
- 1. State the formula for calculating the volume of regular shaped solids, tanks and cylinders.
  - 2. Calculate volumes of regular shaped tanks and cylinders, in both imperial and SI units.
  - 1. State the formula for calculating the capacity of regular shaped solids, tanks and cylinders.
  - 2. Calculate capacity of regular shaped tanks and cylinders, in both imperial and SI units.

**E. Grade and Hanger Calculation ..... 2 Hours**

1. Calculate grade on pipe in both SI and imperial units.
2. Calculate grade from percent in both SI and imperial units.
3. Calculate progressive lengths of hanger rod.
4. State maximum spacing for hangers.
5. Calculate correct number of hangers required for given lengths of pipe.

**F. Triangles ..... 2 Hours**

- |                |   |
|----------------|---|
| 1. Terminology | 1. List and explain basic types of triangles:<br>a) equilateral<br>b) 90 degree   |
| 2. Calculation | 2. State the use of these triangles in sprinkler installations.<br><br>1. Calculate the length of sides of a 90 degree triangle.<br>2. Calculate the sum of the angles. |
| 3. Squaring    | 1. Illustrate how to square using the 3-4-5 triangle.   |

**G. Piping Offsets ..... 6 Hours**

1. State the formula for calculating 22.5 degree and 45 degree offsets.
2. Calculate offset travel using both imperial and SI units for:  
a) parallel  
b) equal spread

**SECTION SIX:.....BLUEPRINT READING, DRAWING AND SKETCHING .....20 HOURS**

**A. Single Line Pipe Drawings..... 4 Hours**

1. Orthographic drawings..... 2 Hours
  1. Draw three views of a single line piping arrangement that consists of 45 and 90 degree fittings.
2. Spool sheet with north arrow indicators..... 2 Hours
  1. Orientate single line piping drawings from orthographic "North" to isometric "North".

2. Draw isometric single line piping arrangements indicating "North" orientation.

**B. Divisions of Blueprints..... 2 Hours**

1. Define divisions of blueprints:
  - a) architectural
  - b) structural
  - c) mechanical
  - d) electrical
  - e) plot

**C. Views and Drawings of a Building ..... 2 Hours**

1. From drawings and prints recognize, interpret and explain views and drawings of a building:
  - a) plans (floor, site/plot)
  - b) elevations
  - c) sections
  - d) details

**D. Elevations (Imperial and SI)..... 2 Hours**

1. From drawings and prints recognize and interpret the following elevations:
  - a) geodetic
  - b) architectural

**E. Applied Blueprint Reading, Drawing and Sketching ..... 10 Hours**

- |  |   |
|--|---|
| <ol style="list-style-type: none"><li>1. Warehouse</li><li>a) grades</li><li>b) dimensioning and scaling</li><li>c) cutting plane lines (sections)</li><li>d) extension lines</li><li>e) symbols and abbreviations</li></ol> | <ol style="list-style-type: none"><li>1. Correctly interpret sprinkler systems information regarding a warehouse sprinkler installation.</li><li>1. Correctly interpret grades on sprinkler pipes.</li><li>1. Interpret correct scale and dimensions.</li><li>1. Correctly interpret cutting plane lines.</li><li>1. State the function of extension lines.</li><li>1. Recognize and interpret symbols and abbreviations on blueprints for:<ol style="list-style-type: none"><li>a) residential systems</li><li>b) fire hydrants and associated equipment</li><li>c) stand pipe systems</li></ol></li></ol> |
|--|---|

f) single line pipe drawings

1. Draw and label in a legible manner, orthographic single line piping drawings.
2. Draw and label in a legible manner, isometric single line piping drawings.
3. Draw and label in a legible manner a plan view of a sprinkler system for a warehouse installation.





**THIRD PERIOD TECHNICAL TRAINING  
Sprinkler Systems Installer TRADE  
COURSE OUTLINE**

**UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.**

Due to the nature of the work of the Sprinkler Systems Installer, it is imperative that safety be taught on a continuous basis throughout the entirety of this course. Special emphasis should be placed on weak areas of theory and shop which are evident from progressive tests and examinations administered throughout the course. The time required for such examinations and tests, shall be allowed for in each area of instruction.

<b>TOPICS</b>	<b>OBJECTIVES</b>
<b>Upon successful completion of this unit, the apprentice will be able to:</b>	
<b>SECTION ONE:..... FIRE PUMPS AND LIMITED WATER SUPPLY.....34 HOURS</b>	
<b>A. Introduction to Fire Pumps..... 28 Hours</b>	
1. Principles of pumping	1. List and describe basic principles of physics involved in pumping: a) suction b) pressure
2. Pumps used in Sprinkler Systems	1. List and compare types of pumps installed by the Sprinkler Systems Installer and list approval agencies.
3. Purpose of fire pumps	1. Explain the purpose of fire pumps.
4. How fire pumps are powered	1. List and describe types of power supply used to operate pumps: a) electricity b) diesel  2. State factors that affect the selection of power supply pumps.
5. Centrifugal and turbine pumps	1. Explain the differences between centrifugal and turbine pumps and describe the application of each.
6. Special service fire pumps	1. List and describe the application of special service, booster pumps or jockey pumps.
7. Sizing	1. Identify factors that determine pump and pipe sizing.
8. Capacity of fire pumps	1. List and describe capacities of pumps.  2. State pressure ratings of pumps.
9. Pump performance	1. State factors that affect pump performance.  2. Interpret a typical fire pump curve.

1. List and describe pre-installation checks for fire pumps.

1. State requirements for a typical pump room.



1. Correctly interpret manufacturer's specifications regarding pump installation.

1. State problems associated with air leaks and air pockets:
  - a) cavitation

2. Describe how to overcome air problems.

1. List and describe periodic testing and maintenance procedures associated with pumps:
  - a) use of flow measuring instruments
  - b) RPM check

**B. Limited Water Supply ..... 6 Hours**

- |                                |  |
|--------------------------------|--|
| 1. Introduction                | 1. Define the term "limited water supply" and describe under what circumstances it would be installed.<br><br>2. List types of limited water supply systems: <ol style="list-style-type: none"><li>a) reservoirs</li><li>b) pressure tanks</li><li>c) gravity tanks</li></ol><br>3. List and describe the types of situations where a limited water supply system would be used. |
| 2. Codes                       | 1. Identify NFPA codes and regulations regarding the installation of limited water supply systems.   |
| 3. Water supply                | 1. Explain how limited water systems are supplied with water.  |
| 4. Fire department connections | 1. Identify correct procedures and piping arrangements for fire department connections to a limited water supply system.   |
| 5. Installation                | 1. List and describe installation requirements for limited water supply systems.   |

- |                                   |   |
|-----------------------------------|---|
| 6. Testing and maintenance        | 1. List and describe periodic testing and maintenance procedures associated with limited water supply systems.  |
| 7. Introduction to pressure tanks | 1. Define the term "pressure tank" and state its use in sprinkler systems.<br>2. Identify typical locations of pressure tanks.                          |
| 8. Codes                          | 1. Identify NFPA codes and regulations regarding the installation and sizing of pressure tanks.   |
| 9. Tank sizing and pressure       | 1. State common tank sizes.<br>2. State typical working pressure of pressure tanks.<br>1. Describe the operation of a typical pressure tank and system. |

1. List and describe water supply requirements to tank.

1. List and describe air supply requirements to tank.

1. List and describe installation requirements for pressure tanks.
2. Identify piping, valves, trim and accessories required.
3. Describe electrical requirements.
4. State requirements for the discharge pipe and drainage pipe.

1. List and describe how the system is tested.

1. List and describe service and maintenance procedures for pressure tank systems.

1. Describe safety practices to be followed when installing and servicing limited water supply systems with regard to:
  - a) personal safety
  - b) personnel safety
  - c) jobsite safety
  - d) public safety

**SECTION TWO: ..... SPECIAL HAZARD SYSTEMS .....58 HOURS**

**A. Dry and Wet Chemical Systems ..... 4 Hours**

- |   |   |
|---|---|
| 1. Definitions  | 1. Define the terms "dry chemical system", "wet chemical system".<br>2. Define the types of establishments that would use a dry or wet chemical system.   |
| 2. Methods of dispensing dry and wet chemicals              | 1. List and define approved methods of applying dry and wet chemicals: <ol style="list-style-type: none"><li>a) portable extinguishers</li><li>b) handhose line systems</li><li>c) fixed piping systems</li><li>d) others</li></ol><br>2. Describe the methods of applying dry and wet chemicals and action of expellent gas. |
| 3. Dry and wet chemical properties and storage and handling | 1. Explain the extinguishing properties of various dry and wet chemicals.<br>2. State precautions necessary for handling and storing dry and wet chemicals.   |

- 3. Describe problems concerning compatibility of dry and wet chemicals from various manufacturers.
- 4. Explain WHMIS requirements.
- 4. Fixed pipe systems
  - 1. List and define various fixed pipe systems including:
    - a) total flooding
    - b) local application
- 5. Installation requirements
  - 1. Identify applicable codes and regulations regarding the installation of dry chemical systems.
  - 2. Explain how systems are engineered.
  - 3. List and describe how various dry and wet chemical systems are installed and materials used.
  - 4. Describe special tools that may be required.
  - 5. Describe how various systems are actuated.
- 6. Testing
  - 1. List and explain how the system is tested.
- 7. Servicing
  - 1. List and describe service and maintenance procedures for dry chemical systems.
- 8. Safety
  - 1. Describe safety practices to be followed when installing and servicing dry and wet chemical systems with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

**B. Fixed Water Spray Systems..... 6 Hours**

- 1. Introduction
  - 1. Define the term "fixed water spray system".
  - 2. List and describe the application of a fixed water spray system and state where it would be used.
  - 3. Identify codes and regulations pertaining to fixed water spray systems.
- 2. Water supply
  - 1. List and explain the water supply required for this system.
- 3. System design
  - 1. State how the system is designed and factors that influence the design.
  - 2. Explain requirements regarding restrictions to size and capacity.
  - 3. List the characteristics and selection of water spray nozzles.

- |                              |   |
|------------------------------|---|
| 4. Installation requirements | <ol style="list-style-type: none"> <li>1. List and define installation procedures.</li> <li>2. State tools and materials required.</li> <li>3. Explain procedures for pipe support.</li> </ol>  |
| 5. System controls           | <ol style="list-style-type: none"> <li>1. List and describe control valve, strainers and trim required for this system.</li> <li>2. State electrical requirements for a typical fixed water spray system.</li> <li>3. Explain requirements for control valve installation and placement of strainers.</li> <li>4. List and describe alarms that are required for a typical fixed water spray system.</li> </ol> |
| 6. Testing                   | <ol style="list-style-type: none"> <li>1. List and explain requirements for leak testing the system.</li> </ol>   |
| 7. Drainage                  | <ol style="list-style-type: none"> <li>1. Describe requirements for drainage of the system.</li> </ol>  |
| 8. Servicing                 | <ol style="list-style-type: none"> <li>1. List and describe service and maintenance procedures for a fixed water spray system.</li> </ol>   |

**C. Water Spray Nozzles ..... 2 Hours**

- |                              |  |
|------------------------------|--|
| 1. Introduction              | <ol style="list-style-type: none"> <li>1. State the application of water spray nozzle in the Sprinkler System Installer trade.</li> <li>2. Identify the various types of water spray nozzles and state the application of each:               <ol style="list-style-type: none"> <li>a) straight stream</li> <li>b) two straight streams</li> <li>c) "multisifyre" type</li> <li>d) "auto-spray" type</li> </ol> </li> </ol> |
| 2. Installation requirements | <ol style="list-style-type: none"> <li>1. Identify applicable NFPA codes and regulations regarding the installation of water spray nozzles.</li> <li>2. List and define installation procedures according to manufacturer's specification.</li> <li>3. State tools and materials required.</li> </ol>  |
| 3. Testing and maintenance   | <ol style="list-style-type: none"> <li>1. List and describe testing, adjusting and maintenance procedures associated with water spray nozzles.</li> </ol>  |

**D. Introduction to Foam Extinguishing Systems ..... 8 Hours**

- |                 |   |
|-----------------|---|
| 1. Introduction | <ol style="list-style-type: none"> <li>1. Define the term "foam extinguishing systems".</li> <li>2. List and describe the application of foam extinguishing systems.</li> </ol> |
|-----------------|---|

- |   |  |
|---|--|
| 2. Types of foam  | <ol style="list-style-type: none"> <li>1. List and describe the major types of foam concentrates.</li> <li>2. State the main characteristics and application of each type of foam.</li> <li>3. Explain the extinguishing properties of various types of foam.</li> <li>4. State WHMIS requirements for various types of foam.</li> </ol>   |
| 3. Installation requirements                            | <ol style="list-style-type: none"> <li>1. Identify applicable NFPA codes and regulations regarding the installation of foam extinguishing systems.</li> <li>2. List and define correct installation procedures.</li> <li>3. State tools and materials required.</li> <li>4. Explain procedures for pipe support.</li> </ol>  |
| 4. Systems control                                      | <ol style="list-style-type: none"> <li>1. List and describe the type of control valve, strainers and trim required for this system and how it is actuated.</li> <li>2. State electrical requirements for control valve installation.</li> <li>3. List and describe alarms that are required for a typical foam extinguishing.</li> <li>4. List and describe a typical installation of:               <ol style="list-style-type: none"> <li>a) foam liquid storage tank and trim</li> <li>b) reserve tank and trim</li> <li>c) foam liquid pump</li> <li>d) check valves, strainers and orifice plates</li> <li>e) deluge valves</li> <li>f) piping</li> <li>g) cross connection control device</li> </ol> </li> </ol> |
| 5. Balanced-pressure proportioning system               | <ol style="list-style-type: none"> <li>1. Describe the operation of a balanced-pressure proportioning system.</li> <li>2. Identify piping arrangement for this system according to NFPA codes.</li> </ol>  |
| 6. Pressure-proportioning tank with diaphragm           | <ol style="list-style-type: none"> <li>1. Describe the operation of a pressure-proportioning tank with diaphragm.</li> <li>2. Identify piping arrangement for this system according to NFPA codes.</li> </ol>  |
| 7. Pressure-proportioning tank method without diaphragm | <ol style="list-style-type: none"> <li>1. Describe the operation of a pressure-proportioning tank method without diaphragm.</li> <li>2. Identify piping arrangement for this system according to NFPA codes.</li> </ol>  |
| 8. Foam-water heads                                     | <ol style="list-style-type: none"> <li>1. Correctly identify the type of sprinkler heads used for this system and describe the type of spray patterns.</li> </ol>  |

- 2. Correctly identify foam-water spray nozzles used for this system and describe the type of spray patterns.
- 9. Testing and maintenance
  - 1. List and describe testing and maintenance procedures associated with foam extinguishing systems.

**E. Outside Exposure Systems ..... 4 Hours**

- 1. Introduction
  - 1. Define the term "outside exposure system".
  - 2. List and describe the application of outside exposure systems.
- 2. Installation requirements
  - 1. Identify applicable NFPA codes and regulations regarding the installation of outside exposure system.
  - 2. Explain water service requirements.
  - 3. Describe fire department connections.
  - 4. List tools and materials required.
  - 5. Identify sprinkler heads that can be used with this system.
- 3. Systems control
  - 1. List and describe the type of control valve, strainers and trim required for this system and how it is actuated.
  - 2. State electrical requirements for this system.
  - 3. List and describe alarms required.
- 4. Testing
  - 1. List and explain requirements for hydrostatic testing of the system.
- 5. Drainage
  - 1. Describe requirements for drainage of the system.
- 6. Servicing
  - 1. List and describe service and maintenance procedures for outside exposure systems.

**F. Introduction to Carbon Dioxide Systems ..... 8 Hours**

- 1. Introduction
  - 1. Define the terms "carbon dioxide system".
  - 2. List and describe the applications of each system.
  - 3. State the difference between "local application" and "total flooding".
- 2. Systems operation
  - 1. List and describe the three methods of systems operations:
    - a) total flooding
    - b) automatic push-button
    - c) hand directed operation
  - 2. Explain how each system is actuated.

3. State how fires are detected.
  4. Explain the difference between low pressure and high pressure systems.
  5. List and describe requirements regarding supervision of system.
  6. State the working pressure of each system.
  7. Describe what alarms and indicators are required for these systems.
3. Requirement for CO<sub>2</sub>
    1. State factors that determine the amount of CO<sub>2</sub> required.
    2. List and describe storage requirements for CO<sub>2</sub> containers.
    3. Explain the importance of correct storage temperatures for CO<sub>2</sub>.
  4. Installation requirements
    1. Identify applicable NFPA codes and regulations regarding the installation of CO<sub>2</sub>.
    2. List and describe correct piping procedures and necessity to keep piping systems clean.
    3. Explain why piping systems must be reamed.
    4. List tools and materials required.
    5. Identify discharge nozzels that can be used with these systems.
    6. State requirements for discharge nozzles.
  5. Testing
    1. List and explain requirements for leak testing the various systems.
  6. Servicing
    1. List and describe service and maintenance procedures for carbon dioxide and halon systems.
  7. Safety
    1. Describe safety practices to be followed when handling, storing, testing and servicing CO<sub>2</sub> and halon systems with regard to:
      - a) personal safety
      - b) personnel safety
      - c) jobsite safety
      - d) public safety

**G. Pre-action and Deluge Systems..... 16 Hours**

1. Define the terms "pre-action" and "deluge systems".
  
2. List and describe the application of pre-action and deluge systems.
3. Explain the major differences between the two systems.
4. Describe what is a "supplemental fire detection system".
5. State advantages and disadvantages of pre-action and deluge systems.
  
2. Pre-action system installation
  1. Identify applicable NFPA codes and regulations regarding the installation of a pre-action system.
  2. Explain water service requirements.
  3. List and describe piping of the system.
  4. Describe fire department connections.
  5. Identify sprinkler heads that can be used with this system.
  6. List and describe requirements for pipe support.
  
3. Systems control
  1. List and describe the type of control valve, strainers and trim required for this system and how it is actuated.
  2. State electrical requirements for this system.
  3. List and describe alarms required.
  
4. Testing
  1. List and explain requirements for leak testing the system.
5. Drainage
  1. Describe requirements for drainage of the system.
6. Servicing
  1. List and describe service and maintenance procedures for pre-action systems.
  
7. Installation of deluge system
  1. Identify applicable NFPA codes and regulations regarding the installation of a deluge system.

2. Explain water service requirements.
  3. Describe fire department connections.
  4. Identify sprinkler heads that can be used with this system.
  5. List and describe requirements for pipe support.
8. Systems control
1. List and describe the type of control valve, strainers and trim required for this system and how it is actuated.
  2. State electrical requirements for this system.
  3. List and describe alarms required.
9. Testing
1. List and explain requirements for leak testing.
  1. Describe requirements for drainage of the system.
- 
1. List and describe service and maintenance procedures for deluge systems.
- 
1. Describe safety practices to be followed when installing and servicing special hazard systems with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

**H. Cross Connection Control Awareness ..... 2 Hours**

- |                                     |   |
|-------------------------------------|---|
| 1. Introduction                     | 1. Describe the term "cross connection control".<br>2. State requirements for testers certification.  |
| 2. Terminology                      | 1. List and describe definitions of terms pertaining to cross connection control.   |
| 3. Liabilities                      | 1. State the liabilities and responsibilities at all levels of a cross connection control program:<br>a) manufacturer of cross connections control devices<br>b) installer<br>c) tester<br>d) enforcing authority<br>e) building owner<br>f) others   |
| 4. Case histories                   | 1. State the consequences of inadequate protection against backflow in water supply as it applies to the Sprinkler Systems Installer.   |
| 5. Hazards                          | 1. List typical health hazards that may result through a cross connection.<br><br>2. List and describe the classification of hazards:<br>a) severe<br>b) moderate<br>c) minor   |
| 6. Regulations and codes            | 1. State regulations and codes pertaining to the installation, maintenance and testing of cross connection control devices.   |
| 7. Examples of preventing backflow  | 1. List and describe examples of preventing backflow in water supply to sprinkler systems.  |
| 8. Cross connection control devices | 1. List and identify the major categories of cross connection control devices and describe their operation:<br>a) air gap<br>b) vacuum breaker<br>c) pressure vacuum breaker<br>d) double check valve assembly<br>e) reduced pressure principle<br><br>2. State examples of recommended protection of water supply in the sprinkler industry. |
| 9. Installation                     | 1. List and describe correct installation procedures for cross connection control devices used in sprinkler systems.  |

**I. Clean Agent Extinguishing Systems ..... 6 Hours**

1. List clean agents used in industry.

2. Describe pre-engineered systems.

3. List and describe the operation of a total flooding.

4. Explain a local application system.

1. List and explain the components used in clean agent systems.

2. Explain the quantity of agent required for each system.

3. Describe storage container arrangements and requirements.

4. Describe the distribution of extinguishing agents.

5. List pipe and materials required for each system.

6. List discharge nozzles required.
7. Describe detection, activation, alarm and control systems.
8. List and explain inspection, testing and maintenance requirements.
1. List and describe possible hazards to personal:

- a) halon, carbon agents
- b) inert gas clean agents

**J. Water Mist..... 2 Hours**

1. Describe the function of a single fluid system.

2. Describe the function of a twin fluid system.
3. List and describe the operation of each system.

1. List installation requirements for pipe fittings and valves.

2. Describe the requirements for a low pressure system.

3. Describe requirements for medium and high pressure systems.

4. Describe requirements for gas and water containers provided for each system.

5. Describe nozzle listing information.

6. List and explain alarm and control system.

1. List and describe possible hazards to personal.

2. List and describe ways to minimize the hazards.

**SECTION THREE: BASIC HYDRAULIC CALCULATIONS, MAINTENANCE AND REPORTS .....34 HOURS**

**A. Basic Hydraulic Calculations ..... 6 Hours**

- |                           |   |
|---------------------------|---|
| 1. Introduction           | <ol style="list-style-type: none"> <li>1. Define the terms:               <ol style="list-style-type: none"> <li>a) hydraulic calculation</li> <li>b) equivalent length</li> <li>c) friction loss</li> <li>d) static pressure</li> <li>e) residual pressure</li> </ol> </li> <li>2. Explain how the terms apply to the Sprinkler Systems Installer trade.</li> </ol>  |
| 2. Water pressure         | <ol style="list-style-type: none"> <li>1. Calculate the affect in change of height on pressure.</li> <li>2. Calculate the affects of friction loss on pressure.</li> </ol>  |
| 3. Hydraulic calculations | <ol style="list-style-type: none"> <li>1. Identify procedures to be followed by hydraulic calculations.</li> <li>2. Describe the importance of water densities over a prescribed area.</li> <li>3. List and describe the classification of occupancies.</li> <li>4. Describe how hand hose connections are calculated.</li> </ol>   |
| 4. Systems layout         | <ol style="list-style-type: none"> <li>1. Identify applicable NFPA codes and regulations regarding the layout of a hydraulically calculated sprinkler system.</li> <li>2. Explain water service requirements.</li> <li>3. State system requirements regarding pipe sizes, branch lines and cross mains.</li> <li>4. Define the terms:               <ol style="list-style-type: none"> <li>a) design densities</li> <li>b) design area</li> </ol> </li> <li>5. Identify sprinkler head that can be used with this system.</li> <li>6. State minimum operating pressure of system.</li> <li>7. State type of piping to be used.</li> <li>8. Explain requirements for future additional heads.</li> </ol> |

**B. Inspection, Testing and Maintenance of Water Based Sprinkler Systems..... 16 Hours**

- 1. Responsibilities
  - 1. State liabilities and responsibilities for general care and maintenance of sprinkler systems:
    - a) regulations regarding maintenance
    - b) manufacturer's responsibility
    - c) installer
    - d) enforcing authority
    - e) building owner
    - f) others
  
- 2. Care and maintenance
  - 1. List and describe inspection, testing and maintenance of water based sprinkler systems including:
    - a) wet pipe
    - b) dry pipe
    - c) pre-action and deluge
    - d) limited water supply
    - e) pressure tanks
    - f) stand pipe hose systems
    - g) fixed water spray
    - h) water spray nozzle
  - 2. List and describe inspection, testing and maintenance of component parts including:
    - a) gauges
    - b) water flow switches
    - c) hydrants
    - d) sprinkler heads
    - e) valves
    - f) other
  - 3. State procedures regarding alterations and repairs to systems.
  - 4. State frequency of inspection, testing and maintenance of sprinkler systems and component parts.
  
- 3. System failure
  - 1. List and describe common causes of sprinkler systems failure.
  - 2. Describe common troubleshooting procedures and methods of correcting systems failure.
  
- 4. Safety
  - 1. Describe safety practices to be followed when servicing and maintaining sprinkler systems and component parts with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

**C. Reports and Workmanship ..... 6 Hours**

- 1. Introduction
  - 1. List and describe reports used by the Sprinkler Systems Installer:
    - a) time sheets
    - b) progress reports
    - c) accident report
    - d) test report and certificate

- e) inspection report
- f) property damage report
- g) others

2. Completing reports

- 1. Demonstrate correct procedures for completing reports in a clear and concise manner.
- 2. Explain the purpose of each report.
- 3. Explain the process each report is normally subject to.

3. Workmanship

- 1. Show training video.

**D. Introduction to Alberta Building Code ..... 6 Hours**

- 1. List and explain important definitions to the Sprinkler Systems Installer including:

- a) AHJ
- b) building area
- c) building height
- d) basements
- e) combustable construction
- f) no-combustable construction
- g) fire compartment
- h) first storey
- i) flame spread rating
- j) residential occupancy
- k) others

1. According to the ABC:

- a) which buildings require sprinkler systems
- b) list the different types of occupancies
- c) what code concessions are allowed for sprinkled buildings?
- d) hose and stand pipe requirements
- e) water supply requirements

**SECTION FOUR: .....PRACTICAL APPLICATIONS .....62 HOURS**

**A. Small Diameter Pipe, Tube and Tubing Cold Bending ..... 6 Hours**

- 1. Identification
  - 1. Identify by name, grade, size and material the tube and tubing used for bending purposes in the Sprinkler Systems Installer trade.
  - 2. Identify by name the tools used for tube and tubing bending.
- 2. Project
  - 1. Demonstrate correct bending practices to required dimensions, using correct procedures.
  - 2. Apply regulation codes regarding bending and manufacturer's information.
- 3. Safety
  - 1. Describe safety practices to be followed when bending pipe, tube and tubing with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

**B. Compression Fitting Project..... 4 Hours**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. O-ring compression joints             <ol style="list-style-type: none"> <li>a) aluminum</li> <li>b) copper tube</li> <li>c) copper tubing</li> <li>d) steel pipe</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>1. Identify by name, grade, size and material the tube used for compression joints in the Sprinkler Systems Installer trades.</li> <li>2. Identify by name, grade, size and material the compression joint fittings used for various applications.</li> <li>3. Identify by name, grade, size and material the tools used for compression joints.</li> <li>4. Use hand tools to prepare and assemble compression joints in a correct and safe manner with regard to:             <ol style="list-style-type: none"> <li>a) personal safety</li> <li>b) personnel safety</li> <li>c) jobsite safety</li> <li>d) public safety</li> </ol> </li> <li>5. Cut, prepare and join tube and tubing to required dimensions using correct processes.</li> <li>6. Assemble and tighten compression joints using correct procedures.</li> <li>7. Leak test compression joints in accordance with the regulations and specifications.</li> </ol> |
|--|---|

**C. Introduction to Fire Alarm Panels..... 6 Hours**

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Definitions</li> </ol>             | <ol style="list-style-type: none"> <li>1. Describe fire alarm panels and supervisory signals.</li> <li>2. List and describe common terms used with fire alarm panels.</li> </ol>   |
| <ol style="list-style-type: none"> <li>2. Types</li> </ol>                   | <ol style="list-style-type: none"> <li>1. Identify the types of fire alarm panels and describe their basic operation.</li> <li>2. Describe the purpose of different types of alarms:             <ol style="list-style-type: none"> <li>a) trouble signal</li> <li>b) alarm signal</li> </ol> </li> </ol>  |
| <ol style="list-style-type: none"> <li>3. Equipment</li> </ol>               | <ol style="list-style-type: none"> <li>1. List and describe the different type of signaling devices that could be installed with fire alarm panels:             <ol style="list-style-type: none"> <li>a) smoke detector</li> <li>b) heat switch</li> <li>c) tamper switch</li> <li>d) flow switch</li> <li>e) pressure switch</li> <li>f) low air pressure switch</li> <li>g) low temperature pressure switch</li> <li>h) other applicable devices</li> </ol> </li> </ol> |
| <ol style="list-style-type: none"> <li>4. Testing and maintenance</li> </ol> | <ol style="list-style-type: none"> <li>1. List and describe maintenance requirements for fire alarm panels and associated devices.</li> <li>2. List and describe procedures for shutting down and reactivation of fire alarm panels.</li> </ol>  |

**D. Trim Alarm Valves ..... 8 Hours**

- |                   |  |
|-------------------|--|
| 1. Identification | <ul style="list-style-type: none"> <li>1. Correctly identify alarm valve to be trimmed.</li> <li>2. List and identify design variations of types of alarm valves.</li> <li>3. List and identify the type of alarms that an alarm valve operates.</li> </ul>  |
| 2. Tools required | <ul style="list-style-type: none"> <li>1. Identify and select correct tools required to complete the project.</li> </ul>   |
| 3. Installation   | <ul style="list-style-type: none"> <li>1. State where alarm valves are usually located.</li> <li>2. Identify trim and accessories required to complete the installation.</li> <li>3. Following correct procedures and manufacturer's recommendations, trim alarm valve.</li> <li>4. State NFPA requirements and other applicable codes.</li> </ul> |

**E. Trim Dry Pipe Valves ..... 8 Hours**

- |                   |   |
|-------------------|---|
| 1. Identification | <ul style="list-style-type: none"> <li>1. Correctly identify dry pipe valve to be trimmed.</li> <li>2. List and identify various types of dry pipe valves.</li> <li>3. List and identify the type of alarms the dry pipe valve will operate.</li> <li>4. Identify the quick opening devices being used.</li> </ul>                      |
| 2. Tools required | <ul style="list-style-type: none"> <li>1. Identify and select correct tools required to complete the project.</li> </ul>  |
| 3. Installation   | <ul style="list-style-type: none"> <li>1. State where the dry pipe valves are usually located.</li> <li>2. Identify trim and accessories required to complete the installation.</li> <li>3. Following correct procedures and manufacturer's recommendations.</li> <li>4. State NFPA requirements and other applicable codes.</li> </ul> |

**F. Trim Deluge Valves..... 14 Hours**

- |                   |  |
|-------------------|--|
| 1. Identification | <ul style="list-style-type: none"> <li>1. Correctly identify deluge valve to be trimmed.</li> <li>2. List and identify various types of deluge valves.</li> <li>3. List and identify the type of alarms that deluge valve will operate.</li> <li>4. State various methods of valve actuation.</li> </ul> |
|-------------------|--|

- 2. Tools required
  - 1. Identify and select correct tools required to complete the project.
- 3. Installation
  - 1. State where deluge valves are usually located.
  - 2. Identify trim and accessories required to complete the installation.
  - 3. Following correct procedures, and manufacturer's recommendations, trim deluge valves.
  - 4. State NFPA requirements and other applicable codes.

**G. Trim Pre-action Valves ..... 16 Hours**

- 1. Identification
  - 1. Correctly identify pre-action valve to be trimmed.
  - 2. List and identify various types of pre-action valves.
  - 3. List and identify the type of alarms that pre-action valves will operate.
  - 4. State various methods of valve actuation.
- 2. Tools required
  - 1. Identify and select correct tools required to complete the project.
- 3. Installation
  - 1. State where pre-action valves are usually located.
  - 2. Identify trim and accessories required to complete the installation.
  - 3. Following correct procedures, and manufacturer's recommendations, trim pre-action valves.
  - 4. State NFPA requirements and other applicable codes.
- 4. Safety
  - 1. Apply correct safety practices to be followed when trimming and servicing all sprinkler valves, with regard to:
    - a) personal safety
    - b) personnel safety
    - c) jobsite safety
    - d) public safety

**SECTION FIVE:..... TRADE MATHEMATICS AND SCIENCE.....16 HOURS**

**A. Review..... 4 Hours**

- 1. Review first and second periods mathematics and science as necessary.

**B. Piping Offsets ..... 6 Hours**

- |                  |  |
|------------------|--|
| 1. Basic offset  | 1. State the formula for calculating a 45 degree offset.   |
|                  | 2. Calculate length of travel using both imperial and SI units.  |
| 2. Other offsets | 1. Identify the formula for offset travel for: <ul style="list-style-type: none"> <li>a) parallel</li> <li>b) equal spread</li> <li>c) unequal spread</li> <li>d) rolling</li> </ul> |
|                  | 2. Calculate the length of travel using both imperial and SI units for the previously listed offsets.  |

**C. Introduction to Electricity ..... 6 Hours**

- |                                    |   |
|------------------------------------|---|
| 1. Electricity                     | 1. Describe the electron theory of electricity.   |
| a) basic principles of electricity | 2. Define and explain the meaning of the terms: <ul style="list-style-type: none"> <li>a) amps</li> <li>b) volts</li> <li>c) ohms</li> </ul>  |
| b) direct current flow             | 1. Define and explain the principles of direct current flow of electricity.   |
| c) alternating current flow        | 1. Define and explain the principles of alternating current flow of electricity.  |
| d) electrical circuits             | 1. Sketch and describe simple electrical circuits: <ul style="list-style-type: none"> <li>a) series circuits</li> <li>b) parallel circuits</li> </ul>   |
| e) electromagnetic                 | 1. Explain the principles of electromagnetism.  |
|                                    | 2. List and explain operating principles of electromagnetic devices: <ul style="list-style-type: none"> <li>a) transformers</li> <li>b) solenoids</li> </ul>  |
| f) system devices                  | 1. List and describe the operation and function in a sprinkler system: <ul style="list-style-type: none"> <li>a) flow switches</li> <li>b) pressure switches</li> <li>c) tamper switches</li> </ul> |

**SECTION SIX:.....BLUEPRINT READING, DRAWING AND SKETCHING .....6 HOURS**

**A. Blueprint Interpretation ..... 6 Hours**

- |                                    |   |
|------------------------------------|---|
| 1. 100 head sprinkler installation | 1. Correctly interpret sprinkler systems information regarding a typical 100 head sprinkler installation. |
| a) grades                          | 1. Correctly interpret grades on sprinkler pipes.   |

- b) dimensioning and scaling
  - 1. Interpret correct scale and dimensions.
- c) cutting plane lines (sections)
  - 1. Correctly interpret cutting plane lines.
- d) extension lines
  - 1. State the function of extension lines.
- e) symbols and abbreviations
  - 1. Recognize and interpret symbols and abbreviations on blueprints for:
    - a) sprinkler systems
    - b) fire hydrants and associated equipment
    - c) stand pipe systems
- f) single line pipe drawings
  - 1. Draw and label in a legible manner, orthographic single line piping drawings.
  - 2. Draw and label in a legible manner, isometric single line piping drawings.
- 2. Materials list
  - 1. Compile a complete materials list for the 100 head sprinkler installation.
- 3. Estimate
  - 1. Estimate the separate costs for materials and labour.



*Excellence through training and experience*

**3701.2**