Saskatchewan Apprenticeship and Trade Certification Commission

Sprinkler Fitter

On-the-Job Training Guide

2021

Online: www.saskapprenticeship.ca

Recognition:
To promote transparency and consistency, portions of this document has been adapted from the 2016 Sprinkler Fitter Red Seal Occupational Standard (Employment and Social Development Canada).

A complete version of the Occupational Standard can be found at www.red-seal.ca

STRUCTURE OF THE ON-THE-JOB TRAINING GUIDE

To facilitate understanding of the occupation, this on-the-job training guide contains the following sections:

Description of the Sprinkler Fitter trade: an overview of the trade's duties and training requirements.

Essential Skills Summary: an overview of how each of the nine essential skills is applied in this trade.

Harmonization: a brief description on the pan-Canadian Harmonization Initiative for the Sprinkler Fitter trade.

Task Matrix: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard detailing the essential skills and the level of training where the content is covered.

Major Work Activity (MWA): the largest division within the standard that is comprised of a distinct set of trade activities.

Task: distinct actions that describe the activities within a major work activity.

Sub-task: distinct actions that describe the activities within a task.

On-the-Job and In-school Training Content for the Sprinkler Fitter Trade: a chart which outlines on-the-job examples for apprentices to achieve relevant work experience to prepare for topics of technical training.

DESCRIPTION OF THE SPRINKLER FITTER TRADE

Sprinkler Fitter install, test and repair fixed fire suppression systems.

Sprinkler fitters lay out, install, repair, maintain, modify, inspect and test fire protection systems in a variety of buildings and settings. They work on fire protection systems such as wet, dry, water mist, preaction, foam, deluge, standpipe, clean agent, carbon dioxide, hybrid, antifreeze, and wet and dry chemical fire suppression system. Their duties include reading and interpreting engineered drawings, installing hangers and clamps to support the piping system, preparing the pipe, joining pipe using a variety of methods, installing associated equipment including cross-connection control, as well as maintaining, inspecting and testing all types of fire protection systems.

Sprinkler fitters usually, but not exclusively, work on industrial, institutional, commercial and residential sites such as office buildings, plants, factories, hospitals, hotels, houses, apartment buildings, airports and personal care homes. They may work for trade contractors, maintenance departments of factories, and servicing companies. They may also be self-employed. Sprinkler fitters may specialize in installation, maintenance, testing or inspection.

Sprinkler fitters use tools and equipment such as hand tools, portable and stationary power tools, measuring and testing equipment, access equipment, and rigging, hoisting and lifting equipment.

Sprinkler fitters work primarily indoors, often in unheated or temporarily heated spaces. They may also be required to install outdoor systems both above and below ground. The installation of sprinkler equipment takes place throughout all phases of construction, typically in the mid-to later stages of new construction or in situations where renovation of existing structures is undertaken or upgrading is legislated. Sprinkler fitters frequently work on the same site more than once and routinely perform a variety of tasks covering all aspects of the trade. They are frequently required to work in confined spaces and at heights. They may occasionally experience physical discomfort due to extensive lifting of various weights overhead, repetitive motion, temperature changes, noise and dust.

Key attributes for persons entering this trade are mechanical and mathematical aptitude, manual dexterity, good communication and problem solving skills and the ability to pay close attention to detail. Physical strength and stamina, and the ability to work at a considerable height are also assets in this trade.

This standard recognizes similarities or overlaps with the work of plumbers and steamfitter-pipefitters.

Experienced sprinkler fitters may advance to positions such as foreman, estimators, contractors, inspection personnel and instructors. They also act as mentors and trainers of apprentices in the trade.

Training Requirements: 7200 hours and 4 years, including three 8-week technical training sessions delivered by Red Deer College, Red Deer, AB.

Journeyperson to apprentice ratio for this trade is: 1:2

The information contained in this document serves as a guide for employers and apprentices. Apprenticeship training is mutually beneficial to both employer and apprentice. The employer's investment in training apprentices results in skilled and certified workers. The document summarizes the tasks to be covered by the apprentice during their on-the-job portion of apprenticeship training. An apprentice spends approximately 85% of their apprenticeship term training on-the-job.

It is the employer's or journeyperson's responsibility to supervise an apprentice's practical skills development until a satisfactory level of proficiency has been reached.

EMPLOYER TRAINING RESPONSIBILITY

- introduce the apprentice to daily practice in approved procedures
- provide guided, hands-on practice in the operation and maintenance of tools and equipment
- demonstrate the techniques of cutting, installing and trouble-shooting various materials

Employers should make every effort to expose their apprentices to work experience in as many areas of the trade as possible.

In the On-the-Job Training Guide, in-school instruction is listed first; on-the-job suggestions to help employers assist the apprentice to prepare for in-school training are listed next.

The content of the training components is subject to change without notice.

Entrance Requirements for Apprenticeship Training

Your grade twelve transcript (with no modified classes) or GED 12 is your guarantee that you meet the educational entrance requirements for apprenticeship in Saskatchewan. In fact, employers prefer and recommend apprentices who have completed high school. This ensures the individual has all of the necessary skills required to successfully complete the apprenticeship program, and receive journeyperson certification.

Individuals with "modified" or "general" classes in math or science do not meet our entry requirements. These individuals are required to take an entrance assessment prescribed by the SATCC.

English is the language of instruction in all apprenticeship programs and is the common language for business in Saskatchewan. Before admission, all apprentices and/or "upgraders" must be able to understand and communicate in the English language. Applicants whose first language is not English must have a minimum Canadian Language Benchmark Assessment of six (CLB6).

Note: A CLB assessment is valid for a one-year period from date of issue.

Designated Trade Name	**Math Credit** at the Indicated Grade Level❶	**Science Credit** at Grade Level
Sprinkler Fitter	Grade 11	Grade 10

❶ - (One of the following) WA – Workplace and Apprenticeship; or F – Foundations; or P – Pre-calculus, or a Math at the indicated grade level (Modified and General Math credits are not acceptable.).

*Applicants who have graduated in advance of 2015-2016, or who do not have access to the revised Science curricula will require a Science at the minimum grade level indicated by trade.

For information about high school curriculum, including Math and Science course names, please see: http://www.curriculum.gov.sk.ca/#

Individuals not meeting the entrance requirements will be subject to an assessment and any required training

ESSENTIAL SKILLS SUMMARY

(How each of the nine essential skills is applied in this trade)

Essential skills are needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

A series of CCDA-endorsed tools have been developed to support apprentices in their training and to be better prepared for a career in the trades. The tools can be used independently or with the assistance of a tradesperson, trainer, employer, teacher or mentor to:

- understand how essential skills are used in the trades;
- learn about individual essential skills strengths and areas for improvement; and
- improve essential skills and increase success in an apprenticeship program.

The tools are available online or for order at: www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

The application of these skills may be described throughout this document within the skills and knowledge which support each sub-task of the trade. The most important essential skills for each sub-task have also been identified. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile. A link to the complete essential skills profile can be found at www.red-seal.ca.

READING

Sprinkler fitters read texts such as short descriptions and directions on labels for products. They read bulletins, manuals, work orders, reports and procedures when installing, operating, diagnosing, maintaining, inspecting and repairing equipment. They also read emails and memos from supervisors, co-workers and suppliers about ongoing work.

DOCUMENT USE

Sprinkler fitters scan and locate data on labels, lists, tables and schedules. They reference applicable codes such as National Fire Protection Association (NFPA) and National Building Code (NBC).They may interpret graphs when monitoring equipment operation. They interpret or review schematics and engineered drawings of systems (pneumatic, mechanical, electrical, structural and hydraulic) to identify malfunctions. Sprinkler fitters may also retrieve and study data from scale drawings to identify and verify the location of equipment to be installed. They also complete forms such as test certificates, safety documents, purchase orders, inspection reports, maintenance forms, logbooks, time sheets and work orders.

WRITING

Sprinkler fitters write brief text entries in logbooks and in forms. They may write maintenance, repair and safe work procedures. Sprinkler fitters write emails to supervisors and co-workers about ongoing work, and suppliers about equipment specifications. They also write incident reports and update drawings as required.

ORAL COMMUNICATION

Sprinkler fitters talk to suppliers, engineers, contractors, co-workers, supervisors, other tradespersons and clients and members of the public about equipment specifications, access, orders, and delivery and service times. They discuss work orders, equipment malfunctions and job task coordination with co-workers. They also discuss safety, productivity, and procedural and policy changes at meetings with co-workers, supervisors, engineers and clients.

NUMERACY

Sprinkler fitters measure various physical properties of equipment. Calculations are required in multiple aspects of the sprinkler fitter trade, such as pneumatic, mechanical, structural and hydraulic systems. They calculate distances, totals, maximums, minimums, tolerances, fits and quantities required. They may calculate loads, capacities, speeds, velocities, flows and dimensions for mechanical components and systems. They perform calculations in order to adjust, level and align equipment according to specifications, and for diagnosing process variables. Sprinkler fitters assess weights and distances appropriate for rigging, hoisting, lifting and moving equipment.

THINKING

Thinking skills are critical to the sprinkler fitter trade. They need the ability to adapt on a day to-day basis to site conditions, design, fabrication and installation issues, safety concerns, performance and productivity goals. They may assess the feasibility of designs for small modifications to fire protection systems, ensuring that designs meet technical specifications, performance requirements and jurisdictional regulations. Sprinkler fitters also troubleshoot fire protection systems to determine service requirements.

WORKING WITH OTHERS

Sprinkler fitters are required to work independently, with other sprinkler fitters, other tradespeople and personnel from other departments and jurisdictional organizations depending on the scope of the work.

DIGITAL TECHNOLOGY

Sprinkler fitters may use databases to perform queries on maintenance history, regulatory items and procedures. They may also enter data from completed work orders in a computerized maintenance management system (CMMS). They may use programs to aid in the adjustment of drawings with computer-assisted design (CAD) and building information modelling (BIM) software. Sprinkler fitters use hand-held computerized alignment and levelling measurement tools. They may use word processing software to write, edit and format texts such as incident reports and maintenance procedures. They may access work orders, asset information and documents on tablets, phones and other electronic devices.

CONTINUOUS LEARNING

Sprinkler fitters read manuals and trade-related documents to stay up to date on developments in their trade. They also attend training sessions (online or classroom-based) on new technologies, equipment and safety procedures. In addition, they learn informally by exchanging information with co-workers and suppliers.

HARMONIZATION

At the request of industry, the Harmonization Initiative was launched in 2013 to *substantively align* apprenticeship systems across Canada by making training requirements more consistent in the Red Seal trades. Harmonization aims to improve the mobility of apprentices, support an increase in their completion rates and enable employers to access a larger pool of apprentices.

As part of this work, the Canadian Council of the Directors of Apprenticeship (CCDA) identified four main harmonization priorities in consultation with industry and training stakeholders:

1. Trade name

The official Red Seal name for this trade is Sprinkler Fitter.

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for the Sprinkler Fitter trade is 3.

3. Total Training Hours during Apprenticeship Training

The total hours of training, including both on-the-job and in-school training for the Sprinkler Fitter trade is 7200.

4. Consistent sequencing of training content (at each level) using the most recent Occupational Standard

Implementation for harmonization took place progressively.

SPRINKLER FITTER TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2017 Sprinkler Fitter Red Seal Occupational Standard. Each sub-task details the corresponding essential skill and level of training where the content is covered*.

* Sub Tasks with numbers in the boxes is where the content will be delivered in technical training.

Implementation for harmonization took place progressively. Since the Sprinkler Fitter technical training takes place in Alberta, they were responsible for implementation of the Harmonized training. For your information, Alberta has kept the name of the trade as *Sprinkler Fitter Installer*, not the Harmonized recommended name of *Sprinkler Fitter*. Additionally, in Alberta, the pipe fitting trades attend a common Level One, therefore the recommended specific Sprinkler Fitter Level One topics (*Piping Components* and *Water-Based Systems*) are taught in Level Two, not as recommended in Level One. Additional differences to the Harmonized recommendations include that *Communications* is taught in Level Three, not Level One, *Deluge Systems* is taught in Level Three, not Level Two, and, *Private Water Supply Systems* is taught in Alberta Level Two, not in Level Three.

A - PERFORMS COMMON OCCUPATIONAL SKILLS 20%

Task A-1 Performs safety-related functions 23%	1.01 Maintains safe work environment 1	1.02 Uses personal protective equipment (PPE) and safety equipment 1	1.03 Performs lock-out and tag-out procedures 1	A-1.04 Performs work in confined space 1	
Task A-2 Uses and maintains tools and equipment 26%	A-2.01 Uses hand tools 1	A-2.02 Uses portable and stationary power tools 1	A-2.03 Uses measuring and testing equipment 1	A-2.04 Uses access equipment 1	A-2.05 Uses rigging, hoisting and lifting equipment 1
	A-2.06 Uses soldering and brazing equipment 1				
Task A-3 Organizes work 25%	A-3.01 Interprets codes, standards, regulations and procedures 1, 2, 3	A-3.02 Uses drawings and specifications 1, 2, 3	A-3.03 Uses documentation and reference material 1, 2	A-3.04 Plans job tasks and procedures 1, 2	A-3.05 Prepares work site 1, 2
	A-3.06 Performs layout of systems 1, 2				

Task A-4 Commission systems 18%	**A-4.01 Commissions water supply systems** 2, 3	**A-4.02 Commissions fire protection systems** 2, 3
Task A-5 Uses communication and mentoring techniques 8%	**A-5.01 Uses communication techniques** ~~1~~, 3	**A-5.02 Uses mentoring techniques** ~~1~~, 3

B – INSTALLS WATER SUPPLY 15%

B-6 Prepares pipe 18%	**B-6.01 Supervises trenching and backfilling (NOT COMMON CORE)** 2	**B-6.02 Installs underground piping and components (NOT COMMON CORE)** 2	**B-6.03 Flushes underground system** 2
Task B-7 Installs fire pump units 38%	**B-7.01 Determines location of pumps, drivers, controllers and components** 3	**B-7.02 Installs pumps, drivers, controllers and components** 3	
Task B-8 Installs fire department connections 26%	**B-8.01 Determines location, size and type of fire department connections** 2	**B-8.02 Installs fire department connection piping and components** 2	
Task B-9 Installs private water supply systems 18%	**B-9.01 Installs water tanks** 3	**B-9.02 Installs related equipment** 3	

C – INSTALLS PIPING 28%

Task C-10 Prepares pipe, tube and fittings for installation 27%	**C-10.01 Cuts pipe and tube** 1	**C-10.02 Bends pipe and tube** 1	**C-10.03 Threads pipe** 1	**C-10.04 Grooves pipe** 1	**C-10.05 Drills pipe and tube** 1

	C-10.06 Grinds pipe 1	C-10.07 Prepares fittings 1			
Task C-11 Installs pipe, tube and fittings 37%	C-11.01 Installs steel pipe, tube and fittings 1	C-11.02 Installs plastic pipe, tube and fittings 1	C-11.03 Installs copper pipe, tube and fittings 1	C-11.04 Paints and labels pipe and tube 1	
Task C-12 Installs piping components 36%	C-12.01 Selects sprinklers ~~1~~, 2	C-12.02 Installs sprinklers and nozzles ~~1~~, 2	C-12.03 Installs sleeves ~~1~~, 2	C-12.04 Installs supports and hangers ~~1~~, 2	C-12.05 Installs seismic protection 2
	C-12.06 Installs cross-connection control assemblies 2	C-12.07 Installs system drainage ~~1~~, 2			

D – INSTALLS AND LAYS OUT FIRE PROTECTION SYSTEMS AND DEVICES

21%

Task D-13 Installs water-based systems 58%	D-13.01 Installs wet pipe systems ~~1~~, 2	D-13.02 Installs dry pipe systems ~~1~~, 2	D-13.03 Installs antifreeze systems ~~1~~, 2	D-13.04 Installs preaction/deluge systems ~~1~~, 2, 3	D-13.05 Installs foam systems 3
	D-13.06 Installs standpipe systems 2	D-13.07 Installs water mist and hybrid systems 3			
Task D-14 Installs specialty fire suppression systems 17%	D-14.01 Installs dry and wet chemical, clean agent and carbon dioxide systems 3	D-14.02 Installs portable extinguishers 3			
Task D-15 Installs detection devices 11%	D -15.01 Installs wet and dry pilot lines 2	D -15.02 Installs heat-actuated devices (HADs) (NOT COMMON CORE) 2	D -15.03 Installs spark detection systems (NOT COMMON CORE) 3	D -15.04 Installs air sampling systems (NOT COMMON CORE) 3	D -15.05 Installs electrical detection systems (NOT COMMON CORE) 3

Task D -16 **Installs signal-initiating devices** **14%**	**D -16.01 Installs alarm-initiating devices** **2**	**D -16.02 Installs supervisory-initiating devices** **2**

E – INSPECTS, TESTS AND MAINTAINS (ITM) FIRE PROTECTION SYSTEMS — 16%

Task E-17 **Maintains and repairs fire protection systems** **54%**	**E -17.01 Troubleshoots fire protection systems** **3**	**E -17.02 Repairs deficiencies** **3**	**E -17.03 Performs scheduled maintenance** **3**
Task E -18 **Inspects and tests fire protection systems** **46%**	**E -18.01 Performs scheduled tests** **3**	**E -18.02 Performs scheduled inspections** **3**	**E -18.03 Inspects portable fire extinguishers** **3**

Red and ~~crossed out~~ topics deviate from Harmonized Recommendations

ON-THE JOB AND IN-SCHOOL TRAINING CONTENT FOR THE SPRINKLER FITTER TRADE

This chart outlines on-the-job examples for apprentices to achieve relevant work experience to prepare for the topics of technical training. Topics of technical training are provided with the associated learning outcomes.

Since the Sprinkler Fitter technical training takes place in Alberta, Alberta is responsible for the Harmonized training. In Alberta, pipe fitting trades attend a common Level One, therefore the recommended specific Sprinkler Fitter Level One topics (*Piping Components* and *Water-Based Systems*) are taught in Level Two. Additional differences to the Harmonized recommendations include that: Communications is taught in Level Three, not Level One, Deluge systems is taught in Level Three, not Level Two, and, Private Water Supply Systems is taught in Alberta Level Two, not in Level Three.

Level One — 8 weeks — 240 hours

Workplace Safety & Rigging — 24 hours

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

- demonstrate the application of the Occupational Health and Safety Act, Regulation and Code
- 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
- describe industry practices for hazard assessment and control procedures
- describe the responsibilities of worker and employers to apply emergency procedures
- describe tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures
- describe the roles and responsibilities of employers and employees with the selection and use of personal protective equipment (PPE)
- maintain required PPE for tasks
- use required PPE for tasks

B. Climbing, Lifting, Rigging and Hoisting — 6 hours

- describe manual lifting procedures
- describe rigging hardware and associated safety factors
- select equipment for rigging loads
- describe hoisting and load moving procedures
- maintain personal protective equipment (PPE) for climbing, lifting and load moving equipment
- use PPE for climbing, lifting and moving equipment

C. Hazardous Materials & Fire Protection — 4 hours

- describe roles, responsibilities, features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program
- describe the three key elements of WHMIS
- describe handling, storing and transporting procedures for hazardous material
- describe venting procedures when working with hazardous materials
- describe fire hazards, classes, procedures and equipment related to fire protection

D. Apprenticeship Training Program 3 hours

- describe the contractual responsibilities of the apprentice, employer and Alberta Apprenticeship and Industry Training
- describe the purpose of the record book
- describe the procedure for changing employers during an active apprenticeship
- describe the purpose of the course outline
- describe the procedure for progressing through an apprenticeship
- describe advancement opportunities in this trade

E. Pipe Trades Codes 3 hours

- identify code documents relating to pipe trades including ASME/ ABSA, CSA, NRC, NFPA, ASHRAE
- explain the purpose of codes and standards
- describe where codes and standards are applicable and by what authority
- describe the procedures for the acceptance of the codes by the provinces and the local authorities

F. Electrical Safety 4 hours

- identify safe work practices to protect from arc flash hazards
- describe lockout/tagout procedures
- identify safe work practices to prevent electrical shock

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing WHMIS training*
- *reviewing company-specific safety protocols, and*
- *explaining the role of Occupational Health and Safety*
- *demonstrating the use of personal protective equipment (PPE) and safe practices for climbing, lifting, rigging and hoisting*
- *identifying types of rope and various rigging components, and demonstrating how to tie basic knots and hitches*
- *demonstrating the various climbing and elevated work platforms used in the sprinkler industry*
- *identifying safe work practices to prevent electric shock*

Tools Equipment and Materials — 92 hours

A. Hand Tools 6 hours

- identify the types of hand tools
- describe use of hand tools
- describe the maintenance of hand tools

B. Power Tools 6 hours

- identify the types of power tools
- describe use of power tools
- describe the maintenance of power tools

C. Welded Pipe and Fittings 12 hours

- identify types, markings, designations and pressure rating for welded pipe fittings
- identify stud tensioning systems
- state factors, methods and torque measurements for bolt ups
- identify types, markings, designations, temperature and pressure ratings of flanged fittings and gaskets
- describe the fabrication process for welded pipe and fittings to the tack-up stage

- describe flange preparation and joining techniques for flanged joints

D. Plastic Pipe and Tube 12 hours

- identify types, applications and designations of plastic pipe, tubing and fittings
- describe fabrication processes for solvent welding plastic pipe
- describe fabrication processes for plastic pipe and tubing using alternative joining methods
- describe fabrication processes for bell end joints
- describe fabrication processes for plastic pipe using thermal fusion and electric resistance welding
- fabricate and test a solvent weld spool to manufacturer's specifications
- fabricate and test a fusion weld spool to manufacturer's specifications

E. Threaded and Grooved Pipe 15 hours

- identify types, markings, designations, temperature and pressure ratings of ferrous pipe and fittings
- identify applications of codes, regulations and manufacturer's specifications
- describe the composition of ferrous, alloyed and non-ferrous pipe
- describe the fabrication steps for threading and grooving pipe
- calculate cut length for threaded and grooved pipe
- demonstrate use of hand tools to thread and groove pipe
- demonstrate use of power tools to thread and groove pipe
- assemble and pressure test an assigned project

F. Tube and Tubing 12 hours

- identify types, designations and pressure ratings
- identify fitting types and joining techniques
- identify applications and manufacturer's specifications pertaining to joining methods
- identify health and safety issues pertaining to joining methods
- describe the process for bending tubing
- describe the fabrication processes for joining tubing systems
- assemble and pressure test an assigned project including flared, compression joints and bending components

G. Valves 12 hours

- identify types of valves
- describe fundamental design variations and their applications
- describe service and maintenance procedures
- explain specifications and manufacturer's requirements for valves

H. Hangers, Supports and Fasteners 10 hours

- identify types of hangers, supports and fasteners
- describe applications of hangers, supports and fasteners
- describe installation techniques for hangers, supports and fasteners
- explain specifications and manufacturer requirements for hangers, supports and fasteners

10 **Pressure Testing** 3 hours

- identify equipment used for pressure testing piping installations
- describe procedures and requirements for pneumatic and hydrostatic testing
- describe hazards specific to pressure testing

11 **Pumps** 4 hours

- identify types of pumps
- describe applications for pumps
- describe factors affecting the operation of a pump

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing hands-on activities to ensure familiarity and safe use*
- *reviewing the fabrication processes and safe procedures to be used when soft soldering tube and tubing for all sizes*
- *reviewing calculations for hanger spacing and stating maximum distances between hangers on different sizes of lines in both international system of units (SI) and imperial units*
- *describing the technical data and installation requirements for steel pipe*
- *identifying the requirements for assembly of threaded pipe and fittings*
- *identifying the requirements for assembly of plastic pipe fittings*
- *identifying the requirements for assembly of ferrous and non-ferrous tub and tubing and related fittings*
- *identifying the requirements for soldering copper tube, tubing and fittings*
- *identifying the requirements for installing and servicing valves*
- *identifying the requirements for installing hangers including sway bracing*
- *identifying the requirements for installing and servicing grooved pipe and fittings and flanged pipe fittings*
- *identify equipment used for pressure testing piping installations*
- *reviewing hazards specific to pressure testing*
- *demonstrating the appropriate use of hand and power tools common to the sprinkler systems trade, as well as their applications, maintenance and procedures*
- *describing and demonstrating the operation and safe use of powder activated tools*

Metal Fabrication — 46 hours

A. Welding Safety — 4 hours

- identify hazards for welding and cutting operations
- identify personal protective equipment for welding and cutting operations
- explain hazards involved with welding fumes and gases
- identify welding fume ventilation methods
- explain the effects of electricity and precautions used to prevent injury
- describe procedures for welding or cutting in confined spaces
- interpret sections of the Occupational Health and Safety Act, general safety regulations

B. Welding — 30 hours

- identify five basic joint types
- describe types of welds and their required dimensions
- Identify types of metals using practical tests
- Identify oxy-fuel cutting equipment
- Identify arc welding equipment
- build a bracket project
- build a spool project

C. Brazing and Soldering — 12 hours

- identify applications of brazed and solder joints
- identify equipment and materials required to braze and solder
- describe brazing and soldering procedures
- assemble and test assigned project

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrate safe work practices and procedures when working with welding and cutting equipment*
- *allowing for hands-on practice with different welding and cutting processes*

- *demonstrate how to braze copper or brass joints to specific codes and requirements*

Drawings and Specifications — 30 hours

A. Sketching and Drawing — 6 hours

- identify the types of drafting equipment
- explain the use of drafting equipment
- identify the types of drafting lines found on a drawing
- identify the three views of an orthographic projection
- draw and label the three views of an orthographic drawing

B. Single Line Drawing — 12 hours

- identify piping symbols
- draw and label orthographic single-line drawings
- draw and label isometric single-line piping drawings

C. Drawing Interpretation

- identify the views of a drawing
- explain usage of scales
- calculate dimensions using imperial and metric scales
- describe symbols found on a drawing
- identify the five divisions of a drawing package
- describe the purpose of drawing divisions
- use architectural and mechanical drawings

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating how to effectively read symbols and comments on blueprints and drawings*
- *demonstrating how to recognize and interpret blueprint divisions, views and elevations*
- *demonstrating how to read and interpret project specifications for sprinkler applications*
- *providing hands-on activities to ensure skill development*

Calculations and Science — 48 hours

A. Applied Calculations — 8 hours

- perform calculations using whole numbers, fractions and decimals
- describe the metric and imperial measurement systems
- describe the operation of the AIT calculator
- perform number conversions using whole numbers, fractions and decimals
- perform measurement conversions using whole numbers, fractions and decimals

B. Perimeters, Areas, Percentage and Grade — 11 hours

- identify concepts when working with formulas
- apply formulas for calculating perimeters of a rectangle, triangle and a circle
- apply formulas for calculating the surface area of regular-shaped solids, tanks and cylinders
- apply the formula for calculating percentages
- calculate grades in percentage, fractions and ratio

C. Volumes and Capacities — 4 hours

- apply formulas for calculating volumes of regular shaped solids, tanks and cylinders
- calculate capacities of regular shaped tanks and cylinders using both metric and imperial values

D. Piping Offsets — 6 hours

- calculate offsets for right angle triangles
- apply formulas for 45° and 90° offsets
- calculate offset dimensions around an object

E. Matter, Density and Relative Density 6 hours

- describe three common states of matter
- define the terms matter, element, compound and mixture
- define the terms adhesion, cohesion, surface tension and capillarity
- calculate density, mass and volume of substances
- calculate mass and density using relative densities

F. Pressure and Atmosphere 6 hours

- define pressure and force
- state the six principles of hydrostatics
- define pressure constants used for calculating pressures
- describe atmospheric pressure and the effect of altitude
- perform pressure and force calculations in both imperial and metric units
- perform calculations to convert absolute, gauge and mercury pressures

G. Principles of Electricity 7 hours

- identify principles of electricity including direct and alternating current flow, electrolysis and electromagnetism
- sketch series and parallel electrical circuits
- apply Ohm's Law

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating that everyday work is influenced by math and science principles, and*
- *showing how math formulas relate to the workplace*
- *allowing opportunity for the apprentice to solve mathematical problems involving pressure and density*
- *utilizing standard science fundamentals relevant to the sprinkler installer trade*
- *allowing opportunities for the apprentice to solve mathematical problems with respect to volumes and capacities*
- *defining electrical terms and principles for simple circuits*
- *allowing opportunities for the apprentice to solve mathematical problems regarding grade and hanger calculations, triangles, and 22.5 degree and 45 degree offsets*
- *demonstrating how to correctly interpret and draw orthographic and isometric piping spool drawings to specific requirements*
- *demonstrating how to effectively read symbols and comments on blueprints and drawings*
- *demonstrating how to recognize and interpret blueprint divisions, views and elevations*
- *demonstrating how to read and interpret project specifications for sprinkler applications*
- *allowing opportunity for the apprentice to draw orthographic and isometric piping drawings*
- *providing hands-on activities to ensure skill development*

~~**Piping Components**~~ (*Taught in L2 not in L1 as Harm recommended*)

~~**Water Based Systems**~~ (*Taught in L2 not in L1 as Harm recommended*)

~~**Communications**~~ (*Taught in L2 not in L1 as Harm recommended*)

Level Two — 8 weeks — 240 hours

Fire Sprinkler Systems — 81 hours

A. Hazard Classifications 8 hours

- describe fire science terms
- describe sprinkler system design
- describe hazard classifications
- explain methods of fire containment
- perform hazard assessments

B. Piping Arrangements 22 hours

- identify formulas for multiple piping offsets
- describe piping system types
- describe piping system components
- describe hand hose connections
- describe application of equal and unequal spread offsets
- explain pipe schedule systems
- explain hydraulically calculated systems
- explain special piping arrangements
- explain flushing connections
- explain pipe sleeve clearances
- design pipe schedule systems
- construct piping systems

C. Sprinkler System Drainage 5 hours

- describe drainage installation requirements
- describe drainage components for sprinkler systems
- explain grade requirements for piping systems
- explain sprinkler system drainage maintenance procedures
- install sprinkler system drains

D. Piping Support Systems (**Piping Components** *Taught in L2 not Harm L1 as recommended*) 7 hours

- describe hanger types
- describe bracing types
- describe hanger components
- describe bracing components
- explain seismic bracing requirements
- explain installation of sprinkler system supports
- perform trapeze hanger calculations
- perform rod sizing calculations

E. Sprinkler Installation 22 hours

- describe sprinkler types
- describe nozzle types
- describe sprinkler components
- describe nozzle components
- describe sprinkler installation
- describe nozzle installation
- explain sprinkler care
- explain clearance requirements for sprinklers.
- explain sprinkler selection.
- explain sprinkler spray patterns.
- explain obstruction rules.
- calculate clearances for sprinkler installation.
- install sprinklers

F. System Hydraulic Design 14 hours

- describe hydraulic calculation terminology
- describe hydraulic calculation procedures

- describe pressure loss
- explain water density requirements over a design area
- perform pressure loss calculation
- perform water demand calculation
- use hydraulic calculations for system layout

G. Access Equipment 3 hours

- describe elevated work platform types
- explain OH&S standards for elevated work platforms

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating the difference between commercial and residential applications*
- *identify NFPA and other applicable regulations used to install sprinklers*
- *demonstrate how to select and install sprinklers to applicable installation standards and manufacturer's specifications*
- *identifying location and clearance requirements for sprinklers*
- *identifying sprinklers used in specific applications and their installation requirements*
- *identifying residential sprinkler systems and their components and their installation requirements*

Water-Based Systems (*Taught in L2 not Harm L3 as recommended*) **68 hours**

A. Residential Sprinkler Systems 10 hours

- describe residential sprinkler system types
- describe water supply requirements
- describe material requirements
- explain maintenance procedures
- perform residential piping installation
- explain OH&S standards for elevated work platforms

B. Wet Sprinkler Systems 18 hours

- describe wet system types
- describe wet system components
- explain wet system testing procedures
- explain wet system maintenance
- sketch an isometric drawing of an alarm check valve
- perform trim installation on an alarm valve

C. Dry Sprinkler Systems 22 hours

- describe dry system types
- describe dry system components
- explain dry system testing procedures
- explain dry system maintenance
- explain air supply requirements for a dry system
- sketch an isometric drawing of a dry pipe valve
- perform trim installation on a dry pipe valve

D. Freeze Protection 6 hours

- describe freeze protection systems
- describe freeze protection components
- describe freeze protection for piping
- explain freeze protection system hazards
- explain freeze protection testing procedures
- service freeze protection systems

E. Stand Pipe Systems 12 hours

- describe stand pipe system types

- describe stand pipe system components
- describe stand pipe system testing requirements
- explain stand pipe system maintenance requirements

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating the use of the building code for your area*
- *explaining how an inspection is completed, and*
- *demonstrating knowledge of system components and basic operations of fire alarm panels*
- *demonstrating the safe use and function of electrical test equipment as it applies to electrical components on sprinkler systems*
- *applying NFPA standards, codes, regulations and manufacturers' requirements governing electrical components for wet sprinkler, pre-action and deluge, and clean agent systems*
- *applying NFPA and other codes and regulations governing hydraulic calculations*
- *providing opportunities for the apprentice to practice calculating piping offsets*
- *identifying the effect of different materials on fire behavior and sprinkler system design*
- *explaining the practical application of science principles on the job*

Water Supply — 51 hours

A. Public Water Supply — 6 hours

- describe public water supply
- describe water supply terminology
- explain flushing requirements
- explain types of public water supply connections

B. Private Water Supply (*Taught in L2 not Harm L3 as recommended*) — 6 hours

- describe private water supply systems
- describe private water supply storage tanks
- describe private water supply components
- describe corrosive water supplies
- explain flushing requirements
- perform tank size calculation

C. Cross Connection Control — 6 hours

- identify cross connection control categories. Describe cross connection control terminology
- describe American Water Works Association (AWWA) certification
- explain cross connection control installation procedures
- explain cross connection control testing procedures

D. Fire Department Connections — 4 hours

- describe fire department connections
- describe fire department connection components
- describe fire department connection testing
- explain fire department connection installation

E. Fire Hydrant — 15 hours

- identify hydrant tools
- describe hydrant types
- describe hydrant components
- describe hydrant operation
- describe hydrant maintenance
- perform hydrant flow test calculation

F. Underground Piping — 10 hours

- describe underground piping systems

- describe underground piping system components
- explain flushing requirements

G. Water Properties 4 hours

- describe chemical properties of water
- describe water flow terminology
- explain Venturi effect
- explain head pressure
- interpret water properties

Mentors can assist the apprentice to prepare for this section of technical training by:

- *supervising hands-on learning with this equipment, and*
- *explaining the role of this equipment*
- *identifying water supplies for fire systems as required by codes and standards*
- *identifying water supply installation requirements*
- *describing corrosive water supplies relating to fire systems*
- *identifying various types of fire hydrants and associated equipment, stand pipe and hose systems*
- *applying NFPA and other codes and regulations governing applications and installations of various types of fire hydrants and associated equipment, stand pipe hose systems and fire department connections*

Work Organization **40 hours**

A. Legislated Requirements 16 Hours

- identify environmental regulations
- describe fire protection legislation
- explain National Fire Protection Association (NFPA) standards
- explain Alberta Fire Code (AFC)
- explain Alberta Building Code (ABC)
- explain National Building Code (NBC)

B. System Layout 12 Hours

- interpret installation specifications
- interpret blueprints
- perform system layout

C. Job Site Planning 12 Hours

- identify project management requirements
- identify jobsite requirements
- identify factors that affect jobsite requirements
- describe jobsite reports
- explain work permits
- coordinate tasks with other trades

Mentors can assist the apprentice to prepare for this section of technical training by:

- *supervising hands-on learning with this equipment, and*
- *explaining the role of this equipment*
- *identifying water supplies for fire systems as required by codes and standards*
- *identifying water supply installation requirements*
- *describing corrosive water supplies relating to fire systems*
- *identifying various types of fire hydrants and associated equipment, stand pipe and hose systems*
- *applying NFPA and other codes and regulations governing applications and installations of various types of fire hydrants and associated equipment, stand pipe hose systems and fire department connections*

~~Deluge Systems~~ **(Taught in L3 not in L2 as Harm recommended)**

Level Three — 8 weeks — 240 hours

Fire Pump Units — 42 hours

A. Fire Pumps — 30 Hours

- describe fire pumps
- describe fire pump operation principles
- describe fire pump components
- describe jockey pumps
- describe pipe sizing
- explain fire pump commissioning
- explain fire pump maintenance
- explain fire pump room
- sketch fire pump room
- perform fire pump curve calculations

B. Drivers — 6 Hours

- identify driver performance
- identify power supplies
- describe drivers
- describe driver components
- describe driver operation
- explain driver-to-pump alignment
- perform water horsepower calculation

C. Controllers — 6 Hours

- describe controllers
- describe controller operation
- describe controller components
- explain sensing line installations

Mentors can assist the apprentice to prepare for this section of technical training by:

- *identifying the requirements for the use of a fire pump*
- *identifying various types of fire pumps and associated equipment*
- *applying pump sizing information*
- *applying NFPA and other applicable codes and regulations governing the installation, testing and maintenance of fire pumps*

Specialty Hazard Systems — 101 hours

A. Chemical Systems — 6 Hours

- describe chemical systems
- describe dry chemical system components
- describe wet chemical system components
- describe operations of dry chemical systems
- describe wet chemical systems
- explain maintenance of chemical systems

B. Extinguishers — 6 Hours

- describe fire extinguisher classes
- describe fire extinguisher components
- explain fire extinguisher inspection

- explain fire extinguisher maintenance

C. Foam Systems 15 Hours

- describe foam systems.
- describe foam concentrates.
- describe foam system discharge devices.
- explain foam system component installation
- explain commissioning of foam systems
- explain operation of a foam system

D. Clean Agent Systems 10 Hours

- describe clean agent systems
- describe clean agent system components
- describe clean agent system operation
- explain clean agent system testing requirements

E. Carbon Dioxide Systems 6 Hours

- describe carbon dioxide systems
- describe carbon dioxide system components
- describe carbon dioxide system operations
- explain carbon dioxide system testing

F. Pre-Action Systems 22 Hours

- describe pre-action systems
- describe pre-action system components
- describe pre-action system operations
- explain pre-action systems testing requirements
- perform trim installation on a pre-action valve

G. **Deluge Systems** (*Taught in L3 not Harm L2 as recommended*) 20 Hours

- describe deluge systems
- describe deluge system components
- describe deluge system operation
- describe fixed water spray systems
- describe outside exposure systems
- perform trim installation on a deluge valve

H. Water Mist Systems 10 Hours

- describe water mist systems
- describe water mist system components
- describe water mist system operations
- describe hybrid systems
- describe hybrid system components
- describe hybrid system operation

I. Corrosion Inhibiting 6 Hours

- describe piping corrosion
- describe corrosion inhibiting system devices
- explain corrosion inhibiting methods

Mentors can assist the apprentice to prepare for this section of technical training by:

- *applying NFPA and other codes and regulations governing the application and installation of dry and wet chemical, fixed water spray, foam extinguishing, outside exposure, carbon dioxide, pre-action, deluge, clean agent and water mist, and air sampling and spark detection systems*
- *explaining the various foam extinguishing systems and components*
- *applicable codes and regulations governing the installation of piping for sensing lines*
- *demonstrating the installation of these systems, and*

- *assisting to choose the best product for job application*

Inspection, Testing and Maintenance — 36 hours

A. Inspect Fire Protection Systems — 10 Hours

- identify owner's responsibilities for disarming systems
- identify sprinkler systems installer's responsibilities for disabling systems
- describe required testing procedures
- describe tools used for testing
- describe equipment used for testing
- describe types of inspection report documents
- describe inspection report terminology
- describe report document preparation
- perform a fire protection system inspection

B. Fire Protection System Maintenance — 10 Hours

- identify owner's responsibilities for sprinkler systems
- identify sprinkler systems installer's legal responsibilities
- describe tools required for system maintenance
- describe equipment required for system maintenance
- describe routine maintenance procedures

C. Deficiencies — 16 Hours

- describe system deficiencies
- describe system impairments
- describe sprinkler system failures
- describe sprinkler system repair procedures

Mentors can assist the apprentice to prepare for this section of technical training by:

- *identifying the legal responsibilities for parties involved in owning and maintaining a fire protection system*
- *applying the Saskatchewan Building and Fire code and their and their applicable STANDATA in reference to sprinkler systems*
- *applying NFPA, other codes, regulations and manufacturers' requirements governing inspection, testing and maintenance of water based systems*
- *applying best business practices for completing reports to industry standards*

Detection and Signal Initiating Devices — 39 Hours

A. Actuating Devices — 9 Hours

- describe actuating devices
- describe actuating device components
- explain device actuation

B. Spark Detection Systems — 3 Hours

- describe spark detection systems
- describe spark detection system components
- describe spark detection system operation

C. Air Sampling Systems — 6 Hours

- describe air sampling systems
- describe air sampling system components
- explain operation of air sampling systems

D. Signal Initiating Devices 7 Hours

- describe signal initiating devices
- describe signal initiating device components
- explain operation of a signal initiating device

E. Fire Alarm Panels 8 Hours

- describe fire alarm panels
- describe fire alarm panel terminology
- explain fire alarm devices
- explain fire alarm panel bypassing procedures
- explain fire alarm panel reset procedures
- operate fire alarm panels

F. Electrical Test Equipment 6 Hours

- identify electrical test equipment
- describe electrical test equipment functions
- use electrical test equipment

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating the use of the building code for your area*
- *explaining how an inspection is completed, and*
- *demonstrating knowledge of system components and basic operations of fire alarm panels*
- *demonstrating the safe use and function of electrical test equipment as it applies to electrical components on sprinkler systems*
- *applying NFPA standards, codes, regulations and manufacturers' requirements governing electrical components for wet sprinkler, pre-action and deluge, and clean agent systems*
- *applying NFPA and other codes and regulations governing hydraulic calculations*
- *providing opportunities for the apprentice to practice calculating piping offsets*
- *identifying the effect of different materials on fire behavior and sprinkler system design*
- *explaining the practical application of science principles on the job*

Emerging Technology, Communication and Apprenticeship 22 Hours

A. Estimation 10 Hours

- define scope of work
- describe contract purpose
- explain estimating principles
- explain contract change order process
- perform a jobsite estimate

B. Building Information Modelling 6 Hours

- describe building information modelling
- explain building information modelling functions
- use building information modelling software

C. Communication Techniques (*Taught in L3 not Harm L1 as recommended*) 3 Hours

- describe professional expectations
- describe effective communications skills
- describe conflict resolution processes
- use communication techniques

D. Workplace Coaching Skills 1 Hour

- describe the process for coaching an apprentice

E. Alberta's Industry Network 1 Hour

- describe Alberta's Apprenticeship and Industry Training system
- describe the roles and responsibilities of the Alberta Apprenticeship and Industry Training Board, the Government of Alberta and post-secondary institutions
- 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

- identify Red Seal products used to develop Interprovincial examinations
- use Red Seal products to prepare for an Interprovincial examination

Mentors can assist the apprentice to prepare for this section of technical training by:

- *locating specific information in a set of blueprints and draw piping for the appropriate installation*
- *compiling a complete material list and estimate material*
- *identify the purpose and implementation of a contract*
- *providing opportunities for the apprentice to estimate the labour cost*
- *displaying coaching skills*
- *recognizing project management principles*
- *applying Saskatchewan Safety legislation and accident reporting in the workplace*
- *identifying blueprint symbols and their use, and*
- *explaining how blueprints are drafted, and used on the job*

~~**Private Water Supply**~~ (Taught in L2 not in Level 3 as Harm Recommended)

Red font and ~~Crossed out~~ font topics deviate from harmonized recommendations

APPENDIX A: POST HARMONIZATION TRAINING PROFILE CHART

This chart which outlines the finalized model for SATCC technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

Implementation for harmonization took place progressively.

SATCC Level One	Hours	Pan-Canadian Harmonized Level One
		In Context
		Signal-Initiating Devices (installs)*
Workplace Safety & Rigging	24	Safety Related Functions
		Organizes Work
		~~Communications~~
Tools, Equipment and Materials	92	Tools and Equipment
Metal Fabrication	46	Pipe, Tube and Fittings (prepare) Pipe, Tube and Fittings (installs) ~~Piping Components~~ ~~Water-Based Systems***~~
Drawing and Specification	30	
Calculations and Science	48	
	240	

SATCC Level Two	Hours	Pan-Canadian Harmonized Level Two
		In Context
		Safety Related Functions
		Tools and Equipment
		Pipe, Tube and Fittings (Prepare)
		Pipe, Tube and Fittings (Installs)
		Water-Based Systems
Work Organization	40	Organizes Work (In-Context)
Water Supply	51	Underground Water Supply
		Commissions Systems
Fire Sprinkler Systems	81	Fire Department Connections
		Detection Devices
		Signal-Initiating Devices (Installs) (~~Deluge Systems~~)
		Piping Components
Water Based Systems	68	Water Based Systems
		Private Water Supply Systems**
	240	

SATCC Level Three	Hours	Pan-Canadian Harmonized Level Three
		In Context
		Safety-Related Functions
		Tools and Equipment
		Organizes Work
		Pipe, Tube and Fittings (installs)
		Signal-Initiating Devices (Installs)
Emerging Technology, Communication and Apprenticeship	22	Organizes Work
		Communication and Mentoring
Fire Pump Units	42	Fire Pump Units
Specialty Hazard Systems	101	Specialty Fire Suppression Systems (Deluge Systems)
		~~Private Water Supply Systems**~~
		~~Water Based Systems***~~
		Commissions Systems
Detection and Signal Initiating Devices	39	Detection Devices (Installs)
Inspection, Testing and Maintenance	36	Inspection, Testing and Maintenance
	240	

Red and ~~crossed out~~ topics deviate from Harmonized Recommendations