

Apprenticeship and Industry Training

Sprinkler Systems Installer Apprenticeship Course Outline

037 (2020)

Alberta 



Apprenticeship
and Industry
Training

ADVANCED EDUCATION

Sprinkler Systems Installer : apprenticeship course outline.

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**Sprinkler Systems Installer
Table of Contents**

Sprinkler Systems Installer Table of Contents 1
Apprenticeship 2
Apprenticeship and Industry Training System 2
Apprenticeship Safety 4
Procedures for Recommending Revisions to the Course Outline..... 5
Apprenticeship Route Toward Certification 6
Sprinkler Systems Installer Training Profile 7

Course Outline

First Period Technical Training..... 10
Second Period Technical Training..... 17
Third Period Technical Training..... 23

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:

- be proficient in all phases of sprinkler systems installation and maintenance
- know the installation and operation requirements of fire protection equipment
- read and interpret plans and specifications
- calculate material quantities
- use and maintenance of hand tools, machines and equipment
- recognize the safety requirements of Occupational Health & Safety
- jobsite coordination
- installs, inspects, tests and maintains (ITM) fire protection systems
- competent with fire protection water supply systems including underground mains.
- Apply NFPA related codes to the 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 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

Ms. M. Osetsky Edmonton Presiding Officer
Mr. S. Huska Calgary Employer
Mr. R. Russell..... Leduc Employer
Mr. L. Zallas..... Edmonton Employer
Mr. L. Bates Spruce Grove..... Employee
Mr. M. Kastern..... Calgary Employee
Mr. T. O'Brien Calgary Employee

Alberta Government

Alberta Advanced Education 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

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.alberta.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.

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.

Occupational Health and Safety (a division of Alberta Human Services) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.humanservices.alberta.ca

Technical Training

Apprenticeship technical training is delivered by the technical institutes and 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 a strong emphasis on safety that complements safe workplace practices towards the development of a culture of safety for all trades.

The technical institutes and colleges work with Alberta's Apprenticeship and Industry Training Board, industry committees and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs across the Province. They develop curriculum from the course outlines established by industry and provide technical training to apprentices.

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

Procedures for Recommending Revisions to the Course Outline

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

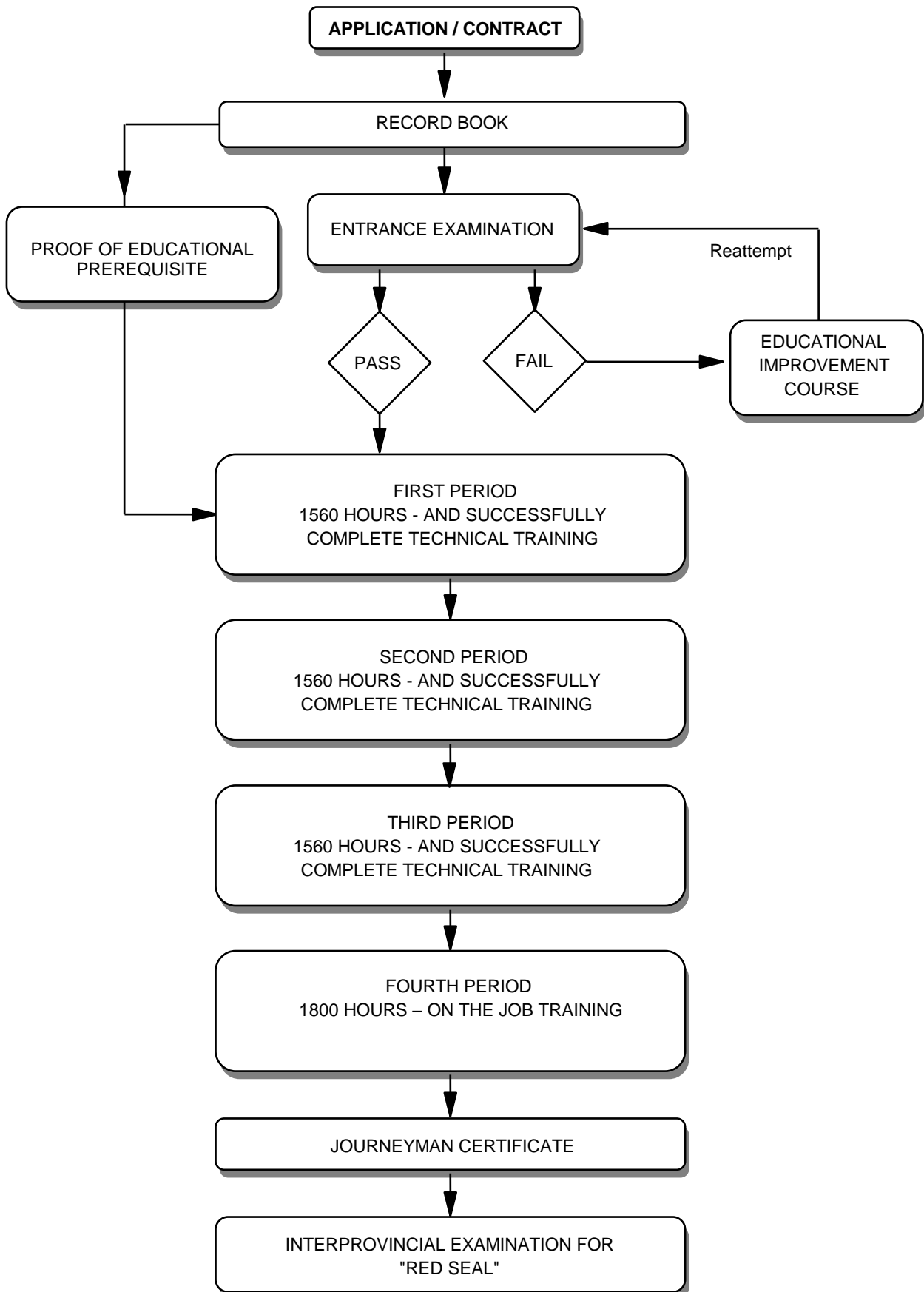
This course outline was approved on November 29, 2019 by the Alberta Apprenticeship and Industry Training Board on a recommendation from the Provincial Apprenticeship Committee. The valuable input provided by representatives of industry and the institutions that provide the technical training is acknowledged.

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
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 System Installer Training Profile
FIRST PERIOD
(8 Weeks 30 Hours per Week – Total of 240 Hours)

SECTION ONE

WORKPLACE SAFETY AND RIGGING
 24 HOURS

⇒	A	B	C
	Safety Legislation, Regulations & Industry Policy in the Trades 4 Hours	Climbing, Lifting, Rigging and Hoisting 6 Hours	Hazardous Materials & Fire Protection 4 Hours
	D	E	F
	Apprenticeship Training Program 3 Hours	Pipe Trade Codes 3 Hours	Electrical Safety 4 Hours

SECTION TWO

TOOLS, EQUIPMENT AND MATERIALS
 92 HOURS

⇒	A	B	C
	Hand Tools 6 Hours	Power Tools 6 Hours	Welded Pipe and Fittings 12 Hours
	D	E	F
	Plastic Pipe and Tube 12 Hours	Threaded and Grooved Pipe 15 Hours	Tube and Tubing 12 Hours
	G	H	I
	Valves 12 Hours	Hangers, Supports and Fasteners 10 Hours	Pressure Testing 3 Hours
	J		
	Pumps 4 Hours		

SECTION THREE

METAL FABRICATION
 46 HOURS

⇒	A	B	C
	Welding Safety 4 Hours	Welding 30 Hours	Brazing and Soldering 12 Hours

SECTION FOUR

DRAWING AND SPECIFICATIONS
 30 HOURS

⇒	A	B	C
	Sketching and Drawing 6 Hours	Single Line Drawing 12 Hours	Drawing Interpretations 12 Hours

SECTION FIVE

CALCULATIONS AND SCIENCE
 48 HOURS

⇒	A	B	C
	Applied Calculations 8 Hours	Perimeters, Areas, Percentage and Grade 11 Hours	Volumes and Capacities 4 Hours
	D	E	F
	Piping Offsets 6 Hours	Matter, Density and Relative Density 6 Hours	Pressure and Atmosphere 6 Hours
	G		
	Principles of Electricity 7 Hours		

SECOND PERIOD
(8 Weeks 30 Hours per Week – Total of 240 Hours)

SECTION ONE

FIRE SPRINKLER SYSTEMS
81 HOURS



A	B	C
Hazard Classifications 8 Hours	Piping Arrangements 22 Hours	Sprinkler System Drainage 5 Hours
D	E	F
Piping Support Systems 7 Hours	Sprinkler Installation 22 Hours	System Hydraulic Design 14 Hours
G		
Access Equipment 3 Hours		

SECTION TWO

WATER-BASED SYSTEMS
68 HOURS



A	B	C
Residential Systems 10 Hours	Wet Sprinkler Systems 18 Hours	Dry Sprinkler Systems 22 Hours
D	E	
Freeze Protection 6 Hours	Stand Pipe Systems 12 Hours	

SECTION THREE

WATER SUPPLY
51 HOURS



A	B	C
Public Water Supply 6 Hours	Private Water Supply 6 Hours	Cross Connection Control 6 Hours
D	E	F
Fire Department Connections 4 Hours	Fire Hydrants 15 Hours	Underground Piping 10 Hours
G		
Water Properties 4 Hours		

SECTION FOUR

WORK ORGANIZATION
40 HOURS



A	B	C
Legislated Requirements 16 Hours	Systems Layout 12 Hours	Job Site Planning 12 Hours

THIRD PERIOD
(8 Weeks 30 Hours per Week – Total of 240 Hours)

SECTION ONE	A	B	C
FIRE PUMP UNITS 42 HOURS	Fire Pumps 30 Hours	Drivers 6 Hours	Controllers 6 Hours
SECTION TWO	A	B	C
SPECIALTY HAZARD SYSTEMS 101 HOURS	Dry and Wet Chemical Systems 6 Hours	Extinguishers 6 Hours	Foam Systems 15 Hours
	D	E	F
	Clean Agent Systems 10 Hours	Carbon Dioxide Systems 6 Hours	Pre-Action Systems 22 Hours
	G	H	I
	Deluge Systems 20 Hours	Water Mist Systems 10 Hours	Corrosion Inhibiting 6 Hours
SECTION THREE	A	B	C
INSPECTION, TESTING AND MAINTENANCE 36 HOURS	Inspect Fire Protection Systems 10 Hours	Fire Protection Systems Maintenance 10 Hours	Deficiencies 16 Hours
SECTION FOUR	A	B	C
DETECTION AND SIGNAL INITIATING DEVICES 39 HOURS	Actuating Devices 9 Hours	Spark Detection Systems 3 Hours	Air Sampling Systems 6 Hours
	D	E	F
	Signal Initiating Devices 7 Hours	Fire Alarm Panels 8 Hours	Electrical Test Equipment 6 Hours
SECTION FIVE	A	B	C
EMERGING TECHNOLOGY, COMMUNICATION AND APPRENTICESHIP 22 HOURS	Estimation 10 Hours	Building Information Modelling 6 Hours	Communication Techniques 3 Hours
	D	E	F
	Workplace Coaching Skills 1 Hour	Alberta's Industry Network 1 Hour	Interprovincial Standards Red Seal Program 1 Hour

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: WORKPLACE SAFETY AND RIGGING24 HOURS

A. Safety Legislation, Regulations & Industry Policy in the Trades 4 Hours

Outcome: ***Apply legislation, regulations and practices ensuring safe work in this trade.***

1. Demonstrate the application of the Occupational Health and Safety Act, Regulation and Code.
2. Describe the employer's and employee's role with 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. Describe industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of worker and employers to apply emergency procedures.
5. Describe tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of employers and employees with the selection and use of personal protective equipment (PPE).
7. Maintain required PPE for tasks.
8. Use required PPE for tasks.

B. Climbing, Lifting, Rigging and Hoisting 6 Hours

Outcome: ***Use industry standard practices for climbing, lifting, rigging and hoisting in this trade.***

1. Describe manual lifting procedures.
2. Describe rigging hardware and associated safety factors.
3. Select equipment for rigging loads.
4. Describe hoisting and load moving procedures.
5. Maintain personal protective equipment (PPE) for climbing, lifting and load moving equipment.
6. Use PPE for climbing, lifting and moving equipment.

C. Hazardous Materials & Fire Protection 4 Hours

Outcome: ***Apply industry standard practices for hazardous materials and fire protection in this trade.***

1. Describe 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 for hazardous material.
4. Describe venting procedures when working with hazardous materials.
5. Describe fire hazards, classes, procedures and equipment related to fire protection.

D. Apprenticeship Training Program 3 Hours**Outcome: *Manage an apprenticeship to earn journeyman certification.***

1. Describe the contractual responsibilities of the apprentice, employer and Alberta Apprenticeship and Industry Training.
2. Describe the purpose of the record book.
3. Describe the procedure for changing employers during an active apprenticeship.
4. Describe the purpose of the course outline.
5. Describe the procedure for progressing through an apprenticeship.
6. Describe advancement opportunities in this trade.

E. Pipe Trades Codes 3 Hours**Outcome: *Use code and standards that are applied in the pipe trades.***

1. Identify code documents relating to pipe trades including ASME/ ABSA, CSA, NRC, NFPA, ASHRAE.
2. Explain the purpose of codes and standards.
3. Describe where codes and standards are applicable and by what authority.
4. Describe the procedures for the acceptance of the codes by the provinces and the local authorities.

F. Electrical Safety 4 Hours**Outcome: *Apply arc flash safety and lockout and tagout on a jobsite.***

1. Identify safe work practices to protect from arc flash hazards.
2. Describe lockout/tagout procedures.
3. Identify safe work practices to prevent electrical shock.

SECTION TWO: TOOLS, EQUIPMENT AND MATERIALS.....92 HOURS**A. Hand Tools 6 Hours****Outcome: *Use hand tools common to the pipe trades.***

1. Identify the types of hand tools.
2. Describe use of hand tools.
3. Describe the maintenance of hand tools.

B. Power Tools 6 Hours**Outcome: *Use power tools common to the pipe trades.***

1. Identify the types of power tools.
2. Describe use of power tools.
3. Describe the maintenance of power tools.

C. Welded Pipe and Fittings 12 Hours**Outcome: *Construct welded and flanged piping system components.***

1. Identify types, markings, designations and pressure rating for welded pipe fittings.

2. Identify stud tensioning systems.
3. State factors, methods and torque measurements for bolt ups.
4. Identify types, markings, designations, temperature and pressure ratings of flanged fittings and gaskets.
5. Describe the fabrication process for welded pipe and fittings to the tack-up stage.
6. Describe flange preparation and joining techniques for flanged joints.

D. Plastic Pipe and Tube 12 Hours

Outcome: **Construct plastic piping and tubing systems.**

1. Identify types, applications and designations of plastic pipe, tubing and fittings.
2. Describe fabrication processes for solvent welding plastic pipe.
3. Describe fabrication processes for plastic pipe and tubing using alternative joining methods.
4. Describe fabrication processes for bell end joints.
5. Describe fabrication processes for plastic pipe using thermal fusion and electric resistance welding.
6. Fabricate and test a solvent weld spool to manufacturer’s specifications.
7. Fabricate and test a fusion weld spool to manufacturer’s specifications.

E. Threaded and Grooved Pipe 15 Hours

Outcome: **Construct threaded and grooved piping system components.**

1. Identify types, markings, designations, temperature and pressure ratings of ferrous pipe and fittings.
2. Identify applications of codes, regulations and manufacturer's specifications.
3. Describe the composition of ferrous, alloyed and non-ferrous pipe.
4. Describe the fabrication steps for threading and grooving pipe.
5. Calculate cut length for threaded and grooved pipe.
6. Demonstrate use of hand tools to thread and groove pipe.
7. Demonstrate use of power tools to thread and groove pipe.
8. Assemble and pressure test an assigned project.

F. Tube and Tubing..... 12 Hours

Outcome: **Construct tube and tubing system components.**

1. Identify types, designations and pressure ratings.
2. Identify fitting types and joining techniques.
3. Identify applications and manufacturer’s specifications pertaining to joining methods.
4. Identify health and safety issues pertaining to joining methods.
5. Describe the process for bending tubing.
6. Describe the fabrication processes for joining tubing systems.
7. Assemble and pressure test an assigned project including flared, compression joints and bending components.

G. Valves 12 Hours

Outcome: *Install valves in piping systems.*

1. Identify types of valves.
2. Describe fundamental design variations and their applications.
3. Describe service and maintenance procedures.
4. Explain specifications and manufacturer's requirements for valves.

H. Hangers, Supports and Fasteners 10 Hours

Outcome: *Install hangers, supports and fasteners for piping systems.*

1. Identify types of hangers, supports and fasteners.
2. Describe applications of hangers, supports and fasteners.
3. Describe installation techniques for hangers, supports and fasteners.
4. Explain specifications and manufacturer requirements for hangers, supports and fasteners.

I. Pressure Testing..... 3 Hours

Outcome: *Conduct a pressure test on a system.*

1. Identify equipment used for pressure testing piping installations.
2. Describe procedures and requirements for pneumatic and hydrostatic testing.
3. Describe hazards specific to pressure testing.

J. Pumps..... 4 Hours

Outcome: *Describe pumps for piping systems.*

1. Identify types of pumps.
2. Describe applications for pumps.
3. Describe factors affecting the operation of a pump.

SECTION THREE: METAL FABRICATION46 HOURS

A. Welding Safety 4 Hours

Outcome: *Apply safe work practices according to Occupational Health and Safety Act (OHS) legislation.*

1. Identify hazards for welding and cutting operations.
2. Identify personal protective equipment for welding and cutting operations.
3. Explain hazards involved with welding fumes and gases.
4. Identify welding fume ventilation methods.
5. Explain the effects of electricity and precautions used to prevent injury.
6. Describe procedures for welding or cutting in confined spaces.
7. Interpret sections of the Occupational Health and Safety Act, general safety regulations.

B. Welding.....30 Hours

Outcome: *Use oxy-fuel and welding equipment.*

1. Identify five basic joint types.
2. Describe types of welds and their required dimensions.
3. Identify types of metals using practical tests.
4. Identify oxy-fuel cutting equipment.
5. Identify arc welding equipment.
6. Build a bracket project.
7. Build a spool project.

C. Brazing and Soldering 12 Hours

Outcome: *Braze and solder metal alloys.*

1. Identify applications of brazed and solder joints.
2. Identify equipment and materials required to braze and solder.
3. Describe brazing and soldering procedures.
4. Assemble and test assigned project.

SECTION FOUR:DRAWINGS AND SPECIFCATIONS30 HOURS

A. Sketching and Drawing..... 6 Hours

Outcome: *Apply sketching and drawing concepts.*

1. Identify the types of drafting equipment.
2. Explain the use of drafting equipment.
3. Identify the types of drafting lines found on a drawing.
4. Identify the three views of an orthographic projection.
5. Draw and label the three views of an orthographic drawing.

B. Single Line Drawing 12 Hours

Outcome: *Develop single line pipe drawings.*

1. Identify piping symbols.
2. Draw and label orthographic single-line drawings.
3. Draw and label isometric single-line piping drawings.

C. Drawing Interpretation 12 Hours

Outcome: *Interpret drawings.*

1. Identify the views of a drawing.
2. Explain usage of scales.
3. Calculate dimensions using imperial and metric scales.
4. Describe symbols found on a drawing.
5. Identify the five divisions of a drawing package.

6. Describe the purpose of drawing divisions.
7. Use architectural and mechanical drawings.

SECTION FIVE: CALCULATIONS AND SCIENCE 48 HOURS

A. Applied Calculations 8 Hours

Outcome: *Apply calculations using both metric and imperial measurements.*

1. Perform calculations using whole numbers, fractions and decimals.
2. Describe the metric and imperial measurement systems.
3. Describe the operation of the AIT calculator.
4. Perform number conversions using whole numbers, fractions and decimals.
5. Perform measurement conversions using whole numbers, fractions and decimals.

B. Perimeters, Areas, Percentage and Grade..... 11 Hours

Outcome: *Perform calculations involving perimeter, areas, percentage and grade.*

1. Identify concepts when working with formulas.
2. Apply formulas for calculating perimeters of a rectangle, triangle and a circle.
3. Apply formulas for calculating the surface area of regular-shaped solids, tanks and cylinders.
4. Apply the formula for calculating percentages.
5. Calculate grades in percentage, fractions and ratio.

C. Volumes and Capacities 4 Hours

Outcome: *Calculate volumetric capacities for tanks and cylinders.*

1. Apply formulas for calculating volumes of regular shaped solids, tanks and cylinders.
2. Calculate capacities of regular shaped tanks and cylinders using both metric and imperial values.

D. Piping Offsets 6 Hours

Outcome: *Calculate 45° and 90° offsets for piping systems.*

1. Calculate offsets for right angle triangles.
2. Apply formulas for 45° and 90° offsets.
3. Calculate offset dimensions around an object.

E. Matter, Density and Relative Density 6 Hours

Outcome: *Calculate mass, densities and relative densities.*

1. Describe three common states of matter.
2. Define the terms matter, element, compound and mixture.
3. Define the terms adhesion, cohesion, surface tension and capillarity.
4. Calculate density, mass and volume of substances.
5. Calculate mass and density using relative densities.

F. Pressure and Atmosphere..... 6 Hours

Outcome: **Calculate pressures in metric and imperial values.**

1. Define pressure and force.
2. State the six principles of hydrostatics.
3. Define pressure constants used for calculating pressures.
4. Describe atmospheric pressure and the effect of altitude.
5. Perform pressure and force calculations in both imperial and metric units.
6. Perform calculations to convert absolute, gauge and mercury pressures.

G. Principles of Electricity..... 7 Hours

Outcome: **Perform electrical calculations.**

1. Identify principles of electricity including direct and alternating current flow, electrolysis and electromagnetism.
2. Sketch series and parallel electrical circuits.
3. Apply Ohm's Law.

**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.

SECTION ONE:..... FIRE SPRINKLER SYSTEMS81 HOURS

A. Hazard Classifications 8 Hours

Outcome: Perform a hazard assessment.

1. Describe fire science terms.
2. Describe sprinkler system design.
3. Describe hazard classifications.
4. Explain methods of fire containment.
5. Perform hazard assessments.

B. Piping Arrangements 22 Hours

Outcome: Construct piping systems.

1. Identify formulas for multiple piping offsets.
2. Describe piping system types.
3. Describe piping system components.
4. Describe hand hose connections.
5. Describe application of equal and unequal spread offsets.
6. Explain pipe schedule systems.
7. Explain hydraulically calculated systems.
8. Explain special piping arrangements.
9. Explain flushing connections.
10. Explain pipe sleeve clearances.
11. Design pipe schedule systems.
12. Construct piping systems.

C. Sprinkler System Drainage..... 5 Hours

Outcome: Install sprinkler system drains.

1. Describe drainage installation requirements.
2. Describe drainage components for sprinkler systems.
3. Explain grade requirements for piping systems.
4. Explain sprinkler system drainage maintenance procedures.
5. Install sprinkler system drains.

D. Piping Support Systems 7 Hours

Outcome: ***Install sprinkler systems supports.***

1. Describe hanger types.
2. Describe bracing types.
3. Describe hanger components.
4. Describe bracing components.
5. Explain seismic bracing requirements.
6. Explain installation of sprinkler system supports.
7. Perform trapeze hanger calculations.
8. Perform rod sizing calculations.

E. Sprinkler Installation 22 Hours

Outcome: ***Install sprinklers.***

1. Describe sprinkler types.
2. Describe nozzle types.
3. Describe sprinkler components.
4. Describe nozzle components.
5. Describe sprinkler installation.
6. Describe nozzle installation.
7. Explain sprinkler care.
8. Explain clearance requirements for sprinklers.
9. Explain sprinkler selection.
10. Explain sprinkler spray patterns.
11. Explain obstruction rules.
12. Calculate clearances for sprinkler installation.
13. Install sprinklers.

F. System Hydraulic Design 14 Hours

Outcome: ***Use hydraulic calculations for system layout.***

1. Describe hydraulic calculation terminology.
2. Describe hydraulic calculation procedures.
3. Describe pressure loss.
4. Explain water density requirements over a design area.
5. Perform pressure loss calculation.
6. Perform water demand calculation.
7. Use hydraulic calculations for system layout.

G. Access Equipment 3 Hours

Outcome: *Use access equipment.*

1. Describe elevated work platform types.
2. Explain OH&S standards for elevated work platforms.

SECTION TWO:WATER-BASED SYSTEMS.....68 HOURS

A. Residential Sprinkler Systems..... 10 Hours

Outcome: *Install residential sprinkler systems.*

1. Describe residential sprinkler system types.
2. Describe water supply requirements.
3. Describe material requirements.
4. Explain maintenance procedures.
5. Perform residential piping installation.

B. Wet Sprinkler Systems 18 Hours

Outcome: *Install wet sprinkler systems.*

1. Describe wet system types.
2. Describe wet system components.
3. Explain wet system testing procedures.
4. Explain wet system maintenance.
5. Sketch an isometric drawing of an alarm check valve.
6. Perform trim installation on an alarm valve.

C. Dry Sprinkler Systems..... 22 Hours

Outcome: *Install dry sprinkler systems.*

1. Describe dry system types.
2. Describe dry system components.
3. Explain dry system testing procedures.
4. Explain dry system maintenance.
5. Explain air supply requirements for a dry system.
6. Sketch an isometric drawing of a dry pipe valve.
7. Perform trim installation on a dry pipe valve.

D. Freeze Protection 6 Hours

Outcome: *Service freeze protection systems.*

1. Describe freeze protection systems.
2. Describe freeze protection components.
3. Describe freeze protection for piping.

- 4. Explain freeze protection system hazards.
- 5. Explain freeze protection testing procedures.
- 6. Service freeze protection systems.

E. Stand Pipe Systems 12 Hours

Outcome: *Install stand pipe systems.*

- 1. Describe stand pipe system types.
- 2. Describe stand pipe system components.
- 3. Describe stand pipe system testing requirements.
- 4. Explain stand pipe system maintenance requirements.

SECTION THREE: WATER SUPPLY 51 HOURS

A. Public Water Supply 6 Hours

Outcome: *Install public water supply connections.*

- 1. Describe public water supply.
- 2. Describe water supply terminology.
- 3. Explain flushing requirements.
- 4. Explain types of public water supply connections.

B. Private Water Supply 6 Hours

Outcome: *Install private water supply systems.*

- 1. Describe private water supply systems.
- 2. Describe private water supply storage tanks.
- 3. Describe private water supply components.
- 4. Describe corrosive water supplies.
- 5. Explain flushing requirements.
- 6. Perform tank size calculation.

C. Cross Connection Control 6 Hours

Outcome: *Install cross connection control.*

- 1. Identify cross connection control categories.
- 2. Describe cross connection control terminology.
- 3. Describe American Water Works Association (AWWA) certification.
- 4. Explain cross connection control installation procedures.
- 5. Explain cross connection control testing procedures.

D. Fire Department Connections 4 Hours

Outcome: *Install fire department connections.*

- 1. Describe fire department connections.
- 2. Describe fire department connection components.

- 3. Describe fire department connection testing.
- 4. Explain fire department connection installation.

E. Fire Hydrants 15 Hours

Outcome: *Install fire hydrants.*

- 1. Identify hydrant tools.
- 2. Describe hydrant types.
- 3. Describe hydrant components.
- 4. Describe hydrant operation.
- 5. Describe hydrant maintenance.
- 6. Perform hydrant flow test calculation.

F. Underground Piping 10 Hours

Outcome: *Install underground piping systems.*

- 1. Describe underground piping systems.
- 2. Describe underground piping system components.
- 3. Explain flushing requirements.

G. Water Properties 4 Hours

Outcome: *Interpret water properties.*

- 1. Describe chemical properties of water.
- 2. Describe water flow terminology.
- 3. Explain Venturi effect.
- 4. Explain head pressure.
- 5. Interpret water properties.

SECTION FOUR: WORK ORGANIZATION40 HOURS

A. Legislated Requirements 16 Hours

Outcome: *Interpret legislation, regulations, codes, and standards.*

- 1. Identify environmental regulations.
- 2. Describe fire protection legislation.
- 3. Explain National Fire Protection Association (NFPA) standards.
- 4. Explain Alberta Fire Code (AFC).
- 5. Explain Alberta Building Code (ABC).
- 6. Explain National Building Code (NBC).

B. System Layout 12 Hours

Outcome: *Perform system layout.*

1. Interpret installation specifications.
2. Interpret blueprints.
3. Perform system layout.

C. Job Site Planning 12 Hours

Outcome: *Perform job site planning.*

1. Identify project management requirements.
2. Identify jobsite requirements.
3. Identify factors that affect jobsite requirements.
4. Describe jobsite reports.
5. Explain work permits.
6. Coordinate tasks with other trades.

**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.

SECTION ONE:.....FIRE PUMP UNITS.....42 HOURS

A. Fire Pumps30 Hours

Outcome: *Install fire pumps.*

1. Describe fire pumps.
2. Describe fire pump operation principles.
3. Describe fire pump components.
4. Describe jockey pumps.
5. Describe pipe sizing.
6. Explain fire pump commissioning.
7. Explain fire pump maintenance.
8. Explain fire pump room.
9. Sketch fire pump room.
10. Perform fire pump curve calculations.

B. Drivers.....6 Hours

Outcome: *Install drivers.*

1. Identify driver performance.
2. Identify power supplies.
3. Describe drivers.
4. Describe driver components.
5. Describe driver operation.
6. Explain driver-to-pump alignment.
7. Perform water horsepower calculation.

C. Controllers.....6 Hours

Outcome: *Install controllers.*

1. Describe controllers.
2. Describe controller operation.
3. Describe controller components.
4. Explain sensing line installations.

SECTION TWO: SPECIALTY HAZARD SYSTEMS 101 HOURS

A. Chemical Systems 6 Hours

Outcome: *Install chemical systems.*

1. Describe chemical systems.
2. Describe dry chemical system components.
3. Describe wet chemical system components.
4. Describe operations of dry chemical systems.
5. Describe wet chemical systems.
6. Explain maintenance of chemical systems.

B. Extinguishers..... 6 Hours

Outcome: *Install fire extinguishers.*

1. Describe fire extinguisher classes.
2. Describe fire extinguisher components.
3. Explain fire extinguisher inspection.
4. Explain fire extinguisher maintenance.

C. Foam Systems 15 Hours

Outcome: *Install foam systems.*

1. Describe foam systems.
2. Describe foam concentrates.
3. Describe foam system discharge devices.
4. Explain foam system component installation.
5. Explain commissioning of foam systems.
6. Explain operation of a foam system.

D. Clean Agent Systems 10 Hours

Outcome: *Install clean agent systems.*

1. Describe clean agent systems.
2. Describe clean agent system components.
3. Describe clean agent system operation.
4. Explain clean agent system testing requirements.

E. Carbon Dioxide Systems 6 Hours

Outcome: *Install carbon dioxide systems.*

1. Describe carbon dioxide systems.
2. Describe carbon dioxide system components.
3. Describe carbon dioxide system operations.
4. Explain carbon dioxide system testing.

F. Pre-Action Systems 22 Hours

Outcome: *Install pre-action systems.*

1. Describe pre-action systems.
2. Describe pre-action system components.
3. Describe pre-action system operations.
4. Explain pre-action systems testing requirements.
5. Perform trim installation on a pre-action valve.

G. Deluge Systems..... 20 Hours

Outcome: *Install deluge systems.*

1. Describe deluge systems.
2. Describe deluge system components.
3. Describe deluge system operation.
4. Describe fixed water spray systems.
5. Describe outside exposure systems.
6. Perform trim installation on a deluge valve.

H. Water Mist Systems 10 Hours

Outcome: *Install water mist systems.*

1. Describe water mist systems.
2. Describe water mist system components.
3. Describe water mist system operations.
4. Describe hybrid systems.
5. Describe hybrid system components.
6. Describe hybrid system operation.

I. Corrosion Inhibiting 6 Hours

Outcome: *Install corrosion inhibiting devices.*

1. Describe piping corrosion.
2. Describe corrosion inhibiting system devices.
3. Explain corrosion inhibiting methods.

SECTION THREE: INSPECTION, TESTING AND MAINTENANCE 36 HOURS

A. Inspect Fire Protection Systems 10 Hours

Outcome: *Perform fire protection system inspections.*

1. Identify owner’s responsibilities for disarming systems.
2. Identify sprinkler systems installer’s responsibilities for disabling systems.
3. Describe required testing procedures.
4. Describe tools used for testing.

5. Describe equipment used for testing.
6. Describe types of inspection report documents.
7. Describe inspection report terminology.
8. Describe report document preparation.
9. Perform a fire protection system inspection.

B. Fire Protection System Maintenance 10 Hours

Outcome: Maintain fire protection systems.

1. Identify owner’s responsibilities for sprinkler systems.
2. Identify sprinkler systems installer’s legal responsibilities.
3. Describe tools required for system maintenance.
4. Describe equipment required for system maintenance.
5. Describe routine maintenance procedures.

C. Deficiencies 16 Hours

Outcome: Repair deficiencies.

1. Describe system deficiencies.
2. Describe system impairments.
3. Describe sprinkler system failures.
4. Describe sprinkler system repair procedures.

SECTION FOUR.....DETECTION AND SIGNAL INITIATING DEVICES.....39 HOURS

A. Actuating Devices 9 Hours

Outcome: Install actuating devices.

1. Describe actuating devices.
2. Describe actuating device components.
3. Explain device actuation.

B. Spark Detection Systems 3 Hours

Outcome: Install spark detection systems.

1. Describe spark detection systems.
2. Describe spark detection system components.
3. Describe spark detection system operation.

C. Air Sampling Systems 6 Hours

Outcome: Install air sampling systems.

1. Describe air sampling systems.
2. Describe air sampling system components.
3. Explain operation of air sampling systems.

D. Signal Initiating Devices..... 7 Hours

Outcome: Install signal initiating devices.

1. Describe signal initiating devices.
2. Describe signal initiating device components.
3. Explain operation of a signal initiating device.

E. Fire Alarm Panels 8 Hours

Outcome: Operate fire alarm panels.

1. Describe fire alarm panels.
2. Describe fire alarm panel terminology.
3. Explain fire alarm devices.
4. Explain fire alarm panel bypassing procedures.
5. Explain fire alarm panel reset procedures.
6. Operate fire alarm panels.

F. Electrical Test Equipment 6 Hours

Outcome: Use electrical test equipment.

1. Identify electrical test equipment.
2. Describe electrical test equipment functions.
3. Use electrical test equipment.

SECTION FIVE:....EMERGING TECHNOLOGY, COMMUNICATION AND APPRENTICESHIP22 HOURS

A. Estimation 10 Hours

Outcome: Perform jobsite estimates.

1. Define scope of work.
2. Describe contract purpose.
3. Explain estimating principles.
4. Explain contract change order process.
5. Perform a jobsite estimate.

B. Building Information Modelling 6 Hours

Outcome: Use building information modelling software.

1. Describe building information modelling.
2. Explain building information modelling functions.
3. Use building information modelling software.

C. Communication Techniques 3 Hours

Outcome: Use communication techniques.

1. Describe professional expectations.

2. Describe effective communications skills.
3. Describe conflict resolution processes.
4. Use communication techniques.

D. Workplace Coaching Skills 1 Hour

Outcome: *Use coaching skills when training an apprentice.*

1. Describe the process for coaching an apprentice.

E. Alberta’s Industry Network 1 Hour

Outcome: *Describe the role of the network of industry committees that represent trades and occupations in Alberta.*

1. Describe Alberta’s Apprenticeship and Industry Training system.
2. Describe the roles and responsibilities of the Alberta Apprenticeship and Industry Training Board, the Government of Alberta and post-secondary institutions.
3. Describe the roles and responsibilities of the Provincial Apprenticeship Committees (PACs), Local Apprenticeship Committees (LACs) and Occupational Committees (OCs).

F. Interprovincial Standards Red Seal Program..... 1 Hour

Outcome: *Use Red Seal products to challenge an Interprovincial examination.*

1. Identify Red Seal products used to develop Interprovincial examinations.
2. Use Red Seal products to prepare for an Interprovincial examination.



Apprenticeship and Industry Training

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037