

SPRINKLER FITTER

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PLAN OF TRAINING

Atlantic Apprenticeship Curriculum Standard

Sprinkler Fitter

December 2025



**Government of Newfoundland and Labrador
Department of Education and Early Childhood Development
Apprenticeship and Trades Certification Division**

Approved by:

A handwritten signature in black ink, appearing to read "Lana Hanuman".

Chairperson, Provincial Apprenticeship and Certification Board

Date: December 15th, 2025

Atlantic Apprenticeship Curriculum Standard

Sprinkler Fitter

Preface

This Atlantic Apprenticeship Curriculum Standard is intended to assist instructional staff in the design and delivery of technical, in-class training in support of the Sprinkler Fitter program.

This document contains all the technical training elements required to complete the Sprinkler Fitter apprenticeship program and has been developed based on the Red Seal Occupational Standard (RSOS). The RSOS can be found on the Red Seal website (www.red-seal.ca).

Implementation of this AACS for Apprenticeship training is outlined in the following table.

Level	Implementation Effective
Level 1	2026-2027
Level 2	2027-2028
Level 3	2028-2029
Level 4	2029-2030

The above implementation schedule was current at time of printing. Please confirm with Apprenticeship Staff prior to commencing training.

Granting of credit or permission to challenge level examinations for pre-employment or pre-apprenticeship training for the Sprinkler Fitter will be based on the content outlined in this standard. Training providers must contact their provincial apprenticeship authority for more information on the process and requirements for determining eligibility for credit towards an apprenticeship program.

Acknowledgements

The development of the Atlantic Apprenticeship Curriculum Standard (AACS) is an initiative of the Atlantic Apprenticeship Council's Atlantic Apprenticeship Harmonization Partnership (AAHP) through the Atlantic Workforce Partnership. The AAHP was created in 2014 and funded through contributions from Employment and Social Development Canada and the four Atlantic Provinces. In 2023, Phase III of the AAHP concluded and transitioned to a maintenance office through the Atlantic Provinces.

The Atlantic Apprenticeship Council appreciates the financial support provided by Employment and Social Development Canada (ESDC) to assist in the completion of the three phases of the Atlantic Apprenticeship Harmonization project.

The Atlantic Apprenticeship Council wishes to acknowledge the contributions of the industry and instructional representatives on the Atlantic Trade Advisory Committee (ATAC) who participated in the development of this document.

Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this document. Without their dedication to quality apprenticeship training, this document could not have been produced.

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User Guide

Atlantic Apprenticeship Curriculum Standards (AACS) are developed based on trade specific national occupational standards, such as the Red Seal Occupational Standard (RSOS), and industry consultation. This document represents the minimum content to be delivered as part of the harmonized Atlantic program for the Bricklayer trade.

The AACSs are deliberately constructed for ease of use and flexibility of structure to adapt to all delivery requirements. They detail units of training, unit outcomes and objectives. They do not impose a delivery model or teaching format.

Jurisdictions and/or training providers will select and develop delivery materials and techniques that accommodate a variety of learning styles and delivery patterns. The AACS does not dictate study materials, textbooks or learning activities to be used in delivery.

The document includes a Level Structure to facilitate mobility for apprentices moving from one jurisdiction to another.

Structure

The content of the AACS is divided into units. Unit codes are used as a means of identification and are not intended to convey the order of delivery. It is at the discretion of the training provider to deliver the content in the required logical sequence of delivery within the level. Jurisdictions are free to deliver units one at a time or concurrently within a level, provided all outcomes are met.

The Learning Outcomes describe what the apprentice should know or be able to do at the end of training. Wording of the Learning Outcomes, “Demonstrate knowledge of...” acknowledges the broad spectrum of ways in which knowledge can be assessed (i.e., practical projects, multiple choice testing, presentations, etc.) by instructional staff within the training.

Summative evaluation will be through a multiple-choice level exam administered through the jurisdictional Apprenticeship Authority.

User Guide (continued)

The Red Seal Occupational Standard (RSOS) to AACS comparison chart outlines the relation between each RSOS sub-task and the AACS units. RSOS references have also been detailed in each unit to highlight the direct link between the unit and relevant sub-tasks in the RSOS.

In the Level Structure section, the document identifies suggested hours to provide an indication of the time it should take to cover the material in the unit and is provided as a guide only. Adjustments to the suggested hours for each unit may be required to account for rate of apprentice learning, statutory holidays, storm days, registration, and examinations. These suggested hours detailed for each unit will represent both theory and practical training (if relevant) and for consistency will be based on a standard of 30 hours per week of training. The true length of time required to deliver an outcome successfully will depend upon the learning activities and teaching methods used.

There are two types of objectives found in the AACS document: theoretical and practical.

The theoretical objectives represent the material that is to be covered during the technical training to convey the required knowledge to the apprentice.

The practical objectives represent the tasks or skills that have been deemed by the Atlantic Trade Advisory Committee as critical for the apprentices to receive exposure to while attending technical training. For example, exposure could be done through instructor demonstration or individual or group performance of the skill or task. Training providers are encouraged to use practical demonstration and opportunities for hands-on learning whenever possible. Practical objectives are not intended to replace the on-the-job training component of the apprentice's program or to mirror or replace the logbook skills that are to be taught and evaluated in the workplace.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided. The AACS should be used in conjunction with the national standard for the trade – the Red Seal Occupational Standard (RSOS).

Glossary of Terms

These definitions are intended as a guide to how language is used in the document.

Adjust	To put in good working order; regulate; bring to a proper state or position.
Application	The use to which something is put and/or the circumstance in which an individual would use it.
Characteristic	A feature that helps to identify, tell apart or describe recognizably, a distinguishing mark or trait.
Component	A part that can be separated from or attached to a system, a segment or unit.
Define	To state the meaning of (a word, phrase, etc.).
Describe	To give a verbal account of; talk about in detail.
Explain	To make plain or clear; illustrate; rationalize.
Identify	To point out or name objectives or types.
Interpret	To translate information from observation, charts, tables, graphs, and written material.
Maintain	To keep in a condition of good repair or efficiency.
Method	A means or manner of doing something that has procedures attached to it.
Operate	How an object works; to control or direct the functioning of.
Procedure	A prescribed series of steps taken to accomplish an end.
Purpose	The reason for which something exists or is done, made or used.

Glossary of Terms (continued)

Service	Routine inspection and replacement of worn or deteriorating parts.
	An act or business function provided to a customer in the course of an individual's profession (e.g., haircut).
Technique	Within a procedure, the manner in which technical skills are applied.
Test	v. To subject to a procedure that ascertains effectiveness, value, proper function, or other quality.
	n. A way of examining something to determine its characteristics or properties, or to determine whether it is working correctly.

Essential Skills / Skills for Success

Through extensive research, the Government of Canada and other national and international agencies have identified and validated key essential skills for the workplace. These skills are used in nearly every job and at different levels of complexity. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change. In response to the evolving labour market and changing skill needs, in 2021 the Government of Canada launched a new **Skills for Success** model: QR code #1 or web link below.

<https://www.canada.ca/en/services/jobs/training/initiatives/skills-success/new-model.html>

The Employment and Social Development Canada (ESDC) website provides information about the Skills for Success, including:

- a brief description of the skill;
- why the skill is important;
- tools to help you improve on each of the skills, and
- videos to help you improve on each of the skills.

This information can be found at: QR code #2 or web link below.

<https://www.jobbank.gc.ca/essentialskills>

Skills for Success training tools can be found at: QR code #3 or web link below.

<https://www.canada.ca/en/services/jobs/training/initiatives/skills-success/tools.html>

The development and improvement of these Skills for Success is inherent throughout the apprenticeship training program as apprentices work towards achieving journey person status.



#1 The new Skills for Success model – Canada.ca



#2 Explore careers by essential skills – Job Bank



#3 Assessment and training tools – Canada.ca

Level Structure

Level 1 – 6 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SSI-100	Safety	12	20
SSI-105	Tools and Equipment	12	27
SSI-110	Access Equipment	6	29
SSI-115	Rigging, Hoisting and Lifting I	3	31
SSI-120	Drawings I	12	33
SSI-125	Trade-Related Documents	3	35
SSI-130	Trade-Related Math I	9	36
SSI-135	Steel Pipe, Tube and Fittings	18	37
SSI-140	Non-Metallic Pipe, Tube and Fittings	6	40
SSI-145	Copper Pipe, Tube and Fittings	3	42
SSI-150	Sprinkler Heads and Nozzles I	30	44
SSI-155	Hangers, Supports, Restraints and Bracing	15	47
SSI-160	Pipe Design and Installation I	18	50
SSI-165	Soldering, Brazing and Oxy-Fuel Cutting	6	54
SSI-170	Wet Pipe Sprinkler Systems	18	56
SSI-175	Antifreeze Sprinkler Systems	3	59
MENT-700	Mentoring I	6	61

Level 2 – 6 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SSI-200	Pipe Design and Installation II	18	64
SSI-205	Drawings II	18	66
SSI-210	Rigging, Hoisting and Lifting II	9	69
SSI-215	Dry Pipe Sprinkler Systems	21	72
SSI-220	System Drainage I	9	74
SSI-225	Seismic Protection	12	76
SSI-230	Sprinkler Heads and Nozzles II	24	78
SSI-235	Trade-Related Math II	9	81
SSI-240	Trade-Related Science I	6	82
SSI-245	Detection Devices	9	83
SSI-250	Signal-Initiating Devices	9	85
SSI-255	Deluge and Preaction Systems	30	87
SSI-600	Principles of Electricity	6	89

Level Structure (continued)

Level 3 – 6 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SSI-300	Portable Fire Extinguishers	6	92
SSI-305	Fire Pumps and Controllers	24	94
SSI-310	Private Water Supply Systems	15	97
SSI-315	Drawings III	15	100
SSI-320	Commissioning Water Supply Systems	24	103
SSI-325	System Drainage II	3	105
SSI-330	Commissioning Fire Protection Systems	18	107
SSI-335	Standpipe and Hose Systems	21	109
SSI-340	Cross-Connection Control	6	111
SSI-345	Water Supply, Hydrants and Fire Department Connections	30	113
SSI-350	Trade-Related Math III	9	117
SSI-355	Trade-Related Science II	9	118

Level 4 – 6 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SSI-400	Commissioning Specialty Fire Suppression Systems	18	120
SSI-405	Wet and Dry Chemical Extinguishing Systems	6	122
SSI-410	Water Mist and Hybrid Extinguishing Systems	6	124
SSI-415	Foam Extinguishing Systems	18	126
SSI-420	Carbon Dioxide Extinguishing Systems	6	128
SSI-425	Clean Agent Extinguishing Systems	6	130
SSI-430	Specialty Detection Devices	9	132
SSI-435	Fire Protection Systems Inspection, Testing and Maintenance	39	134
SSI-440	Specialty Fire Suppression Systems Inspection, Testing and Maintenance	18	138
SSI-445	Modifying Existing Systems	9	141
SSI-450	Job Planning	6	143
SSI-455	Continuous Learning	3	146
MENT-701	Mentoring II	6	148
SSI-470	Program Review	30	149

2025 RSOS Sub-Task to AACS Unit Comparison

RSOS Sub-Task		AACS Unit	
Task 1 – Performs safety-related functions.			
1.01	Maintains safe work environment.	SSI-100	Safety
1.02	Uses personal protective equipment (PPE) and safety equipment.	SSI-100	Safety
1.03	Performs lock-out and tag-out procedures.	SSI-100	Safety
1.04	Performs work in confined space.	SSI-100	Safety
1.05	Participates in healthy and respectful workplace practices.	SSI-100	Safety
Task 2 – Uses and maintains tools and equipment.			
2.01	Uses hand and portable power tools.	SSI-105	Tools and Equipment
2.02	Uses portable and stationary power tools.	SSI-105	Tools and Equipment
2.03	Uses measuring and testing equipment.	SSI-105	Tools and Equipment
2.04	Uses access equipment.	SSI-110	Access Equipment
2.05	Uses rigging, hoisting and lifting equipment.	SSI-115	Rigging, Hoisting and Lifting I
		SSI-210	Rigging, Hoisting and Lifting II
2.06	Uses soldering and brazing equipment.	SSI-165	Soldering, Brazing and Oxy-Fuel Cutting
Task 3 – Organizes work			
3.01	Interprets codes, standards, regulations and procedures.	SSI-100	Safety
		SSI-115	Rigging, Hoisting and Lifting I
		SSI-125	Trade-Related Documents
		SSI-150	Sprinkler Heads and Nozzles I
		SSI-155	Hangers, Supports, Restraints and Bracing
		SSI-160	Pipe Design and Installation I
		SSI-170	Wet Pipe Sprinkler Systems
		SSI-175	Antifreeze Sprinkler Systems
		SSI-200	Pipe Design and Installation II
		SSI-210	Rigging, Hoisting and Lifting II
		SSI-215	Dry Pipe Sprinkler Systems
		SSI-220	System Drainage I
		SSI-225	Seismic Protection
		SSI-230	Sprinkler Heads and Nozzles II
		SSI-245	Detection Devices
		SSI-250	Signal-Initiating Devices
		SSI-255	Deluge and Preaction Systems
		SSI-305	Fire Pumps and Controllers
		SSI-310	Private Water Supply Systems

RSOS Sub-Task		AACS Unit	
		SSI-320	Commissioning Water Supply Systems
		SSI-325	System Drainage II
		SSI-330	Commissioning Fire Protection Systems
		SSI-340	Cross-Connection Control
		SSI-335	Standpipe and Hose Systems
		SSI-345	Water Supply, Hydrants and Fire Department Connections
		SSI-400	Commissioning Specialty Fire Suppression Systems
		SSI-405	Wet and Dry Chemical Extinguishing Systems
		SSI-410	Water Mist and Hybrid Extinguishing Systems
		SSI-415	Foam Extinguishing Systems
		SSI-420	Carbon Dioxide Extinguishing Systems
		SSI-425	Clean Agent Extinguishing Systems
		SSI-430	Specialty Detection Devices
		SSI-435	Fire Protection Systems Inspection, Testing and Maintenance
		SSI-440	Specialty Fire Suppression Systems Inspection, Testing and Maintenance
		SSI-445	Modifying Existing Systems
3.02	Uses drawings and specifications.	SSI-120	Drawings I
		SSI-205	Drawings II
		SSI-315	Drawings III
3.03	Uses documentation and reference material.	SSI-125	Trade-Related Documents
		SSI-150	Sprinkler Heads and Nozzles I
		SSI-170	Wet Pipe Sprinkler Systems
		SSI-200	Pipe Design and Installation II
		SSI-215	Dry Pipe Sprinkler Systems
		SSI-225	Seismic Protection
		SSI-230	Sprinkler Heads and Nozzles II
		SSI-245	Detection Devices
		SSI-250	Signal-Initiating Devices

RSOS Sub-Task		AACs Unit	
		SSI-255	Deluge and Preaction Systems
		SSI-305	Fire Pumps and Controllers
		SSI-310	Private Water Supply Systems
		SSI-320	Commissioning Water Supply Systems
		SSI-330	Commissioning Fire Protection Systems
		SSI-335	Standpipe and Hose Systems
		SSI-340	Cross-Connection Control
		SSI-345	Water Supply, Hydrants and Fire Department Connections
		SSI-400	Commissioning Specialty Fire Suppression Systems
		SSI-405	Wet and Dry Chemical Extinguishing Systems
		SSI-410	Water Mist and Hybrid Extinguishing Systems
		SSI-415	Foam Extinguishing Systems
		SSI-420	Carbon Dioxide Extinguishing Systems
		SSI-425	Clean Agent Extinguishing Systems
		SSI-430	Specialty Detection Devices
		SSI-435	Fire Protection Systems Inspection, Testing and Maintenance
		SSI-440	Specialty Fire Suppression Systems Inspection, Testing and Maintenance
3.04	Plans job tasks and procedures.	SSI-160	Pipe Design and Installation I
		SSI-200	Pipe Design and Installation II
		SSI-315	Drawings III
		SSI-450	Job Planning
3.05	Prepares work site.	SSI-160	Pipe Design and Installation I
		SSI-200	Pipe Design and Installation II
		SSI-450	Job Planning
3.06	Performs layout of systems.	SSI-160	Pipe Design and Installation I
		SSI-200	Pipe Design and Installation II
		SSI-310	Private Water Supply Systems

RSOS Sub-Task		AACs Unit	
		SSI-405	Wet and Dry Chemical Extinguishing Systems
		SSI-410	Water Mist and Hybrid Extinguishing Systems
		SSI-415	Foam Extinguishing Systems
		SSI-420	Carbon Dioxide Extinguishing Systems
		SSI-425	Clean Agent Extinguishing Systems
Task 4 – Commission systems.			
4.01	Commissions water supply systems.	SSI-320	Commissioning Water Supply Systems
4.02	Commissions fire protection systems.	SSI-330	Commissioning Fire Protection Systems
4.03	Commissions specialty fire suppression systems.	SSI-400	Commissioning Specialty Fire Suppression Systems
Task 5 – Continuous learning.			
5.01	Upskills in new trade practices and procedures.	SSI-455	Continuous Learning
5.02	Upskills in emerging technologies.	SSI-455	Continuous Learning
Task 6 – Uses communication and mentoring techniques.			
6.01	Uses communication techniques.	MENT-700	Mentoring I
		MENT-701	Mentoring II
6.02	Uses mentoring techniques.	MENT-700	Mentoring I
		MENT-701	Mentoring II
Task 7 – Installs underground water supplies.			
7.01	Supervises trenching and backfilling (NCC).	SSI-345	Water Supply, Hydrants and Fire Department Connections
7.02	Installs underground piping and components (NCC).	SSI-345	Water Supply, Hydrants and Fire Department Connections
7.03	Flushes underground systems.	SSI-345	Water Supply, Hydrants and Fire Department Connections
Task 8 – Installs fire pump units.			
8.01	Determines location of pumps, drivers, controllers and components.	SSI-305	Fire Pumps and Controllers
8.02	Installs pumps, drivers, controllers and components.	SSI-305	Fire Pumps and Controllers

RSOS Sub-Task		AACS Unit	
Task 9 – Installs fire department connections.			
9.01	Determines location, size and type of fire department connections.	SSI-345	Water Supply, Hydrants and Fire Department Connections
9.02	Installs fire department connections, piping and components.	SSI-345	Water Supply, Hydrants and Fire Department Connections
Task 10 – Installs private water supply systems.			
10.01	Installs water tanks.	SSI-310	Private Water Supply Systems
10.02	Installs related equipment.	SSI-310	Private Water Supply Systems
Task 11 – Prepares pipe, tube and fittings for installation.			
11.01	Cuts pipe and tube.	SSI-160	Pipe Design and Installation I
11.02	Bends pipe and tube.	SSI-160	Pipe Design and Installation I
11.03	Threads pipe.	SSI-160	Pipe Design and Installation I
11.04	Grooves pipe.	SSI-160	Pipe Design and Installation I
11.05	Drills pipe and tube.	SSI-160	Pipe Design and Installation I
11.06	Grinds pipe.	SSI-160	Pipe Design and Installation I
11.07	Prepares fittings.	SSI-160	Pipe Design and Installation I
Task 12 – Installs pipe, tube and fittings.			
12.01	Installs steel pipe, tube and fittings.	SSI-135	Steel Pipe, Tube and Fittings
12.02	Installs non-metallic pipe, tube and fittings.	SSI-140	Non-metallic Pipe, Tube and Fittings
12.03	Installs copper pipe, tube and fittings.	SSI-145	Copper Pipe, Tube and Fittings
		SSI-165	Soldering, Brazing and Oxy-Fuel Cutting
12.04	Paints and labels pipe and tube and fittings.	SSI-160	Pipe Design and Installation I
		SSI-200	Pipe Design and Installation II
Task 13 – Installs piping components.			
13.01	Selects sprinklers and nozzles.	SSI-150	Sprinkler Heads and Nozzles I
		SSI-230	Sprinkler Heads and Nozzles II
13.02	Installs sprinklers and nozzles.	SSI-150	Sprinkler Heads and Nozzles I
		SSI-230	Sprinkler Heads and Nozzles II
13.03	Installs pipe sleeves.	SSI-160	Pipe Design and Installation I
		SSI-200	Pipe Design and Installation II
13.04	Installs hangers, supports, restraints and bracing.	SSI-155	Hangers, Supports, Restraints and Bracing
		SSI-225	Seismic Protection
		SSI-335	Standpipe and Hose Systems
13.05	Installs cross-connection control assemblies.	SSI-340	Cross-Connection Control
13.06	Installs system drainage.	SSI-220	System Drainage I
		SSI-325	System Drainage II

RSOS Sub-Task		AACS Unit	
Task 14 – Installs water-based systems.			
14.01	Installs wet pipe systems.	SSI-170	Wet Pipe Sprinkler Systems
14.02	Installs dry pipe systems.	SSI-215	Dry Pipe Sprinkler Systems
14.03	Installs preaction/deluge systems.	SSI-255	Deluge and Preaction Systems
14.04	Installs antifreeze systems.	SSI-175	Antifreeze Sprinkler Systems
14.05	Installs foam systems.	SSI-415	Foam Extinguishing Systems
14.06	Installs water mist and hybrid systems.	SSI-410	Water Mist and Hybrid Extinguishing Systems
14.07	Installs standpipe systems.	SSI-335	Standpipe and Hose Systems
14.08	Modifies existing system.	SSI-445	Modifying Existing Systems
Task 15 – Installs specialty fire suppression systems.			
15.01	Installs dry and wet chemical, clean agent and carbon dioxide systems.	SSI-405	Wet and Dry Chemical Extinguishing Systems
		SSI-420	Carbon Dioxide Extinguishing Systems
		SSI-425	Clean Agent Extinguishing Systems
15.02	Installs portable extinguishers.	SSI-300	Portable Fire Extinguishers
Task 16 – Installs detection devices.			
16.01	Installs wet and dry pilot lines.	SSI-245	Detection Devices
16.02	Installs heat-actuated devices (HADs) (NCC).	SSI-245	Detection Devices
16.03	Installs spark detection systems (NCC).	SSI-430	Specialty Detection Devices
16.04	Installs air sampling systems (NCC).	SSI-430	Specialty Detection Devices
16.05	Installs electrical detection systems (NCC).	SSI-245	Detection Devices
		SSI-430	Specialty Detection Devices
Task 17 – Installs signal-initiating devices.			
17.01	Installs alarm-initiating devices.	SSI-250	Signal-Initiating Devices
17.02	Installs supervisory-initiating devices.	SSI-250	Signal-Initiating Devices
Task 18 – Inspects and tests fire protection systems.			
18.01	Performs scheduled fire protection system inspections.	SSI-435	Fire Protection Systems Inspection, Testing and Maintenance
18.02	Performs scheduled fire protection system tests.	SSI-435	Fire Protection Systems Inspection, Testing and Maintenance
Task 19 – Maintains and repairs fire protection systems.			
19.01	Troubleshoots fire protection systems.	SSI-435	Fire Protection Systems Inspection, Testing and Maintenance

RSOS Sub-Task		AACs Unit	
19.02	Repairs fire protection system deficiencies.	SSI-435	Fire Protection Systems Inspection, Testing and Maintenance
19.03	Performs scheduled maintenance of fire protection systems.	SSI-435	Fire Protection Systems Inspection, Testing and Maintenance
Task 20 – Inspection and testing of fire suppression systems and equipment.			
20.01	Performs scheduled fire suppression system inspections.	SSI-440	Specialty Fire Suppression Systems Inspection, Testing and Maintenance
20.02	Performs scheduled fire suppression system and equipment tests.	SSI-440	Specialty Fire Suppression Systems Inspection, Testing and Maintenance
20.03	Performs scheduled inspections of portable fire extinguishers.	SSI-300	Portable Fire Extinguishers
Task 21 – Maintenance and repair of fire suppression systems and equipment.			
21.01	Troubleshoots fire suppression systems and equipment.	SSI-440	Specialty Fire Suppression Systems Inspection, Testing and Maintenance
21.02	Repairs deficiencies of fire suppression systems and equipment.	SSI-440	Specialty Fire Suppression Systems Inspection, Testing and Maintenance
21.03	Performs scheduled maintenance of fire suppression systems and equipment.	SSI-440	Specialty Fire Suppression Systems Inspection, Testing and Maintenance

Level 1

Unit Code	Title	Suggested Hours	Page
SSI-100	Safety	12	20
SSI-105	Tools and Equipment	12	27
SSI-110	Access Equipment	6	29
SSI-115	Rigging, Hoisting and Lifting I	3	31
SSI-120	Drawings I	12	33
SSI-125	Trade-Related Documents	3	35
SSI-130	Trade-Related Math I	9	36
SSI-135	Steel Pipe, Tube and Fittings	18	37
SSI-140	Non-Metallic Pipe, Tube and Fittings	6	40
SSI-145	Copper Pipe, Tube and Fittings	3	42
SSI-150	Sprinkler Heads and Nozzles I	30	44
SSI-155	Hangers, Supports, Restraints and Bracing	15	47
SSI-160	Pipe Design and Installation I	18	50
SSI-165	Soldering, Brazing and Oxy-Fuel Cutting	6	54
SSI-170	Wet Pipe Sprinkler Systems	18	56
SSI-175	Antifreeze Sprinkler Systems	3	59
MENT-700	Mentoring I	6	61

SSI-100

Safety

Learning Outcomes:

- Demonstrate knowledge of safe work practices and processes to maintain safe work environment.
- Demonstrate knowledge of documentation, training, certification and regulatory requirements pertaining to workplace safety.
- Demonstrate knowledge of training, certification requirements and regulatory requirements for confined space entry.
- Demonstrate knowledge of procedures to monitor and secure confined spaces.
- Demonstrate knowledge of personal protective equipment (PPE), safety equipment, their applications, maintenance, and procedures for use.
- Demonstrate knowledge of personal health and well-being.
- Demonstrate knowledge of techniques to manage health and wellness and promote health and wellness in others.
- Demonstrate knowledge of professionalism and professional ethics.
- Demonstrate knowledge regarding value of diversity, equity, inclusion and belonging in workplace.
- Demonstrate knowledge of environmental regulations and considerations to maintain safe work environment.

2025 Red Seal Occupational Standard Reference:

- 1.01 Maintains safe work environment.
- 1.02 Uses personal protective equipment (PPE) and safety equipment.
- 1.03 Performs lock-out and tag-out procedures.
- 1.04 Performs work in confined space.
- 1.05 Participates in healthy and respectful workplace practices.
- 3.01 Interprets codes, standards, regulations and procedures.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with safe work practices, personal protective (PPE) and safety equipment, confined space procedures and respectful workplace practices.
2. Interpret codes, standards and regulations for safety equipment and for confined space entry.

3. Describe federal, jurisdictional and municipal regulations and practices related to the safe handling, storage, transport and disposal or recycling of hazardous products.
4. Describe jurisdictional and company procedures and responsibilities for emergency response.
5. Identify training and certification requirements for confined space entry.
6. Identify classes of fires and describe procedures to select and use fire extinguishing equipment.
7. Interpret information about safety found on drawings and specifications.
8. Interpret information about PPE and safety equipment found in on-site and manufacturers' documents.
9. Identify common workplace hazards and causes of accidents and describe procedures to mitigate and reduce potential risks.
 - i) workplace hazards
 - personal
 - confined space
 - working at heights
 - lifting and ergonomics
 - trenches
 - workplace
 - hot work
 - lock-out/tag-out
 - electrical/high voltage
 - rotating equipment
 - barricades and flagging
 - radiation
 - extreme temperatures
 - noise
 - vibration
 - trenching and shoring
 - poor housekeeping
 - overhead hazards
 - tripping hazards
 - falling hazards
 - stress
 - pinch points
 - heavy objects
 - exposed fibres
 - burrs

- sparks
 - sharp edges
 - burns
 - systems under pressure
 - other work being performed in the area
 - access equipment
 - ladders
 - scaffolding
 - swing stages
 - power-elevated work platforms
 - environmental
 - hazardous materials
 - silica and asbestos hazards
 - quality of air
 - fumes
 - system drainage and disposal requirements
 - dust
 - ii) safe work procedures
 - aerial lift training
 - fall arrest protection
 - hot work
 - confined space
 - travel restraint
 - using PPE
 - following site-specific requirements
10. Describe safe work practices pertaining to the use of safety equipment.
11. Describe the fundamentals of site housekeeping and procedures to inspect the work environment.
12. Identify and interpret workplace health and safety documentation and jurisdictional health and safety regulations.
- i) documentation
 - field-level risk assessment (FLRA)
 - pre-safety inspection (PSI)
 - lift plans
 - hazard assessments (HA)
 - near miss and accident reports
 - equipment and PPE inspections
 - tool box talk
 - safety meeting minutes
 - Workplace Hazardous Material Information System (WHMIS) documents
 - Globally Harmonized System (GHS) documents

- ii) federal regulations
 - WHMIS/GHS
 - Transportation of Dangerous Goods
 - iii) provincial/territorial regulations
 - Occupational Health and Safety
 - iv) municipal regulations
 - v) confined space procedures and documentation
 - location
 - work description
 - hazard control
 - atmosphere testing
 - rescue plan
 - site-specific and company policies
13. Describe the procedures used to develop workplace safety analysis and assessments and document workplace hazards.
14. Identify types of PPE and describe their characteristics and applications.
- i) basic PPE
 - hard hats
 - safety glasses
 - gloves
 - face shields
 - dust masks
 - respirators
 - hearing protection
 - safety boots
 - high-visibility vests
 - ii) fall arrest protection and travel restraints
 - iii) site-specific PPE
 - iv) specialty
 - air monitoring devices
 - organic respirators
 - dust mask
 - access equipment
15. Identify situations that require specialty safety equipment.
- i) confined space
 - ii) fall protection
 - iii) hot work
 - iv) site specific
16. Identify types and location of site safety equipment and describe their characteristics and applications.

- i) fire extinguishers
 - ii) eye wash stations
 - iii) first aid kits
 - iv) spill kits
 - v) air monitoring devices
 - vi) respirators
17. Identify work environment protection and describe procedures for use.
- i) hoarding
 - ii) fire blankets
 - iii) flash screens
 - iv) barrier tape
 - v) barriers
 - vi) lockouts
 - vii) bump lines
 - viii) guard rails
18. Identify lock-out and tag-out equipment and describe their characteristics, applications, operating principles and procedures to inspect and maintain.
- i) lock-out and tag-out equipment
 - lock and key
 - chains and tags
 - lock-out hasp
 - lockbox
 - blanks
 - valve lockouts
19. Identify tools and equipment used to install and remove lock-out/tag-out equipment and describe their procedures for use.
20. Describe isolation methods and lock-out/tag-out documentation that must be completed.
- i) blinding
 - ii) breaker locks
 - iii) opening low point valves
 - iv) checking gauges and switches
 - v) inspecting sight glasses
21. Identify confined spaces requiring monitoring and describe potential hazards and associated safety procedures.
22. Describe the procedures used to inspect, maintain and store PPE and safety equipment.
- i) inspect and identify outdated or damaged PPE
 - expired hard hats

- excessively worn boots
- cracked safety glasses
- worn harnesses

23. Describe procedures to lock-out/tag-out.
24. Describe how personal health and well-being impacts professional practice and healthy work environments.
25. Identify and describe physical and emotional requirements of trade and workplace stressors.
26. Describe elements of healthy organizational cultures and importance of sense of collaboration and community.
27. Identify behaviours that affect physical and mental health, including stress and time management techniques.
28. Identify supports and techniques to manage health and wellbeing of self and others.
29. Identify characteristics, purpose and factors that impact professionalism and professional ethics.
30. Identify elements of codes of ethics, codes of conduct and other professional standards, and describe their characteristics and applications.
31. Define diversity and differences between individuals.
32. Define inclusion and the creation of respectful work environments.
33. Define equity and the importance of individuals' access to opportunities and resources.
34. Identify conduct that constitutes harassment and discrimination.
35. Identify environmental regulations and environmentally friendly products to maintain a safe work environment.
36. Describe procedures to dispose of and recycle PPE and safety equipment.

Practical Objectives:

N/A

SSI-105

Tools and Equipment

Learning Outcomes:

- Demonstrate knowledge of hand tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of portable and stationary power tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of measuring and testing equipment, their applications, maintenance and procedures for use.

2025 Red Seal Occupational Standard Reference:

- 2.01 Uses hand tools.
- 2.02 Uses portable and stationary power tools.
- 2.03 Uses measuring and testing equipment.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with tools and equipment.
2. Identify hazards and describe safe work practices pertaining to the use and maintenance of tools and equipment.
3. Interpret information about tools and measuring and testing equipment found in manufacturers' specifications.
4. Identify types of tools and equipment, and describe their characteristics, applications, operating principles and procedures for use.
 - i) hand tools
 - ii) portable and stationary power tools
 - iii) measuring and testing equipment
5. Identify measuring and testing equipment that require third-party calibration and documents.
6. Describe procedures to clean, maintain and store tools and measuring and testing equipment.

7. Describe procedures to inspect and tag damaged tools and identify defects and criteria for replacement, repair or removal of hand tools and testing and measuring equipment.
8. Identify damage/defects to tools that require replacement, repair or removal.
 - i) mushroomed drift pins
 - ii) dull saws and cutting blades
 - iii) worn jaws on pipe wrenches
 - iv) chipped cutting wheels
 - v) fractured, cracked or corroded equipment
 - vi) missing parts
 - vii) defective or missing guards
 - viii) frayed or cut cords
 - ix) defective blades
 - x) missing ground on plugs or cords
 - xi) breaks, bends, burns in cords
9. Describe procedures to dispose of and recycle tools and equipment.

Practical Objectives:

N/A

SSI-110

Access Equipment

Learning Outcomes:

- Demonstrate knowledge of access equipment, their characteristics and applications.
- Demonstrate knowledge of procedures to use and maintain access equipment.
- Demonstrate knowledge of regulatory, training and certification requirements for access equipment.

2025 Red Seal Occupational Standard Reference:

2.04 Uses access equipment.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with access equipment.
2. Identify hazards and describe safe work practices for using and maintaining access equipment.
3. Interpret codes, standards and regulations pertaining to the use of access equipment.
4. Identify training and certification requirements to use access equipment.
5. Interpret information about access equipment found in manufacturers' specifications.
6. Identify types of access equipment and describe their characteristics, applications, operating principles and procedures to use.
7. Identify types of safety features of access equipment and describe their characteristics and applications.
 - i) outriggers
 - ii) jack screws
 - iii) ladder ties
 - iv) blocking at base of extension ladders
8. Describe the procedures to inspect and tag worn, damaged and defective access equipment.
9. Describe the procedures used to erect, level and dismantle access equipment.

10. Identify defects and criteria for replacement, repair or removal of access equipment.
11. Describe the procedures to clean, maintain and store access equipment.
12. Describe procedures to dispose of and recycle damaged access equipment.

Practical Objectives:

N/A

SSI-115

Rigging, Hoisting and Lifting I

Learning Outcomes:

- Demonstrate knowledge of rigging, hoisting and lifting equipment, their components, characteristics, applications, and operation.
- Demonstrate knowledge of procedures to select, use, inspect and maintain rigging, hoisting and lifting equipment.
- Demonstrate knowledge of calculations required to perform rigging, hoisting and lifting operations.
- Demonstrate knowledge of knots, bends and hitches, their applications and procedures for tying.
- Demonstrate knowledge of communication methods used for hoisting and lifting.
- Demonstrate knowledge of the procedures used to plan and perform rigging, hoisting and lifting operations.
- Demonstrate knowledge of training, certification and regulatory requirements to use rigging, hoisting and lifting equipment.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

2.05 Uses rigging, hoisting and lifting equipment.

3.01 Interprets codes, standards, regulations and procedures.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with rigging, hoisting and lifting equipment.
2. Identify hazards and describe safe work practices pertaining to rigging, hoisting and lifting equipment.
 - i) hazards
 - overhead obstructions
 - excavations
 - excessive loads
 - blind spots
 - overhead piping
 - live equipment
 - power lines
 - site-specific hazards
 - shock loading

- equipment fatigue
 - uneven surfaces
3. Interpret codes, standards and regulations for using rigging, hoisting and lifting equipment.
 4. Identify training and certification requirements to use rigging, hoisting and lifting equipment.
 5. Identify documentation pertaining to rigging, hoisting and lifting equipment.
 6. Interpret information about rigging, hoisting and lifting equipment found in manufacturers' specifications.
 7. Identify types of rigging, hoisting and lifting equipment, and describe their characteristics, applications and operating principles.
 8. Identify types of knots, bends and hitches used on ropes and describe their applications and procedures to tie them.
 - i) bowline
 - ii) cat's paw
 - iii) clove hitch
 - iv) timber hitch
 - v) half hitch
 9. Describe the procedures to use, inspect, maintain and store hoisting, lifting and rigging equipment.
 10. Describe the communication methods used during hoisting, lifting and rigging operations.
 - i) hand signals (visual)
 - ii) electronic communications (audible)
 11. Describe procedures to dispose of and recycle rigging, hoisting and lifting equipment.
 12. Identify practices that contribute to environmental protection during use of lifting equipment.

Practical Objectives:

1. Perform hand signals.
2. Perform tying of knots, bends and hitches.

SSI-120

Drawings I

Learning Outcomes:

- Demonstrate knowledge of sprinkler system drawings and on-site drawings.
- Demonstrate knowledge of the procedures to read and interpret drawings and on-site drawings.

2025 Red Seal Occupational Standard Reference:

3.02 Uses drawings and specifications.

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with reading and sketching drawings.
2. Identify drawings and on-site drawings and describe their characteristics and applications.
 - i) drawings
 - isometric
 - orthographic
 - 3-D
 - digital or paper
 - spool sheets
 - schematic
 - architectural
 - mechanical
 - structural
 - electrical
 - shop
 - site service
 - ii) on-site drawings
 - sketches
 - mark-ups
 - as-builts
3. Explain the fundamentals of orthographic and isometric projections.
4. Identify types of lines found on sprinkler system drawings.
 - i) object (visible)

- ii) hidden
 - iii) center
 - iv) dimension
 - v) extension
 - vi) section cutting
 - vii) material section
5. Identify symbols found on sprinkler system drawings.
6. Identify types of views found on sprinkler system drawings.
- i) plan
 - ii) elevation
 - iii) sections
 - iv) details
 - v) site
 - vi) plot
 - vii) survey
7. Identify types of scales and describe their characteristics and applications.
- i) metric scale (SI)
 - ii) architect scale (imperial)
 - iii) engineer scales
8. Identify divisions of drawings and describe their purpose.
- i) divisions of drawings
 - architectural
 - structural
 - mechanical
 - electrical
 - site-service
 - landscaping
 - specifications
 - schedules
9. Define elements of reading and sketching drawings.

Practical Objectives:

1. Perform scaling of drawings in both imperial and metric.

SSI-125**Trade-Related Documents****Learning Outcomes:**

- Demonstrate knowledge of trade-related codes, standards, regulations, procedures and their applications.
- Demonstrate knowledge of trade-related documentation, reports and reference material and their application.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with trade-related documentation, codes, standards, regulations, and reference material.
2. Identify types of trade-related documentation, codes, standards, regulations, reports, reference material, and describe their applications.
3. Explain responsibilities associated with completing and/or signing trade-related documents.
4. Describe the procedures used to complete trade-related documents.

Practical Objectives:

N/A

SSI-130**Trade-Related Math I****Learning Outcomes:**

- Demonstrate knowledge of math foundations used in measurements and calculations.
- Demonstrate knowledge of calculating pipe and rod measurements with required take outs.
- Demonstrate knowledge of calculating linear 90° and 45° piping offsets.

2025 Red Seal Occupational Standard Reference:

N/A

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Describe the procedures to add/subtract linear measurements.
2. Describe the procedures to apply mathematical concepts to convert linear measurement into decimal feet.
3. Describe the procedures to convert between imperial and metric.
4. Describe the procedures to calculate linear 90° pipe offsets.
 - i) 90° offset
 - ii) parallel offsets
5. Describe procedures to apply mathematical concepts for piping.
 - i) Pythagorean theorem
 - ii) trigonometry
 - iii) area and capacity

Practical Objectives:

N/A

SSI-135

Steel Pipe, Tube and Fittings

Learning Outcomes:

- Demonstrate knowledge of steel pipe, tube and fittings, their characteristics and applications.
- Demonstrate knowledge of the procedures used to install steel pipe, tube and fittings.
- Demonstrate knowledge of training and certification requirements to weld steel pipe, tube and fittings.
- Demonstrate knowledge of regulatory requirements for installing steel pipe, tube and fittings.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

12.01 Installs steel pipe, tube and fittings.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with steel pipe, tube and fittings.
2. Identify hazards and describe safe work practices related to installing steel pipe, tube and fittings.
3. Interpret codes, standards and regulations pertaining to steel pipe, tube and fittings.
4. Identify training and certification requirements to weld steel pipe, tube and fittings.
5. Interpret information pertaining to steel pipe, tube and fittings installation found on drawings and specifications.
6. Identify types of steel pipe, tube and fittings and describe their characteristics and applications.
 - i) types of steel pipe
 - stainless
 - galvanized
 - carbon
 - ii) types of steel tube
 - stainless
 - mild

- iii) types of fittings
 - couplings
 - flanges
 - elbows
 - tees
 - crosses
 - adaptors
- 7. Identify tools and equipment for installing steel pipe, tube and fittings, and describe their procedures for use.
 - i) wrenches
 - ii) levels
 - iii) sockets
 - iv) chain vices
 - v) threaders
 - vi) groovers
- 8. Explain friction loss (C-value) as it applies to steel pipe schedules and hydraulically calculated systems.
- 9. Identify the design considerations for installing steel pipe, tube and fittings.
- 10. Describe the procedures used to install steel pipe, tube and fittings.
- 11. Describe procedures used to install rigid joints, flexible joints or seismic separation assemblies.
- 12. Describe connection types related to steel pipe and tube.
- 13. Describe the procedures to apply mathematical concepts to steel pipe, tube and fittings layout and installation.
 - i) converting decimal feet in a linear measurement
 - ii) metric and imperial conversions
 - iii) geometry
 - iv) fitting allowances
 - v) bending allowances
 - vi) Pythagorean theorem
- 14. Identify practices that contribute to environmental protection.
- 15. Describe procedures to dispose of and recycle steel pipe, tube and fittings.

Practical Objectives:

1. Perform cutting, threading and grooving of steel pipe.

SSI-140

Non-Metallic Pipe, Tube and Fittings

Learning Outcomes:

- Demonstrate knowledge of non-metallic pipe, tube and fittings, their characteristics and applications.
- Demonstrate knowledge of the procedures used to install non-metallic pipe, tube and fittings.
- Demonstrate regulatory requirements for installing non-metallic pipe, tube and fittings.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

12.02 Installs non-metallic pipe, tube and fittings.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with non-metallic pipe, tube and fittings.
2. Identify hazards and describe safe work practices related to installing non-metallic pipe, tube and fittings.
3. Interpret codes, standards and regulations pertaining to non-metallic pipe, tube and fittings.
4. Interpret information pertaining to non-metallic pipe, tube and fittings installation found on drawings and specifications.
5. Identify types of non-metallic pipe, tube and fittings and describe their characteristics and applications.
 - i) types of non-metallic pipe and tube
 - chlorinated polyvinyl chloride (CPVC)
 - cross-linked polyethylene (PEX)
 - polyvinyl chloride (PVC)
 - ii) types of fittings
 - couplings
 - flanges
 - elbows
 - tees
 - crosses

- adaptors

6. Identify tools and equipment for installing non-metallic pipe, tube and fittings and describe their procedures for use.
7. Explain friction loss (C-value) as it applies to non-metallic pipe and tube and hydraulically calculated systems.
8. Describe connection types related to non-metallic pipe and tube.
9. Describe the procedures used to install non-metallic pipe, tube and fittings.
10. Identify design considerations for installing non-metallic pipe, tube and fittings.
11. Describe the procedures to apply mathematical concepts to non-metallic pipe, tube and fittings, layout and installation.
 - i) converting decimal feet in a linear measurement
 - ii) metric and imperial conversions
 - iii) geometry
 - iv) fitting allowances
 - v) Pythagorean theorem
12. Identify practices that contribute to environmental protection.
13. Describe procedures to dispose of and recycle non-metallic pipe, tube and fittings.

Practical Objectives:

1. Perform prep, cut and assembly of non-metallic pipe.

SSI-145

Copper Pipe, Tube and Fittings

Learning Outcomes:

- Demonstrate knowledge of copper pipe, tube and fittings, their components, characteristics, applications and operation.
- Demonstrate knowledge of the procedures used to install copper pipe, tube and fittings.
- Demonstrate knowledge of regulatory requirements for installing copper pipe, tube and fittings.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

12.03 Installs copper pipe, tube and fittings.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with copper pipe tube, tubing and fittings.
2. Identify hazards and describe safe work practices for installing copper pipe, tube and fittings.
3. Interpret codes, standards and regulations pertaining to copper pipe, tube and fittings.
4. Interpret information pertaining to copper pipe, tube and fittings found on drawings and specifications.
5. Identify types of copper pipe, tube and fittings and describe their characteristics and applications.
6. Identify tools and equipment used to install copper pipe, tube and fittings and describe their procedures for use.
7. Describe connection types related to copper pipe and tube.
 - i) soldering
 - ii) brazing
 - iii) using grooved couplings
 - iv) compression type fittings
 - v) threading

8. Describe procedures used to install copper pipe, tube and fittings.
9. Explain the effect of electrolysis on piping and tubing materials.
10. Explain the effect of galvanic corrosion on piping and tubing materials.
11. Explain friction loss (C-value) as it applies to copper pipe and tube, and hydraulically calculated systems.
12. Identify the design considerations for installing copper pipe, tube and fittings.
13. Describe the procedures used to prepare and assemble flare and compression joints using hand tools.
14. Describe the procedures to apply mathematical concepts to copper pipe, tube, fittings, layout and installation.
 - i) converting decimal feet in a linear measurement
 - ii) metric and imperial conversions
 - iii) geometry
 - iv) fitting allowances
 - v) bending allowances
 - vi) Pythagorean theorem
15. Identify practices that contribute to environmental protection.
16. Describe procedures to dispose of and recycle copper pipe, tube and fittings.

Practical Objectives:

1. Perform prep, cutting, bending and assembly of copper pipe, tube and fittings.

SSI-150

Sprinkler Heads and Nozzles I

Learning Outcomes:

- Demonstrate knowledge of sprinklers and nozzles their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to select sprinklers and nozzles.
- Demonstrate knowledge of regulatory requirements for sprinklers and nozzles.
- Demonstrate knowledge of the procedures used to install standard spray sprinklers and nozzles and their components.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 13.01 Selects sprinklers and nozzles.
- 13.02 Installs sprinklers and nozzles.

Suggested Hours:

30 Hours

Theoretical Objectives:

1. Define terminology associated with sprinklers and nozzles.
2. Identify hazards and describe safe work practices pertaining to standard spray sprinklers and nozzles and their components.
3. Interpret codes, standards and regulations pertaining to standard spray sprinklers and nozzles.
4. Interpret information pertaining to standard spray sprinklers and nozzles found on drawings, specifications, sprinkler and nozzle listings and manufacturers' data sheets.
 - i) listings
 - ii) K-factor
 - iii) temperature
 - iv) date of manufacture
 - v) sprinkler identification number (SIN)
5. Identify types of standard sprinklers and nozzles and describe their characteristics and applications.
 - i) automatic sprinklers

- solder
 - bulb
 - open
 - ii) standard spray sprinklers
 - upright
 - pendant
 - sidewall
 - iii) flexible sprinkler assemblies
6. Describe the operating principles of standard spray sprinklers, nozzles and finishing plates.
 7. Identify tools and equipment relating to standard sprinklers and nozzles and their components and describe their applications and procedures for use.
 8. Describe procedures to select standard spray sprinklers and nozzles.
 9. Identify conditions, hazard / occupancy classifications and storage arrangements for selecting standard spray sprinklers.
 - i) conditions
 - freezing
 - excessive heat
 - corrosive environment
 - ii) hazard/occupancy classifications
 - light hazard
 - ordinary hazard
 - extra hazard
 - iii) storage arrangements
 - high pile storage
 - in-rack
 - solid pile
 10. Explain the importance of correct positioning for standard spray sprinklers and nozzles.
 11. Identify spacing and obstruction requirements based on occupancy classification, drawings, manufacturers' and project specifications, codes, standards and regulations.
 12. Identify clearances required between piled storage materials and sprinkler deflectors.
 13. Identify the factors that affect maximum ceiling temperature.
 14. Identify temperature ratings and colour coding.
 - i) ordinary
 - ii) intermediate

- iii) high
 - iv) extra-high
15. Identify performance characteristics that apply to automatic sprinklers and nozzles.
- i) deflector design/spray patterns
 - ii) orifice size
 - iii) temperature rating
 - iv) temperature sensitivity
 - v) orientation
16. Describe the procedures used to install standard sprinklers and nozzles and their components.
17. Describe the procedures used and the factors to consider to protect, handle and care for standard spray sprinklers and nozzles prior to and during the installation process.
18. Identify location requirements.
- i) bays
 - ii) beams
 - iii) girders
 - iv) joists
 - v) open bar joists
 - vi) open ceilings
 - vii) trusses
19. Identify practices that contribute to environmental protection.
20. Describe procedures to dispose of and recycle sprinklers and nozzles.

Practical Objectives:

N/A

SSI-155

Hangers, Supports, Restraints and Bracing

Learning Outcomes:

- Demonstrate knowledge of hangers, supports, restraints and bracing, their components, characteristics and applications.
- Demonstrate knowledge of the procedures used to install hangers, supports, restraints and bracing.
- Demonstrate knowledge of regulatory requirements for hangers, supports, restraints and bracing.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
13.04 Installs hangers, bracing, supports, and restraints.

Suggested Hours:

15 Hours

Theoretical Objectives:

1. Define terminology associated with supports and hangers.
2. Identify hazards and describe safe work practices pertaining to hangers, supports, restraints and bracing.
3. Interpret codes, standards and regulations pertaining to hangers, supports, restraints and bracing.
4. Interpret information pertaining to hangers, supports, restraints and bracing found on drawings and specifications.
5. Identify types of hangers, supports, restraints and bracing used in the installation of pipe, tube and tubing, and describe their characteristics and applications.
 - i) hangers
 - riser clamps
 - pipe clamps
 - swivel rings
 - clevis
 - split rings
 - ii) supports
 - pipe stands

- riser clamps
 - pipe straps
 - iii) bracing
 - ceiling flanges
 - side beam attachments
 - C-clamps
 - longitudinal
 - lateral
 - restraint wire
 - restraint strap
 - 4-way
6. Identify tools and equipment used to install hangers, supports, restraints and bracing and describe their applications and procedures for use.
 7. Identify hanger, support, restraint and bracing requirements for various systems.
 8. Identify types of bracing materials and describe their characteristics and applications.
 - i) pipe
 - ii) angle iron
 - iii) threaded rod
 9. Identify types and sizes of hanger rods and describe their characteristics and applications.
 10. Identify types of protective materials applied to hangers and describe their purpose and applications.
 11. Identify types of fasteners and inserts and describe their characteristics and applications.
 12. Describe the procedures used to install hangers, supports, restraints and bracing.
 13. Describe the procedures used to install fasteners into structure material.
 14. Describe the procedures to apply mathematical concepts to hangers, supports and bracing layout and installation.
 - i) converting decimal feet in a linear measurement
 - ii) metric and imperial conversions
 - iii) geometry
 - iv) Pythagorean theorem
 - v) trapeze
 15. Identify practices that contribute to environmental protection.

16. Describe procedures to dispose of and recycle hangers, supports, restraints and bracing.

Practical Objectives:

N/A

SSI-160

Pipe Design and Installation I

Learning Outcomes:

- Demonstrate knowledge of the procedures to plan and organize jobs.
- Demonstrate knowledge of regulatory requirements for planning and organizing jobs.
- Demonstrate knowledge of procedures to receive materials and verify orders.
- Demonstrate knowledge of procedures used to store, secure, organize and maintain materials.
- Demonstrate knowledge of procedures used to plan for and prepare work sites.
- Demonstrate knowledge of sprinkler system layout.
- Demonstrate knowledge of pipe and tube, fittings and pipe sleeves, their characteristics and applications.
- Demonstrate knowledge of pipe installation tools, materials and equipment and their procedures for use.
- Demonstrate knowledge of pipe and tube cutting equipment, their characteristics and applications.
- Demonstrate knowledge of the procedures to prepare and install pipe and tube.
- Demonstrate knowledge of pipe sleeves and their installation.
- Demonstrate knowledge of regulatory requirements pertaining to pipe design and installation.
- Demonstrate knowledge of standards pertaining to painting and labelling pipe, tube and fittings.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.04 Plans job tasks and procedures.
- 3.05 Prepares work site.
- 3.06 Performs layout of systems.
- 11.01 Cuts pipe and tube.
- 11.02 Bends pipe and tube.
- 11.03 Threads pipe.
- 11.04 Grooves pipe.
- 11.05 Drills pipe and tube.
- 11.06 Grinds pipe.
- 11.07 Prepares fittings.
- 12.04 Paints and labels pipe, tube and fittings.
- 13.03 Installs pipe sleeves.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with pipe design and installation.
 - i) cutting pipe and tube
 - ii) bending pipe and tube
 - iii) threading pipe
 - iv) grooving pipe
 - v) drilling pipe and tube
 - vi) grinding pipe
 - vii) pipe fittings
 - viii) sleeves
 - ix) painting and labeling pipe and tube
 - x) job planning activities
 - xi) sprinkler system layout
2. Identify hazards and describe safe work practices pertaining to pipe design and installation.
3. Interpret codes, standards and regulations pertaining to pipe design and installation.
4. Interpret information pertaining to pipe design and installation found on drawings and specifications.
5. Identify types of thread, and describe their thread specifications, characteristics and applications.
 - i) thread
 - National Pipe Thread (NPT)
 - National Standard Thread (NST)
 - taper
 - parallel
 - ii) thread specifications
 - thread depth
 - taper
 - pitch
 - angle
 - length
6. Identify types of pipe sleeves and describe their characteristics and applications.
7. Describe fire rating requirements for penetrations.

8. Identify types of cutting oils and describe their characteristics and applications.
9. Identify tools and equipment relating to pipe design and installation and describe their applications and procedures for use.
10. Identify factors to consider for selecting pipe and tube for cutting or bending.
 - i) size
 - ii) materials
 - iii) schedule
 - iv) NFPA standards
 - v) manufacturers' specifications
11. Identify factors for selecting pipe sleeve material, diameter and length.
 - i) pipe size
 - ii) wall and floor thickness
 - iii) codes
 - iv) standards and regulations
12. Describe the procedures used to cut pipe and tube to required dimensions.
13. Describe the procedures used to prepare pipe and tube.
 - i) thread
 - ii) groove
 - iii) grind
 - iv) drill
14. Describe the procedures used to size and install pipe sleeves.
15. Describe the procedures and materials used to paint and label pipe and tube.
16. Describe the procedures used to plan job tasks.
17. Describe the procedures used to lay out sprinkler systems and components.
18. Describe the procedures used to prepare work sites.
19. Describe the procedures used to receive and verify delivered materials.
20. Describe the procedures used to store, secure, organize materials and maintain inventory.
21. Describe the procedures to apply mathematical concepts to pipe design, layout and installation.

- i) converting decimal feet in a linear measurement
 - ii) metric and imperial conversions
 - iii) geometry
 - iv) fitting allowances
 - v) bending allowances
 - vi) Pythagorean theorem
22. Identify practices that contribute to environmental protection.
23. Describe procedures to dispose of and recycle equipment and material related to pipe installation.

Practical Objectives:

1. Perform pipe installation and assembly.

SSI-165

Soldering, Brazing and Oxy-Fuel Cutting

Learning Outcomes:

- Demonstrate knowledge of soldering, brazing and oxy-fuel cutting equipment, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to use and maintain soldering, brazing and oxy-fuel cutting equipment.
- Demonstrate knowledge of regulatory requirements for soldering, brazing and oxy-fuel cutting.
- Demonstrate knowledge of the procedures used to grind pipe.
- Demonstrate knowledge of the procedures used to braze and solder joints.
- Demonstrate knowledge of the procedures used for cutting with oxy-fuel equipment.

2025 Red Seal Occupational Standard Reference:

2.06 Uses soldering and brazing equipment.

12.03 Installs copper pipe, tube and fittings.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with soldering, brazing and oxy-fuel cutting.
2. Identify hazards and describe safe work practices pertaining to soldering, brazing and oxy-fuel cutting.
3. Interpret codes, standards and regulations pertaining to soldering, brazing and oxy-fuel cutting.
4. Interpret information pertaining to soldering, brazing and oxy-fuel cutting equipment found on drawings and specifications.
5. Identify types of soldering, brazing and oxy-fuel equipment and consumables and describe their characteristics, applications and operating principles.
 - i) equipment
 - oxy-fuel and air-fuel torches
 - gas cylinders
 - torch heads and tips
 - pressure regulators
 - ii) consumables

- brazing alloy and flux
 - soldering alloy and flux
 - sand cloth
 - gases
 - oxygen
 - acetylene
 - methylacetylene-propadiene propane [MAPP]
 - propane
 - butane
6. Identify types of soldering and brazing alloys and describe their characteristics and applications.
 - i) 50/50
 - ii) 95/5
 - iii) lead-free
 - iv) BCuP
 - v) BAg
 7. Identify different soldering and brazing processes and applications.
 8. Describe the procedures to use oxy-fuel equipment.
 9. Describe soldering and brazing procedures.
 10. Describe the procedures used to inspect, maintain and store soldering, brazing and oxy-fuel cutting equipment.
 11. Describe procedures to dispose of and recycle soldering, brazing and oxy-fuel cutting equipment.

Practical Objectives:

1. Perform soldering and brazing on various types of pipe, tube and fittings.
2. Perform oxy-fuel torch cutting.

SSI-170

Wet Pipe Sprinkler Systems

Learning Outcomes:

- Demonstrate knowledge of wet pipe systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of the procedures used to install wet pipe systems and components.
- Demonstrate knowledge of regulatory requirements for installing wet pipe systems.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 14.01 Installs wet pipe systems.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with wet pipe systems.
2. Identify hazards and describe safe work practices pertaining to wet pipe systems.
3. Interpret codes, standards and regulations pertaining to wet pipe systems.
4. Interpret information pertaining to wet pipe systems found on drawings and specifications.
5. Identify types of wet pipe systems, and describe their operating principles, applications and characteristics.
6. Identify wet pipe system components, and describe their location, purpose and operation.
 - i) fire department connection
 - ii) test connections and drains
 - iii) sprinklers
 - iv) alarm devices
 - v) control valves
 - vi) alarm check valves
 - vii) water flow alarm devices
 - viii) relief valves

- ix) valves
 - x) flow switches
 - xi) riser manifolds
 - xii) air vents
7. Identify tools and equipment used to install wet pipe systems and describe their applications and procedures for use.
 8. Identify alarm valves to be trimmed and describe their components and relevant design characteristics.
 9. Determine characteristics and application of sprinklers.
 10. Identify design criteria for wet pipe systems.
 - i) engineered drawings
 - ii) occupancy classification
 - iii) hazard classification
 - iv) design area
 11. Identify drainage requirements for wet pipe systems.
 12. Describe the procedures used to lay out and install wet pipe systems and their components.
 13. Describe the procedures used to install alarm valve trim.
 14. Identify the factors to consider and requirements for installing auxiliary drains on wet pipe systems.
 15. Describe the methods used to prevent false alarms.
 - i) excess pressure pump
 - ii) retard chamber
 - iii) flow switch time delay
 - iv) bypass
 16. Identify the requirements for pressure testing of wet pipe systems.
 17. Describe methods used to prevent freezing.
 18. Describe the procedures to apply mathematical concepts to wet pipe sprinkler systems layout and installation.
 - i) converting decimal feet in a linear measurement
 - ii) metric and imperial conversions
 - iii) geometry

iv) Pythagorean theorem

Practical Objectives:

1. Trim an alarm check valve.

SSI-175

Antifreeze Sprinkler Systems

Learning Outcomes:

- Demonstrate knowledge of antifreeze systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of the procedures to install and maintain antifreeze systems.
- Demonstrate knowledge of regulatory requirements for installing and maintaining antifreeze systems.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

3.01 Interprets codes, standards, regulations and procedures.

14.04 Installs antifreeze systems.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with antifreeze systems.
2. Identify hazards and describe safe work practices pertaining to antifreeze systems.
3. Interpret codes, standards and regulations pertaining to antifreeze systems.
4. Interpret information pertaining to antifreeze systems found on drawings and specifications.
5. Identify types of antifreeze systems and their components, and describe their characteristics, applications and operating principles.
 - i) antifreeze systems
 - antifreeze loop
 - cross-connection control
 - ii) components
 - expansion tanks
 - cross-connection control
 - check valves
6. Identify types of antifreeze solutions and describe their characteristics and applications.
 - i) glycol
 - ii) glycerin

- iii) temperature mixtures
- 7. Identify tools and equipment relating to antifreeze systems and describe their applications and procedures for use.
- 8. Identify the factors to consider for determining the need for freezing protection or antifreeze systems.
 - i) location
 - ii) accessibility
 - iii) cost
- 9. Identify the requirements and describe the procedures used to handle, store and dispose of antifreeze.
- 10. Identify valves required for antifreeze systems and describe their characteristics and applications.
- 11. Identify installation requirements for antifreeze systems.
- 12. Describe the procedures used to lay out and install antifreeze systems.
- 13. Describe the procedures used to verify operation of equipment and components.
- 14. Identify the requirements for pressure testing of antifreeze systems and describe associated procedures.
- 15. Identify practices that contribute to environmental protection.

Practical Objectives:

N/A

MENT-700 Mentoring I

Learning Outcomes:

- Demonstrate knowledge of effective communication practices as a learner.
- Demonstrate knowledge of strategies for learning skills in the workplace.

2025 Red Seal Occupational Standard Reference:

- 6.01 Uses communication techniques.
- 6.02 Uses mentoring techniques.

Suggested Hours:

6 Hours

Learning Objectives:

1. Describe the importance of one's own individual experiences.
2. Identify behaviours that demonstrate positive learning experiences.
3. Identify the benefits of workplace mentoring for the apprentice, mentor and employer.
4. Identify the partners involved in apprenticeship training.
5. Describe the shared responsibilities for workplace learning in apprenticeship.
6. Identify different learning needs and strategies to address challenges or barriers in the workplace.
 - i) learning disabilities
 - ii) language
 - iii) underrepresentation
7. Identify the components that create a positive and inclusive workplace culture.
 - i) workplace characteristics
 - ii) individual behaviours
8. Identify various learning styles and determine one's own learning preferences.
9. Explain how learning preferences impact learning new skills.
10. Identify different learning strategies to meet individual learning needs.

11. Describe the importance of adapting to a variety of teaching and learning methods in the workplace.
12. Identify techniques for effective communication as a learner.
 - i) verbal and non-verbal
 - ii) active listening
13. Identify and describe personal responsibilities and attitudes that contribute to on-the-job success.
 - i) self advocating
 - ii) asking questions
 - iii) accepting constructive feedback
 - iv) working safely
 - v) employing time management techniques and being punctual

Practical Objectives:

N/A

Level 2

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SSI-200

Pipe Design and Installation II

Learning Outcomes:

- Demonstrate knowledge of the procedures to plan and organize jobs.
- Demonstrate knowledge of procedures to receive materials.
- Demonstrate knowledge of procedures used to plan for and prepare work sites.
- Demonstrate knowledge of procedures used to store, secure, organize and maintain materials.
- Demonstrate knowledge of sprinkler system layout.
- Demonstrate knowledge of the procedures used to paint and label pipe, tube and fittings.
- Demonstrate knowledge of pipe sleeves, their characteristics and application.
- Demonstrate knowledge of procedures to size and install pipe sleeves.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures
- 3.03 Uses documentation and reference material.
- 3.04 Plans job tasks and procedures.
- 3.05 Prepares work site.
- 3.06 Performs layout of systems.
- 12.04 Paints and labels pipe, tube and fittings.
- 13.03 Installs pipe sleeves.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with pipe design and installation.
 - i) sleeves
 - ii) painting and labeling pipe and tube
 - iii) job planning activities
 - iv) sprinkler system layout
2. Identify hazards and describe safe work practices pertaining to installing pipe sleeves.
3. Interpret codes, standards and regulations pertaining to pipe sleeves.
4. Describe fire rating requirements for penetrations.

5. Identify standards pertaining to painting and labelling pipe, tube and fittings.
6. Interpret information found on drawings, manufacturers' and project specifications.
 - i) labelling pipe, tube and fittings
 - ii) pipe sleeves
7. Identify symbols pertaining to labelling pipe, tube and fittings.
8. Identify types of pipe sleeves and describe their characteristics and applications.
9. Identify tools and equipment relating to pipe design and installation, and describe their applications and procedures for use.
10. Identify factors for selecting pipe sleeve material, diameter and length.
11. Describe procedures to determine location of pipe sleeves.
12. Describe the procedures and materials used to paint and label pipe, tube and fittings.
13. Describe the procedures used to size and install pipe sleeves.
14. Describe the procedures used to plan job tasks.
15. Describe the procedures used to lay out sprinkler systems and components.
16. Describe the procedures used to prepare work sites.
17. Describe the procedures used to receive and verify delivered materials.
18. Describe the procedures used to store, secure, organize materials and maintain inventory.
19. Describe procedures to dispose of and recycle painting, labelling and coring materials.
20. Identify practices that contribute to environmental protection.

Practical Objectives:

1. Calculate the impact on system performance due to friction loss in system pipes, sprinklers and fittings.

SSI-205

Drawings II

Learning Outcomes:

- Demonstrate knowledge of sprinkler system drawings and on-site drawings.
- Demonstrate knowledge of the procedures to read and interpret drawings and on-site drawings.
- Demonstrate knowledge of the procedures to draw and label orthographic and isometric drawings.
- Demonstrate knowledge of the procedures to read and interpret information about fire protection found in drawings.

2025 Red Seal Occupational Standard Reference:

3.02 Uses drawings and specifications.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with reading and sketching drawings.
2. Identify drawings and on-site drawings and describe their characteristics and applications.
 - i) drawings
 - isometric
 - orthographic
 - 3-D
 - digital or paper
 - spool sheets
 - schematic
 - architectural
 - mechanical
 - structural
 - electrical
 - shop
 - site service
 - ii) on-site drawings
 - sketches
 - mark-ups
 - as-builts

3. Explain the fundamentals of orthographic and isometric projections.
4. Identify types of lines found on sprinkler system drawings.
 - i) object (visible)
 - ii) hidden
 - iii) centre
 - iv) dimension
 - v) extension
 - vi) section cutting
 - vii) material section
5. Identify symbols found on sprinkler system drawings.
6. Identify types of views found on sprinkler system drawings.
 - i) plan
 - ii) elevation
 - iii) sections
 - iv) details
 - v) site
 - vi) plot
 - vii) survey
7. Identify types of scales and describe their characteristics and applications.
 - i) metric scale (SI)
 - ii) architect scale (imperial)
 - iii) engineer scales
8. Identify drafting tools, drawing equipment and computer aided design, and describe their applications and procedures for use.
9. Identify views and drawings of a building and describe their purpose.
10. Interpret fire protection information found on drawings.
11. Interpret dimensions on drawings.
12. Describe the procedures used to interpret drawings in both metric and imperial units.
13. Describe the procedures used to prepare and create orthographic and isometric drawings.
14. Describe the procedures used to interpret and convert metric and imperial scaling.

Practical Objectives:

1. Produce isometric drawings.
2. Scale drawings and sketches.
3. Perform take-offs.

SSI-210

Rigging, Hoisting and Lifting II

Learning Outcomes:

- Demonstrate knowledge of rigging, hoisting and lifting equipment, their components, characteristics, applications, and operation.
- Demonstrate knowledge of procedures to select, use, inspect and maintain rigging, hoisting and lifting equipment.
- Demonstrate knowledge of calculations required to perform rigging, hoisting and lifting operations.
- Demonstrate knowledge of knots, bends and hitches, their applications and procedures for tying.
- Demonstrate knowledge of communication methods used for hoisting and lifting.
- Demonstrate knowledge of the procedures used to plan and perform rigging, hoisting and lifting operations.
- Demonstrate knowledge of training, certification and regulatory requirements to use rigging, hoisting and lifting equipment.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

2.05 Uses rigging, hoisting and lifting equipment.

3.01 Interprets codes, standards, regulations and procedures.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with rigging, hoisting and lifting equipment.
2. Identify hazards and describe safe work practices pertaining to rigging, hoisting and lifting equipment.
 - i) hazards
 - overhead obstructions
 - excavations
 - excessive loads
 - blind spots
 - overhead piping
 - live equipment
 - power lines
 - site-specific hazards
 - shock loading

- equipment fatigue
 - uneven surfaces
3. Interpret codes, standards and regulations for using rigging, hoisting and lifting equipment.
 4. Identify training and certification requirements to use rigging, hoisting and lifting equipment.
 5. Identify documentation and regulations pertaining to rigging, hoisting and lifting equipment.
 6. Interpret information about rigging, hoisting and lifting equipment found in manufacturers' specifications.
 7. Identify types of rigging, hoisting and lifting equipment, and describe their characteristics, applications and operating principles.
 8. Identify types of ropes and slings, and describe their characteristics, safe working loads and applications.
 - i) nylon
 - ii) manila
 - iii) graded
 - iv) wire rope and sling
 9. Identify the factors to consider for selecting rigging equipment.
 - i) weight
 - ii) loads
 - iii) distance to be travelled
 - iv) conditions of ground being travelled on
 - v) load characteristics
 - vi) environment
 - vii) safety factors
 - viii) weather
 - ix) temperature
 10. Explain sling angle when preparing for hoisting and lifting operations.
 11. Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment.
 12. Describe procedures to use rigging, hoisting and lifting equipment.

13. Describe the factors to consider, and the procedures used to perform calculations related to rigging, hoisting and lifting operations.
14. Describe the procedures used to ensure the work area is safe for lifting.
 - i) supervision of lift
 - ii) securing work area
 - iii) communication
15. Describe the procedures used to plan and perform a lift.
 - i) determine weight of the load
 - ii) select equipment
 - iii) determine set-up of equipment
 - iv) determine communication methods
 - v) set up hoisting/lifting equipment
 - vi) rig material/equipment to be lifted
 - vii) attach tag line
 - viii) perform pre-lift checks
 - ix) lift and place load
 - x) perform post-lift inspection of the load
 - xi) disconnect the load
16. Describe the procedures to apply mathematical concepts to rigging, hoisting and lifting procedures
 - i) weight conversions
 - ii) safe working load
 - iii) geometry
 - iv) sling angles
17. Describe procedures to dispose of and recycle rigging, hoisting and lifting equipment.
18. Identify practices that contribute to environmental protection during use of lifting equipment.

Practical Objectives:

1. Perform hand signals.
2. Perform tying of knots, bends and hitches.

SSI-215

Dry Pipe Sprinkler Systems

Learning Outcomes:

- Demonstrate knowledge of dry pipe systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of the procedures used to install dry pipe systems and their components.
- Demonstrate knowledge of regulatory requirements for installing dry pipe systems.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 14.02 Installs dry pipe systems.

Suggested Hours:

21 Hours

Theoretical Objectives:

1. Define terminology associated with dry pipe systems.
2. Identify hazards and describe safe work practices pertaining to dry pipe systems.
3. Interpret codes, standards and regulations pertaining to dry pipe systems.
4. Interpret information pertaining to dry pipe systems found on drawings and specifications.
5. Identify types of dry pipe systems and describe their characteristics, applications and operating principles.
 - i) tree
 - ii) looped
6. Identify dry pipe system components, and describe their locations, purpose and operation.
 - i) fire department connections
 - ii) test connections and drains
 - iii) water flow alarm devices
 - iv) regulated air supply
 - v) regulated nitrogen supply
 - vi) valves

- control
 - dry pipe
 - vii) Quick Opening Devices (QODs)
 - viii) anti-flooding devices
 - ix) auxiliary drains
 - x) drum drips
 - xi) high/low supervisory devices
 - xii) pressure gauges
 - xiii) corrosion mitigation devices
7. Identify tools and equipment relating to dry pipe systems and describe their applications and procedures for use.
 8. Identify dry pipe valves to be trimmed and describe their components and design characteristics.
 9. Identify factors to consider and requirements for installing auxiliary drains on dry pipe systems.
 10. Identify the requirements for pressure testing of dry pipe systems and describe associated procedures.
 11. Describe procedures used to lay out and install dry pipe systems and components.
 12. Describe procedures used to install dry pipe valve trim.
 13. Describe the preventative methods used to prevent false alarms.
 - i) use of automatic air and nitrogen supply
 - ii) air maintenance device
 14. Identify calculations pertaining to capacity of dry pipe systems and air or nitrogen supply.
 15. Describe the procedures to apply mathematical concepts to dry pipe sprinkler systems layout and installation.
 - i) converting decimal feet in a linear measurement
 - ii) metric and imperial conversions
 - iii) geometry
 - iv) Pythagorean theorem

Practical Objectives:

1. Reset a dry pipe valve (DPV).

SSI-220

System Drainage I

Learning Outcomes:

- Demonstrate knowledge of system drainage, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to lay out and install system drainage and components.
- Demonstrate knowledge of regulatory requirements for system drainage layout and installation.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

3.01 Interprets codes, standards, regulations and procedures.

13.06 Installs system drainage.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with system drainage.
2. Identify hazards and describe safe work practices pertaining to system drainage.
3. Interpret codes, standards and regulations pertaining to system drainage.
4. Interpret information pertaining to system drainage found on drawings and specifications.
5. Identify types of system drainage, and describe their characteristics, applications and operating principles.
 - i) main
 - ii) auxiliary
 - iii) sectional
6. Identify system drainage components and describe their location, purpose and operation.
 - i) drain valves
 - ii) drain cups
 - iii) air gaps

7. Identify tools and equipment relating to system drainage and describe their applications and procedures for use.
8. Identify grading requirements for system drainage.
9. Describe procedures used to lay out and install system drainage and components.
10. Identify practices that contribute to environmental protection.
11. Describe procedures to dispose of and recycle system drainage components.

Practical Objectives:

N/A

SSI-225

Seismic Protection

Learning Outcomes:

- Demonstrate knowledge of bracing, components, characteristics and applications.
- Demonstrate knowledge of the procedures used to select and locate sway/seismic bracing.
- Demonstrate knowledge of the procedures used to install sway/seismic bracing.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 13.04 Installs hangers, supports, restraints and bracing

Suggested Hours:

12 Hours

Theoretical Objectives:

1. Define terminology associated with sway/seismic bracing.
2. Identify hazards and describe safe work practices pertaining to sway/seismic bracing.
3. Interpret codes, standards and regulations pertaining to sway/seismic bracing.
4. Interpret information pertaining to sway/seismic bracing found on drawings and specifications.
5. Describe principles of sway/seismic bracing and movement.
6. Identify types of sway/seismic bracing and describe their purpose and applications.
7. Identify types of fasteners and inserts and describe their characteristics and applications.
8. Identify tools and equipment relating to sway/seismic bracing and describe their applications and procedures for use.
9. Identify bracing requirements for various systems.
10. Describe the procedures used to install sway/seismic bracing assemblies.
11. Describe the procedures used to install fasteners and inserts.

12. Describe the procedures used to install flexible joints.
13. Describe and apply mathematical concepts related to seismic protection, layout and installation.
 - i) converting decimal feet in a linear measurement
 - ii) geometry
 - iii) Pythagorean theorem

Practical Objectives:

N/A

SSI-230

Sprinkler Heads and Nozzles II

Learning Outcomes:

- Demonstrate knowledge of specific application sprinklers and nozzles, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to select specific application sprinklers and nozzles.
- Demonstrate knowledge of regulatory requirements for sprinklers and nozzles.
- Demonstrate knowledge of the procedures used to install specific application sprinklers and nozzles and their components.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 13.01 Selects sprinklers and nozzles.
- 13.02 Installs sprinklers and nozzles.

Suggested Hours:

24 Hours

Theoretical Objectives:

1. Define terminology associated with specific application sprinklers and nozzles.
2. Identify hazards and describe safe work practices pertaining to specific application sprinklers and nozzles and their components.
3. Interpret codes, standards and regulations pertaining to specific application sprinklers and nozzles.
4. Interpret information pertaining to specific application sprinklers and nozzles found on drawings, specifications, sprinkler and nozzle listings and manufacturers' data sheets.
5. Identify types of specific application sprinklers and nozzles, and describe their characteristics and applications.
 - i) extended coverage sprinklers
 - pendant
 - upright
 - sidewall

- ii) specialty sprinklers and nozzles
 - residential
 - institutional
 - Control Mode Specific Application (CMSA)/large drop
 - Early Suppression Fast Response (ESFR)
 - in-rack
 - attic
 - old-style/conventional
 - open sprinkler
 - window
 - dry
 - foam
 - CO₂
 - clean agent
 - concealed space
 - iii) flexible sprinkler assemblies
6. Describe the operating principles of specific application sprinklers, nozzles and finishing plates.
 7. Identify tools and equipment relating to specific application sprinklers and nozzles, and describe their applications and procedures for use.
 8. Describe procedures to select specific application sprinklers and nozzles.
 9. Identify conditions, hazard/occupancy classifications and storage arrangements for selecting specific application sprinklers.
 - i) conditions
 - freezing
 - excessive heat
 - corrosive environment
 - ii) hazard/occupancy classifications
 - light hazard
 - ordinary hazard
 - extra hazard
 - iii) storage arrangements
 - high pile storage
 - in-rack
 - solid pile
 10. Explain the importance of correct positioning for specific application sprinklers and nozzles.

11. Identify spacing and obstruction requirements based on occupancy classification, drawings, manufacturers' and project specifications, codes, standards and regulations.
12. Identify clearances required between piled storage materials and sprinkler deflectors.
13. Identify the factors that affect maximum ceiling temperature.
14. Identify temperature ratings and colour coding.
 - i) ordinary
 - ii) intermediate
 - iii) high
 - iv) extra-high
15. Identify performance characteristics that apply to automatic sprinklers.
 - i) deflector design/spray patterns
 - ii) orifice size
 - iii) temperature rating
 - iv) temperature sensitivity
 - v) orientation
16. Describe the procedures used to install specific application sprinklers and nozzles and their components.
17. Describe the procedures used and the factors to consider to protect, handle and care for specific application sprinklers and nozzles prior to and during the installation process.
18. Identify location requirements.
 - i) bays
 - ii) beams
 - iii) girders
 - iv) joists
 - v) open bar joists
 - vi) open ceilings
 - vii) trusses
19. Identify practices that contribute to environmental protection.
20. Describe procedures to dispose of and recycle sprinklers and nozzles.

Practical Objectives:

N/A

SSI-235**Trade-Related Math II****Learning Outcomes:**

- Demonstrate knowledge of mathematical calculations used in pipe rolled offsets.

2025 Red Seal Occupational Standard Reference:

N/A

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Describe the procedures to calculate rolling 90° pipe offsets.
 - i) offset travel/advancement
2. Describe the procedures to calculate rolling 45° pipe offsets.
 - i) offset travel/advancement
3. Describe the procedures to calculate linear 45° pipe offsets with trigonometry formulas.
 - i) 45° offset
 - ii) parallel offsets
 - iii) equal spread offsets

Practical Objectives:

N/A

SSI-240**Trade-Related Science I****Learning Outcomes:**

- Demonstrate knowledge of the properties of water.
- Demonstrate knowledge of the properties of fire.

2025 Red Seal Occupational Standard Reference:

N/A

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Describe the 3 states of water.
2. Describe the expansion rate of water.
3. Describe the procedure to determine capacity of water.
4. Describe the fire tetrahedron.

Practical Objectives:

N/A

SSI-245

Detection Devices

Learning Outcomes:

- Demonstrate knowledge of wet and dry pilot lines, their associated pilot line detectors, characteristics, applications and operation.
- Demonstrate knowledge of the procedures used to install and verify operation of wet and dry pilot lines and their associated pilot line detectors.
- Demonstrate knowledge of heat-actuated devices (HADs), their components, characteristics, applications and operation.
- Demonstrate knowledge of electrical detection systems and their components.
- Demonstrate knowledge of the procedures used to install HADs and their associated components.
- Demonstrate knowledge of regulatory requirements for wet and dry pilot lines and their associated pilot line detectors.
- Demonstrate knowledge of regulatory requirements for HADs.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 16.01 Installs wet and dry pilot lines.
- 16.02 Installs heat-actuated devices. (HADs)
- 16.05 Installs electrical detection systems.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with heat-actuated devices (HADs), and wet and dry pilot lines.
2. Identify hazards and describe safe work practices pertaining to HADs and wet and dry pilot lines and their associated pilot line detectors.
3. Interpret codes, standards and regulations pertaining to HADs and wet and dry pilot lines and their associated pilot line detectors.
4. Interpret information pertaining to HADs and wet and dry pilot lines and their associated pilot line detectors found on drawings and specifications.
5. Identify types of wet and dry pilot lines and their associated pilot line detectors, and

describe their characteristics, parameters, applications and operating principles.

6. Identify types of HADs and describe their characteristics, parameters, applications and operating principles.
 - i) types of HADs
 - fixed temperature
 - rate of rise detectors
 - linear heat detector
 - ii) parameters
 - spacing
 - temperature
 - type
7. Identify types of electrical detection systems and components, and describe their characteristics, applications and operating principles.
 - i) types of electrical detection systems
 - single zone
 - cross zone
 - addressable
 - conventional
 - ii) components
 - smoke detectors
 - heat detectors
 - releasing panels
8. Identify tools and equipment relating to HADs and wet and dry pilot lines and their associated pilot line detectors, and describe their applications and procedures for use.
9. Describe the procedures used to install, pressure test and verify operation of wet and dry pilot lines and their associated pilot line detectors.
10. Describe the procedures used to install and verify operation HADs, equipment and components.
11. Identify requirements for testing HADs and components, and describe associated procedures.

Practical Objectives:

N/A

SSI-250

Signal-Initiating Devices

Learning Outcomes:

- Demonstrate knowledge of alarm-initiating devices, their components, characteristics, applications and operation.
- Demonstrate knowledge of supervisory-initiating devices, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures used to install and verify operation of alarm-initiating devices.
- Demonstrate knowledge of procedures used to install and verify operation of supervisory-initiating devices.
- Demonstrate knowledge of regulatory requirements for signal initiating devices.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

3.01 Interprets codes, standards, regulations and procedures.

3.03 Uses documentation and reference material.

17.01 Installs alarm-initiating devices.

17.02 Installs supervisory-initiating devices.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with signal-initiating devices.
2. Identify hazards and describe safe work practices pertaining to signal-initiating devices.
3. Interpret codes, standards and regulations pertaining to signal-initiating devices.
4. Interpret information pertaining to signal-initiating devices found on drawings and specifications.
5. Identify types of signal-initiating devices, and describe their characteristics, applications and operating principles.
 - i) alarm-initiating devices
 - paddle-type flow switches
 - pressure switches
 - ii) supervisory-initiating devices
 - low air pressure

- low water pressure
 - tamper (switches)
6. Identify tools and equipment relating to signal-initiating devices and describe their applications and procedures for use.
 7. Describe the procedures used to install and verify operation of signal-initiating devices.
 8. Identify installation locations for signal-initiating devices.
 9. Identify practices that contribute to environmental protection.

Practical Objectives

1. Adjust and verify a pressure switch.
2. Troubleshoot signal-initiating devices using multimeters.

SSI-255

Deluge and Preaction Systems

Learning Outcomes:

- Demonstrate knowledge of preaction/deluge systems, their components, characteristics, applications and operating principles.
- Demonstrate knowledge of procedures to install and test preaction/deluge systems.
- Demonstrate knowledge of regulatory requirements for preaction/deluge systems.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 14.03 Installs preaction/deluge systems.

Suggested Hours:

30 Hours

Theoretical Objectives:

1. Define terminology associated with preaction/deluge systems.
2. Identify hazards and describe safe work practices pertaining to preaction/deluge systems.
3. Interpret codes, standards and regulations pertaining to preaction/deluge systems.
4. Interpret information pertaining to preaction/deluge systems found on drawings and specifications.
5. Identify types of preaction systems, and describe their characteristics, applications and operating principles.
 - i) non-interlock
 - ii) single interlock
 - iii) double interlock
6. Identify types of deluge systems and describe their operating principles and applications.
 - i) deluge
 - ii) high speed deluge
7. Identify trim components used on preaction/deluge valves and describe their design variations and applications.
 - i) solenoid actuators

- ii) diaphragm actuators
- 8. Identify tools and equipment relating to preaction/deluge systems and describe their applications and procedures for use.
- 9. Identify types of alarms that a preaction/deluge valve will operate.
- 10. Identify supplemental fire detection systems and describe their operating principles and applications.
 - i) electric
 - ii) pneumatic
 - iii) hydraulic
- 11. Identify the system controls required for preaction/deluge systems.
- 12. Describe the procedures used to install system controls required for preaction/deluge systems.
- 13. Explain the requirements for drainage of preaction/deluge systems.
- 14. Describe the procedures used to lay out and install preaction/deluge systems.
- 15. Describe the procedures used to trim preaction/deluge valves.
- 16. Describe procedures used to verify operation of equipment and components.
- 17. Identify the requirements for pressure testing of preaction/deluge systems and describe associated procedures.
- 18. Describe and apply mathematical concepts related to applications and preaction/deluge systems layout and installation.
 - i) converting decimal feet in a linear measurement
 - ii) geometry
 - iii) Pythagorean theorem

Practical Objectives:

- 1. Trim, test and reset a valve.

SSI-600

Principles of Electricity

Learning Outcomes:

- Demonstrate knowledge of the basic concepts of electricity.

2025 Red Seal Occupational Standard Reference:

N/A

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with electricity as related to the trade.
2. Identify hazards and describe safe work practices pertaining to electricity.
3. Identify electrical-related information found on drawings and specifications.
4. Identify tools and equipment used to test electrical circuits and describe their applications and procedures for use.
5. Identify and explain Ohm's law.
6. Identify types of current and describe their characteristics and applications.
 - i) direct current (DC)
 - ii) alternating current (AC)
7. Identify types of electrical circuits and describe their characteristics, operation and applications.
 - i) series
 - ii) parallel
 - iii) series-parallel
8. Identify types of related electrical equipment and components, and describe their characteristics, operation and applications.

Practical Objectives:

1. Use a multimeter.

Level 3

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SSI-300

Portable Fire Extinguishers

Learning Outcomes:

- Demonstrate knowledge of portable fire extinguishers, their components, characteristics, applications and operation.
- Demonstrate knowledge of installation requirements and procedures to install portable fire extinguishers.
- Demonstrate knowledge of procedures to inspect portable fire extinguishers.
- Demonstrate knowledge of jurisdictional training and certification requirements to inspect portable fire extinguishers.
- Demonstrate knowledge of regulatory requirements for portable fire extinguishers.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

15.02 Installs portable extinguishers

20.03 Performs scheduled inspections of portable fire extinguishers.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with portable fire extinguishers.
2. Identify hazards and describe safe work practices pertaining to portable fire extinguishers and their installation.
3. Interpret codes, standards and regulations pertaining to portable fire extinguishers.
4. Identify jurisdictional training and certification requirements to inspect portable fire extinguishers.
5. Describe the liabilities and responsibilities for the installation and inspection of portable fire extinguishers.
6. Interpret information pertaining to portable fire extinguishers found on drawings and specifications.
7. Identify classes and types of portable fire extinguishers, and describe their characteristics, applications and operating principles.
 - i) classes

- A (ordinary combustibles)
 - B (flammable liquids)
 - C (electrical)
 - D (combustible metals)
 - F (oils and fats)
 - K (commercial cooking equipment)
- ii) types
- wet and dry chemical
 - carbon dioxide
 - water-based
 - clean agent
 - foam
 - dry powder
8. Identify components of portable fire extinguishers and describe their characteristics, applications and operating principles.
 9. Identify tools and equipment relating to portable fire extinguishers and describe their applications and procedures for use.
 10. Describe installation requirements and procedures to install portable fire extinguishers.
 11. Identify installation locations for portable fire extinguishers.
 - i) cabinet
 - ii) wall-mount
 - iii) wheeled
 - iv) vehicle mount
 12. Describe the procedures used to operate portable fire extinguishers.
 13. Describe the procedures used to inspect portable fire extinguishers.
 14. Identify the frequency of inspection of portable fire extinguishers.
 15. Identify practices that contribute to environmental protection, including procedures to dispose of and recycle portable fire extinguishers.

Practical Objectives:

N/A

SSI-305

Fire Pumps and Controllers

Learning Outcomes:

- Demonstrate knowledge of pumps, drivers, controllers, their components, characteristics, applications and operation.
- Demonstrate knowledge of water source connections.
- Demonstrate knowledge of the procedures used to install fire pumps, drivers, controllers and their components.
- Demonstrate knowledge of requirements and methods used to determine location of pumps, drivers, controllers and components.
- Demonstrate knowledge of regulatory requirements for pumps, drivers, controllers and components and for determining their location.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 8.01 Determines location of pumps, drivers, controllers and components.
- 8.02 Installs pumps, drivers, controllers and components.

Suggested Hours:

24 Hours

Theoretical Objectives:

1. Define terminology associated with locating and installing pumps, drivers, controllers and components.
2. Identify hazards and describe safe work practices pertaining to locating and installing pumps, drivers, controllers and components.
3. Interpret codes, standards and regulations pertaining to locating and installing pumps, drivers, controllers and components.
4. Interpret information pertaining to locating and installing pumps, drivers, controllers and components found on drawings and specifications.
5. Identify types of pumps, drivers, controllers and their components, and describe their characteristics, applications and operating principles.
 - i) pumps
 - centrifugal

- positive displacement
 - vertical shaft
 - horizontal split case
 - end suction
 - vertical inline
 - ii) drivers
 - diesel
 - electric
 - steam
 - iii) components
 - sensing lines
 - test headers
 - flow meters
 - by-pass connections
 - relief and circulation valves
 - controller cabinets
 - suction and discharge piping
 - anti-vortex plate
 - suction strainers
 - check valves
 - control valves
6. Identify tools and equipment relating to locating and installing pumps, drivers, controllers and components, and describe their applications and procedures for use.
 7. Identify types of water supplies used for fire pump installations and hydraulic system demand requirements.
 - i) municipal
 - ii) private
 - iii) limited
 - tanks
 - reservoirs
 - iv) raw water
 8. Identify the impacts of cross-connection control as they relate to fire pump and hydraulic demand.
 9. Describe procedures used to install fire pumps, drivers, controllers and their components.
 10. Identify practices that contribute to environmental protection such as location of fuel tanks and lines.

Practical Objectives:

1. Determine pump efficiency based on flow calculations.
2. Plot a pump curve on a graph.

SSI-310

Private Water Supply Systems

Learning Outcomes:

- Demonstrate knowledge of water tanks and related equipment, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to install water tanks and related equipment.
- Demonstrate knowledge of regulatory requirements for water tanks and related equipment.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 3.06 Performs layout of systems.
- 10.01 Installs water tanks.
- 10.02 Installs related equipment.

Suggested Hours:

15 Hours

Theoretical Objectives:

1. Define terminology associated with water tanks and related equipment.
2. Identify hazards and describe safe work practices pertaining to water tanks and related equipment.
3. Interpret codes, standards and regulations pertaining to water tanks and related equipment.
4. Interpret information pertaining to water tanks and related equipment found on drawings and specifications.
5. Identify types of water tanks and related equipment, and describe their characteristics, applications and operating principles.
 - i) water tanks
 - gravity
 - pressure
 - below-grade (underground)
 - residential water supply
 - ground level storage

- break
 - ii) characteristics of water tanks
 - metal
 - plastic
 - wood
 - embankment-supported rubberized fabric (ESRF)
 - iii) related equipment
 - overflow
 - vent
 - water level
 - drain
 - heating system
 - access hatches
 - pumps
6. Identify types of controlling devices and describe their characteristics and applications.
 - i) pressure switches
 - ii) agitators
 - iii) circulators
 - iv) control valves
 - v) thermostats
 - vi) check valves
 - vii) auto-fill valve
 - viii) shut-off valve
 7. Identify tools and equipment pertaining to water tanks and related equipment and describe their applications and procedures for use.
 8. Identify types of water supplies and describe their purpose and installation requirements.
 - i) raw water sources
 - ii) tanks
 - iii) cisterns
 9. Identify types of water connections and associated components and describe their characteristics and applications.
 10. Identify methods used for cathodic and corrosion protection of tanks.
 11. Identify the arrangement of fire pump suction components.
 12. Describe procedures used to lay out and install water tanks and related equipment.
 13. Describe supply and discharge piping requirements.

14. Describe and apply mathematical concepts related to private water supply systems.
 - i) converting decimal feet in a linear measurement
 - ii) head pressures
 - iii) water volume
 - iv) unit conversion
15. Identify practices of water tank installation and securement that prevent water loss and collapse of water tanks.

Practical Objectives:

N/A

SSI-315

Drawings III

Learning Outcomes:

- Demonstrate knowledge of sprinkler system drawings and on-site drawings.
- Demonstrate knowledge of the procedures to read and interpret drawings and on-site drawings.
- Demonstrate knowledge of the procedures to draw and label orthographic and isometric drawings.
- Demonstrate knowledge of the procedures to read and interpret information about fire protection found in drawings.

2025 Red Seal Occupational Standard Reference:

3.02 Uses drawings and specifications.

3.04 Plans job tasks and procedures.

Suggested Hours:

15 Hours

Theoretical Objectives:

1. Define terminology associated with reading and sketching drawings.
2. Identify drawings and on-site drawings and describe their characteristics and applications.
 - i) drawings
 - isometric
 - orthographic
 - 3-D
 - digital or paper
 - spool sheets
 - schematic
 - architectural
 - mechanical
 - structural
 - electrical
 - shop
 - site service
 - ii) on-site drawings
 - sketches
 - mark-ups
 - as-builts

3. Identify types of lines found on sprinkler system drawings.
 - i) object (visible)
 - ii) hidden
 - iii) center
 - iv) dimension
 - v) extension
 - vi) section cutting
 - vii) material section
4. Identify symbols found on sprinkler system drawings.
5. Identify types of views found on sprinkler system drawings.
 - i) plan
 - ii) elevation
 - iii) sections
 - iv) details
 - v) site
 - vi) plot
 - vii) survey
6. Identify divisions of drawings and divisions of specifications and describe their purpose.
 - i) divisions of drawings
 - architectural
 - structural
 - mechanical
 - electrical
 - site-service
 - landscaping
 - specifications
 - schedules
 - ii) divisions of specifications
 - architectural
 - structural
 - electrical
 - fire suppression
 - plumbing
 - HVAC
7. Identify types of scales and describe their characteristics and applications.
 - i) metric scale (SI)
 - ii) architect scale (imperial)
 - iii) engineer scales

8. Identify drafting tools and drawing equipment and computer aided design, and describe their applications and procedures for use.
9. Identify views and drawings of a building, and describe their purpose.
10. Interpret fire protection information found on drawings.
11. Interpret dimensions on drawings.
12. Describe the procedures used to interpret drawings in both metric and imperial units.
13. Describe the procedures used to prepare and create orthographic and isometric drawings.
14. Describe the procedures used to interpret and convert metric and imperial scaling.
15. Describe the procedures used to perform material take-offs.
16. Describe the procedures used to create as-built drawings.

Practical Objectives:

1. Generate a material take-off list.
2. Generate an as-built drawing.

SSI-320

Commissioning Water Supply Systems

Learning Outcomes:

- Demonstrate knowledge of water supply systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of the procedures used to commission water supply systems.
- Demonstrate knowledge of regulatory requirements for commissioning of water supply systems.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 4.01 Commissions water supply systems.

Suggested Hours:

24 Hours

Theoretical Objectives:

1. Define terminology associated with the commissioning of water supply systems.
2. Identify workplace hazards and describe safe work practices pertaining to the commissioning of water supply systems.
3. Interpret codes, standards and regulations pertaining to commissioning water supply systems.
4. Interpret information pertaining to the commissioning of water supply systems found on drawings and specifications.
5. Identify water supply systems and components and describe their characteristics, applications and operating principles.
6. Identify tests performed on water supply systems.
 - i) hydrostatic
 - ii) flushing
 - iii) acceptance test (commissioning) of fire pump
 - iv) component operation
 - cross-connection control assemblies
 - water tanks

- reservoirs

7. Describe procedures used to commission water supply systems.
8. Calculate flow rates and discharge pressures.
9. Identify practices that mitigate and control water discharge during commissioning.

Practical Objectives:

N/A

SSI-325

System Drainage II

Learning Outcomes:

- Demonstrate knowledge of system drainage, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to lay out and install system drainage and components.
- Demonstrate knowledge of regulatory requirements for system drainage layout and installation.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

3.01 Interprets codes, standards, regulations and procedures.

13.06 Installs system drainage.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Define terminology associated with system drainage.
2. Identify hazards and describe safe work practices pertaining to system drainage.
3. Interpret codes, standards and regulations pertaining to system drainage.
4. Interpret information pertaining to system drainage found on drawings and specifications.
5. Identify types of system drainage, and describe their characteristics, applications and operating principles.
 - i) main
 - ii) auxiliary
 - iii) sectional
6. Identify system drainage components and describe their location, purpose and operation.
 - i) drain valves
 - ii) drain cups
 - iii) air gaps
7. Identify tools and equipment relating to system drainage and describe their applications

and procedures for use.

8. Identify grading requirements for system drainage.
9. Describe procedures used to lay out and install system drainage and components.
10. Identify practices that contribute to environmental protection.
11. Describe procedures to dispose of and recycle system drainage components.

Practical Objectives:

N/A

SSI-330

Commissioning Fire Protection Systems

Learning Outcomes:

- Demonstrate knowledge of fire protection systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures used to commission fire protection systems.
- Demonstrate knowledge of regulatory requirements for commissioning fire protection systems.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 4.02 Commissions fire protection systems.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with the commissioning of fire protection systems.
2. Identify safety hazards and describe safe work practices pertaining to the commissioning of fire protection systems.
3. Interpret codes, standards and regulations pertaining to the commissioning of fire protection systems.
4. Interpret information pertaining to participating in the commissioning of fire protection systems found on drawings and specifications.
5. Identify fire protection systems and components, and describe their characteristics, applications and operating principles.
6. Identify tools and equipment used to commission fire protection systems and describe their procedures for use.
7. Describe procedures used to commission fire protection systems.
8. Identify acceptance tests and verifications to be performed on fire protection systems.

- i) pressure
 - hydrostatic
 - pneumatic
 - ii) operation
9. Identify practices that contribute to environmental protection during commissioning procedures.

Practical Objectives:

N/A

SSI-335 Standpipe and Hose Systems

Learning Outcomes:

- Demonstrate knowledge of standpipe and hose systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to install standpipe and hose systems.
- Demonstrate knowledge of regulatory requirements for installing standpipe and hose systems.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 13.04 Installs hangers, supports, restraints and bracing.
- 14.07 Installs standpipe systems.

Suggested Hours:

21 Hours

Theoretical Objectives:

1. Define terminology associated with standpipe and hose systems.
2. Identify hazards and describe safe work practices pertaining to standpipe and hose systems.
3. Interpret codes, standards and regulations pertaining to standpipe and hose systems.
4. Interpret code requirements pertaining to flushing connections in piping systems.
5. Interpret information pertaining to standpipe and hose systems found on drawings and specifications.
6. Identify types of standpipe and hose systems, and describe their characteristics, applications and operating principles.
 - i) wet pipe
 - ii) dry pipe
 - iii) manual
 - iv) automatic
 - v) combined
 - vi) semi-automatic dry

7. Identify the classes of standpipe systems and describe their characteristics and applications.
 - i) class I
 - ii) class II
 - iii) class III
8. Identify types of hoses, hose valves and associated fittings, and describe their characteristics and applications.
9. Identify types of hose cabinets and hose stations.
10. Identify types of hose spray nozzles and describe their applications.
11. Identify hanger, support and restraint requirements for standpipe and hose systems.
12. Identify tools and equipment relating to standpipe and hose systems and describe their applications and procedures for use.
13. Identify the factors to consider and the requirements to determine standpipe system design.
 - i) pipe sizing
 - ii) flow rate
 - iii) pressures
 - iv) hose valve location
 - v) hose thread connection
 - vi) authority having jurisdiction (AHJ)
 - vii) gauge location
 - viii) codes, standards and regulations
14. Describe the procedures used to lay out and install standpipe and hose systems.
15. Describe the procedures used to install hose cabinets and stations, and associated equipment.
16. Describe the procedures used to install hose spray nozzles.
17. Describe the procedures used to verify operation of equipment and components.
18. Identify the requirements for pressure testing of standpipe and hose systems and describe the associated procedures.

Practical Objectives:

N/A

SSI-340

Cross-Connection Control

Learning Outcomes:

- Demonstrate knowledge of cross-connection control assemblies, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to install cross-connection control assemblies.
- Demonstrate knowledge of training and certification requirements to test cross-connection control assemblies.
- Demonstrate knowledge of regulatory requirements for cross-connection control assemblies.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 13.05 Installs cross-connection control assemblies.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with cross-connection control assemblies.
2. Identify hazards and describe safe work practices pertaining to cross-connection control assemblies.
3. Interpret codes, standards and regulations pertaining to cross-connection control assemblies.
4. Identify training and certification requirements regarding testing of cross-connection control assemblies.
5. Interpret information pertaining to cross-connection control assemblies found on drawings and specifications.
6. Identify types of cross-connection control assemblies, and describe their characteristics, applications and operating principles.
 - i) reduced pressure backflow (RP)
 - ii) double check valve assembly (DCVA)
 - iii) air gap

7. Identify tools and equipment pertaining to cross-connection control assemblies and describe their applications and procedures for use.
8. Identify the factors to consider for selecting and installing cross-connection control assemblies.
9. Identify means for forward flow testing, and describe their requirements, arrangements and installation location.
10. Describe the procedures used to install cross-connection control assemblies.
11. Identify practices that contribute to environmental protection.

Practical Objectives:

N/A

SSI-345

Water Supply, Hydrants and Fire Department Connections

Learning Outcomes:

- Demonstrate knowledge of procedures, training and certification and regulatory requirements for trenching and backfilling.
- Demonstrate knowledge of communication practices for trenching and backfilling.
- Demonstrate knowledge of underground piping and components, characteristics, applications, operations and installation procedures.
- Demonstrate knowledge of clearances and tolerances for underground piping.
- Demonstrate knowledge of water source connections for underground piping.
- Demonstrate knowledge of procedures for flushing of underground systems.
- Demonstrate knowledge of regulatory requirements for underground piping and components and for flushing underground systems.
- Demonstrate knowledge of fire department connections, their components, characteristics, applications, operation and installation procedures.
- Demonstrate knowledge of procedures to determine location, size and type of fire department connections.
- Demonstrate knowledge of regulatory requirements for fire department connections.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 7.01 Supervises trenching and backfilling
- 7.02 Installs underground piping and components.
- 7.03 Flushes underground system.
- 9.01 Determines location, size and type of fire department connections.
- 9.02 Installs fire department connection piping and components.

Suggested Hours:

30 Hours

Theoretical Objectives:

1. Define terminology associated with water supply, hydrants, fire department connections and underground piping and components.
2. Identify worksite hazards and describe safe work practices pertaining to water supply, hydrants and fire department connections.
 - i) personal safety
 - ii) safety of infrastructure

- iii) environmental requirements
3. Identify worksite hazards and describe safe work practices pertaining to underground piping and components and the flushing of underground systems.
 4. Identify hazards and describe safe work practices for trenching and backfilling.
 5. Interpret codes, standards and regulations pertaining to water supply, hydrants, fire department connections, underground piping and their components.
 6. Identify codes, standards and authority having jurisdiction (AHJ) and occupational health and safety) OHS requirements related to trenching, backfilling and flushing of underground systems.
 7. Identify training and certification requirements for workers performing trenching and backfilling.
 8. Interpret information pertaining to water supply, hydrants, fire department connections and underground piping and components found on drawings and specifications.
 9. Interpret information about trenching and backfilling found on drawings and specifications.
 10. Identify tools and equipment relating to water supply, hydrants, fire department connections and describe their applications and procedures for use.
 11. Identify tools and equipment relating to installing underground piping and component installation and describe their applications and procedures for use.
 12. Identify tools and equipment relating to flushing of underground systems and describe their applications and procedures for use.
 - i) pitot tube
 - ii) Y-isolation valves
 - iii) fire hoses
 - iv) fire hydrant wrenches
 - v) diffusers
 - vi) burlap sack with tie wires
 13. Identify tools and equipment and PPE related to trenching and backfilling.
 14. Identify types of access equipment related to trenching and backfilling.

15. Identify types of backfill material, and describe their characteristics and applications.
 - i) sand
 - ii) screened gravel
 - iii) native fill
16. Identify types of public water sources and their connection requirements.
17. Identify location of water source connection.
18. Identify types of fire department connections, and describe their characteristics, applications, installation requirements and operating principles.
 - i) fire department connections
 - free-standing
 - exposed
 - flush
 - dry
 - ii) installation requirements
 - requirements for check valves
 - placement of fire department connections
 - requirements for drainage of fire department connections
 - requirements for hose thread connections (AHJ)
19. Identify types of hose connections.
 - i) National Hose Standard (NHS)
 - ii) Canadian Standards Association (CSA)
 - iii) quick-connect
 - iv) Storz
 - v) Canadian Standard Thread (CST)
 - vi) AHJ approved
20. Identify underground piping and components, and describe their characteristics, applications and operating principles.
21. Describe procedures to install underground piping and components.
22. Describe procedures to install underground fire mains.
 - i) joining
 - ii) controlling thrust
 - iii) trenching and shoring
 - iv) bedding and backfilling
23. Identify where clearances and tolerances between piping and surrounding environment are considered to prevent damage due to stress loads.

24. Describe the procedures used to flush underground systems.
25. Identify required flow rates for flushing of underground systems.
26. Describe procedures to determine location, size and type of fire department connections.
27. Identify required proximity of fire department connections in relation to hydrants and fire department access.
28. Describe procedures to install fire department connection piping and components.
29. Describe shoring requirements and piping requirements for trenching and backfilling.
30. Describe site conditions that affect trenching and backfilling.
31. Describe procedures for trenching and backfilling.
32. Describe laydowns and spoil piles for debris backfill material and installation material.
33. Describe procedures to inspect trenches.
34. Describe audible/visual procedures for communicating during trenching and backfilling.
35. Identify environmentally sound practices to discharge treated water.
36. Describe procedures to dispose of and recycle spoil waste.
37. Describe procedures to dispose of and recycle underground piping and components.

Practical Objectives:

1. Assemble underground piping.

SSI-350

Trade-Related Math III

Learning Outcomes:

- Demonstrate knowledge of calculations involving geometric shapes.
- Demonstrate knowledge of system hydraulic calculations.

2025 Red Seal Occupational Standard Reference:

N/A

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Describe the procedures to calculate areas and volumes of tanks.
2. Describe the procedures to calculate pipe friction loss and pipe sizing.
3. Describe the procedures to calculate flow rate and sprinkler operating pressure requirements.
4. Describe the procedure to calculate water supply pressure and flow rate.
5. Describe the procedure to determine hydraulic calculation areas and density requirements.
6. Describe the procedure to calculate velocity and gravity pressure.
7. Describe the procedures to calculate linear 45° pipe offsets with trigonometry formulas.
 - i) 45° offset
 - ii) parallel offsets
 - iii) equal spread offsets

Practical Objectives

N/A

SSI-355**Trade-Related Science II****Learning Outcomes:**

- Demonstrate knowledge of the properties of water.

2025 Red Seal Occupational Standard Reference:

N/A

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Describe the procedures to convert between imperial and metric temperature.
2. Describe the procedures to calculate the weight of water.
3. Describe the composition, density, specific gravity and specific weight of fluids.
4. Describe the procedures to calculate gauge and head pressure based on elevations.
5. Describe the procedure to convert between gauge and head pressure.

Practical Objectives:

N/A

Level 4

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SSI-400

Commissioning Specialty Fire Suppression Systems

Learning Outcomes:

- Demonstrate knowledge of specialty fire suppression systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to commission specialty fire suppression systems.
- Demonstrate knowledge of testing specialty fire suppression systems.
- Demonstrate knowledge of regulatory requirements for commissioning specialty fire suppression systems.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 4.03 Commissions specialty fire suppression systems.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with the commissioning of specialty fire suppression systems.
2. Identify safety hazards and describe safe work practices pertaining to the commissioning of specialty fire suppression systems.
3. Interpret codes, standards and regulations pertaining to the commissioning of specialty fire suppression systems.
4. Explain liabilities and responsibilities for testing specialty fire suppression systems.
5. Interpret information pertaining to the commissioning of specialty fire suppression systems found on drawings and specifications.
6. Identify specialty fire suppression systems and components, and describe their characteristics, applications and operating principles.
7. Identify tools and equipment used to commission specialty fire suppression systems and describe their procedures for use.

8. Describe procedures used to commission and test specialty fire suppression systems.
9. Identify requirements of acceptance testing of specialty fire suppression systems.

Practical Objectives:

N/A

SSI-405

Wet and Dry Chemical Extinguishing Systems

Learning Outcomes:

- Demonstrate knowledge of wet and dry chemical systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to install, service, maintain and remove wet and dry chemical systems.
- Demonstrate knowledge of testing wet and dry chemical systems.
- Demonstrate knowledge of regulatory requirements for wet and dry chemical systems.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 3.06 Performs layout of systems.
- 15.01 Installs dry and wet chemical, clean agent and carbon dioxide systems.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with wet and dry chemical systems.
2. Identify hazards and describe safe work practices pertaining to wet and dry chemical systems.
3. Interpret codes, standards, regulations pertaining to wet and dry chemical systems.
4. Explain liabilities and responsibilities for testing of wet and dry chemical systems.
5. Interpret information pertaining to wet and dry chemical systems found on drawings and specifications.
6. Identify types of wet and dry chemical systems, and describe their characteristics, applications and operating principles.
7. Identify the components of wet and dry chemical systems and describe their purpose and operation.

8. Identify types of pipe and fittings used for wet and dry chemical systems.
9. Identify tools and equipment relating to wet and dry chemical systems and describe their applications and procedures for use.
10. Describe fixed pipe systems.
 - i) total flooding
 - ii) local application
11. Identify extinguishing properties of wet and dry chemical systems.
12. Identify the factors to consider and limitations pertaining to wet and dry chemical systems.
13. Identify the installation requirements for wet and dry chemical systems and components.
14. Describe procedures used to lay out, install, service, maintain and remove wet and dry chemical systems and components.
15. Describe procedures to test wet and dry chemical systems.
16. Identify requirements of acceptance testing of wet and dry chemical systems.
17. Describe procedures used to verify operation of equipment and their components.
18. Identify practices that contribute to environmental protection.
19. Identify practices that contribute to net-zero and carbon neutral commitments.
20. Describe procedures to dispose of and recycle wet and dry chemical systems.

Practical Objectives:

N/A

SSI-410

Water Mist and Hybrid Extinguishing Systems

Learning Outcomes:

- Demonstrate knowledge of water mist and hybrid systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures used to install water mist and hybrid systems.
- Demonstrate knowledge of regulatory requirements for lay out and install water mist and hybrid systems and components.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 3.06 Performs layout of systems.
- 14.06 Installs water mist and hybrid systems.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with water mist and hybrid systems.
2. Identify hazards and describe safe work practices pertaining to water mist and hybrid systems.
3. Interpret codes, standards and regulations pertaining to water mist and hybrid systems and components.
4. Interpret information pertaining to water mist and hybrid systems found on drawings and specifications.
5. Identify types of water mist and hybrid systems, and describe their characteristics, applications and operating principles.
 - i) single fluid
 - ii) twin fluid
 - iii) high pressure
 - iv) medium pressure
 - v) low pressure
6. Identify tools and equipment relating to water mist and hybrid systems and describe their applications and procedures for use.

7. Describe procedures used to lay out and install water mist and hybrid systems and components.
8. Identify system controls for water mist and hybrid systems and their installation requirements.
 - i) materials
 - ii) supports and hangers
 - iii) system actuation
 - iv) testing
 - v) manufacturers' specifications/training
 - vi) handling and storage
9. Explain requirements for drainage of water mist and hybrid systems.
10. Describe procedures used to verify operation of equipment and components.
11. Identify requirements for pressure testing of water mist and hybrid systems and describe the associated procedures.

Practical Objectives:

N/A

SSI-415

Foam Extinguishing Systems

Learning Outcomes:

- Demonstrate knowledge of foam systems, their components, characteristics applications and operation.
- Demonstrate knowledge of procedures used to install foam systems.
- Demonstrate knowledge of regulatory requirements for foam systems.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 3.06 Performs layout of systems.
- 14.05 Installs foam systems.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with foam systems.
2. Identify hazards and describe safe work practices pertaining to foam systems.
 - i) environmental considerations
 - ii) containment
 - iii) disposal
3. Interpret codes, standards and regulations pertaining to foam systems.
4. Interpret information pertaining to foam systems found on drawings and specifications.
5. Identify types of foam systems, and describe their characteristics, applications and operating principles.
6. Identify types of concentrate used in foam systems and describe their characteristics and applications.
 - i) aircraft hangers
 - ii) fuel storage tanks
 - iii) chemical manufacturing and storage facilities
7. Identify tools and equipment relating to foam systems and describe their applications

and procedures for use.

8. Identify system controls required for foam systems.
9. Identify supplemental fire detection systems and describe their operating principles and applications.
 - i) electric
 - ii) pneumatic
 - iii) hydraulic
10. Describe procedures used to lay out and install foam systems and components.
11. Describe the installation requirements of foam systems.
 - i) materials
 - ii) hangers
 - iii) supports and bracing
 - iv) system actuation
 - v) testing
 - vi) manufacturers' specifications
12. Describe procedures used to fill foam concentrate tanks.
13. Explain the requirements for drainage of the system.
14. Explain the operation of a balanced pressure proportioning system.
15. Describe procedures used to trim foam systems.
16. Explain the operation of a pressure proportioning tank with and without bladder.
17. Describe procedures used to verify operation of equipment and components.
18. Identify requirements for pressure testing of foam systems and describe the associated procedures.
19. Identify practices that contribute to environmental protection.
20. Describe procedures to dispose of and recycle foam systems.

Practical Objectives:

N/A

SSI-420

Carbon Dioxide Extinguishing Systems

Learning Outcomes:

- Demonstrate knowledge of carbon dioxide systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures used to install, service, maintain and remove carbon dioxide systems.
- Demonstrate knowledge of testing carbon dioxide systems.
- Demonstrate knowledge of regulatory requirements for carbon dioxide systems.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 3.06 Performs layout of systems.
- 15.01 Installs dry and wet chemical, clean agent and carbon dioxide systems.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with carbon dioxide systems.
2. Identify hazards and describe safe work practices pertaining to carbon dioxide systems.
3. Interpret codes, standards, regulations pertaining to carbon dioxide systems.
4. Explain liabilities and responsibilities for testing of carbon dioxide systems.
5. Interpret information pertaining to carbon dioxide systems found on drawings and specifications.
6. Identify types of carbon dioxide systems, and describe their characteristics, applications and operating principles.
7. Identify components of carbon dioxide systems and describe their purpose and operation.
8. Identify types of pipe and fittings used for carbon dioxide systems.

9. Identify tools and equipment relating to carbon dioxide systems and describe their applications and procedures for use.
10. Describe fixed pipe systems.
 - i) total flooding
 - ii) local application
11. Explain the properties of carbon dioxide and inert gases.
12. Identify the extinguishing properties of carbon dioxide systems.
13. Define limited extinguishing ability of carbon dioxide systems.
14. Identify factors to consider and limitations pertaining to carbon dioxide systems.
15. Identify containment requirements for carbon dioxide systems.
16. Identify the installation requirements for carbon dioxide systems and components.
17. Describe procedures used to lay out, install, service, maintain and remove carbon dioxide systems and components.
18. Describe the procedures used to calculate the quantity of carbon dioxide extinguishing agent required for a system.
19. Describe procedures to test carbon dioxide systems.
20. Identify requirements of acceptance testing of carbon dioxide systems.
21. Describe procedures used to verify operation of equipment and their components.
22. Identify practices that contribute to environmental protection.
23. Identify practices that contribute to net-zero and carbon neutral commitments.
24. Describe procedures to dispose of and recycle carbon dioxide systems.

Practical Objectives:

N/A

SSI-425

Clean Agent Extinguishing Systems

Learning Outcomes:

- Demonstrate knowledge of clean agent systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures used to install, service, maintain and remove clean agent systems.
- Demonstrate knowledge of testing clean agent systems.
- Demonstrate knowledge of regulatory requirements for clean agent systems.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 3.06 Performs layout of systems.
- 15.01 Installs dry and wet chemical, clean agent and carbon dioxide systems.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with clean agent systems.
2. Identify hazards and describe safe work practices pertaining to clean agent systems.
3. Interpret codes, standards, regulations pertaining to clean agent systems.
4. Explain liabilities and responsibilities for testing of clean agent systems.
5. Interpret information pertaining to clean agent systems found on drawings and specifications.
6. Identify types of clean agent systems, and describe their characteristics, applications and operating principles.
7. Identify the components of clean agent systems, and describe their purpose and operation.
8. Identify types of pipe and fittings used for clean agent systems.

9. Identify tools and equipment relating to clean agent systems, and describe their applications and procedures for use.
10. Describe fixed pipe systems.
 - i) total flooding
 - ii) local application
11. Identify clean agent system media and their properties.
12. Identify extinguishing properties of clean agent systems.
13. Identify the factors to consider and limitations pertaining to clean agent systems.
14. Identify containment requirements for clean agent systems.
15. Identify installation requirements for clean agent systems.
16. Describe procedures used to lay out, install, service, maintain and remove clean agent systems and components.
17. Describe the procedures used to calculate the quantity of clean agent extinguishing agent required for a system.
18. Describe procedures to test clean agent systems.
19. Identify requirements of acceptance testing of clean agent systems.
20. Describe procedures used to verify operation of equipment and their components.
21. Identify practices that contribute to environmental protection.
22. Identify practices that contribute to net-zero and carbon neutral commitments.
23. Describe procedures to dispose of and recycle clean agent systems.

Practical Objectives:

N/A

SSI-430

Specialty Detection Devices

Learning Outcomes:

- Demonstrate knowledge of spark detection systems, air sampling systems and electrical detection systems, their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to install and verify operation of specialty detection devices.
- Demonstrate knowledge of regulatory requirements for specialty detection devices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 16.03 Installs spark detection systems.
- 16.04 Installs air sampling systems.
- 16.05 Installs electrical detection systems.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with specialty detection devices.
2. Identify hazards and describe safe work practices pertaining to specialty detection devices.
3. Interpret codes, standards and regulations pertaining to spark detection systems, air sampling systems and electrical detection systems.
4. Interpret information pertaining to specialty detection devices found on drawings and specifications.
5. Identify types of spark detection systems, air sampling systems, electrical detection systems and their components, and describe their characteristics, parameters, applications and operating principles.
6. Identify tools and equipment relating to specialty detection devices, and describe their applications and procedures for use.
7. Describe procedures to install and verify operation of spark detection systems, air sampling systems, electrical detection systems, their equipment and components.

8. Identify requirements for testing specialty detection devices and components and describe associated procedures.

Practical Objectives:

N/A

SSI-435**Fire Protection Systems Inspection, Testing and Maintenance****Learning Outcomes:**

- Demonstrate knowledge of fire protection systems and their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to inspect, test, troubleshoot, repair and maintain fire protection systems and their components.
- Demonstrate knowledge of regulatory requirements for fire protection systems and their components.
- Demonstrate knowledge of jurisdictional training and certification requirements to inspect and test fire protection systems and their components.
- Demonstrate knowledge of relationship between sprinkler systems and fire panels.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 18.01 Performs scheduled fire protection system inspections.
- 18.02 Performs scheduled fire protection system tests.
- 19.01 Troubleshoots fire protection systems.
- 19.02 Repairs deficiencies of fire protection systems.
- 19.03 Performs scheduled maintenance of fire protection systems.

Suggested Hours:

39 Hours

Theoretical Objectives:

1. Define terminology associated with inspecting, testing, troubleshooting, repairing and maintaining fire protection systems and their components.
2. Identify hazards and describe safe work practices pertaining to inspecting, testing, troubleshooting, repairing and maintaining fire protection systems and their components.
3. Interpret codes, standards and regulations pertaining to fire protection systems and their components and the inspection of them.
4. Explain liabilities and responsibilities for inspecting, testing, troubleshooting, repairing and maintaining fire protection systems.

5. Interpret information pertaining to fire protection systems and their components found on drawings and specifications.
6. Identify types of fire protection systems and their components, and describe their characteristics, applications and operating principles.
7. Identify types of fire panels and signals, and describe their operation and purpose.
 - i) fire panels
 - alarm
 - release
 - annunciator
 - ii) signals
 - fire alarms
 - supervisory
 - trouble
 - water flow
8. Identify tools and equipment used to inspect, test, troubleshoot, repair and maintain fire protection systems and their components, and describe their applications and procedures for use.
9. Identify frequency of the inspection, testing and maintenance of fire protection systems and components.
10. Identify testing requirements for signaling devices.
11. Identify the testing and troubleshooting methods for signaling devices.
12. Identify requirements for testing fire protection systems and their components, and describe associated procedures.
13. Identify requirements for inspecting and testing systems that have been modified or repaired.
14. Identify types of impairments and deficiencies, and explain associated recommendations and requirements.
 - i) pre-plan
 - ii) emergency
 - iii) critical
 - iv) noncritical
15. Identify common causes of fire protection system deficiencies and failures.
16. Describe the operation of release devices.

17. Describe procedures used to verify operation of equipment and their components.
18. Describe procedures to inspect, test, troubleshoot and repair fire protection systems and their components.
19. Describe scheduled maintenance procedures for fire protection systems and their components.
20. Describe procedures to inspect and test repaired fire protection systems and their components.
21. Describe procedures to inspect maintained fire protection systems and their components.
22. Describe procedures used to inspect and test fire pump units and components.
23. Describe procedures used to repair and maintain fire pump units and components (excluding drivers and controllers).
24. Identify requirements for inspecting backflow preventers.
25. Describe procedures used to test backflow prevention devices.
26. Describe procedures used to inspect and test hydrants and fire department connections for operation and drainage.
27. Describe procedures used to repair and maintain hydrants and fire department connections.
28. Describe procedures used to shut down and reactivate sprinkler systems and associated alarms and supervisory devices.
29. Identify practices that contribute to environmental protection during testing and repair procedures.
 - i) de-chlorination of discharged water
 - ii) disposal of fire protection materials
30. Describe procedures to handle, dispose of and recycle fire protection systems, materials and their components.

Practical Objectives:

N/A

SSI-440**Specialty Fire Suppression Systems Inspection, Testing and Maintenance****Learning Outcomes:**

- Demonstrate knowledge of specialty fire suppression systems and equipment and their components, characteristics, applications and operation.
- Demonstrate knowledge of procedures to inspect, test, troubleshoot and repair specialty fire suppression systems and their components.
- Demonstrate knowledge of scheduled maintenance procedures for specialty fire suppression systems and equipment and their components.
- Demonstrate knowledge of relationships between specialty fire suppression systems and fire panels.
- Demonstrate knowledge of regulatory requirements for specialty fire suppression systems and their equipment and components.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
- 3.03 Uses documentation and reference material.
- 20.01 Performs scheduled fire suppression system inspections.
- 20.02 Performs scheduled fire suppression system and equipment tests.
- 21.01 Troubleshoots specialty fire suppression systems and equipment.
- 21.02 Repairs deficiencies of specialty fire suppression systems and equipment.
- 21.03 Performs scheduled maintenance of specialty fire suppression systems and equipment.

Suggested Hours:

18 Hours

Theoretical Objectives:

1. Define terminology associated with specialty fire suppression systems.
2. Identify hazards, and describe safe work practices for inspecting, testing, troubleshooting, repairing and maintaining specialty fire suppression systems and equipment and their components.
3. Identify codes, standards and regulations for specialty fire suppression systems and equipment and their components.

4. Explain liabilities and responsibilities for inspecting, testing, troubleshooting, repairing and maintaining specialty fire suppression systems and equipment.
5. Interpret information about specialty fire suppression systems and equipment and their components found on drawings and specifications.
6. Identify types of specialty fire suppression systems and equipment and their components, and describe their characteristics, applications and operating principles.
7. Identify types of fire panels and signals, and describe their operation and purpose.
 - i) fire panels
 - alarm
 - releasing control
 - ii) signals
 - trouble
 - supervisory
 - pre-discharge alarm
 - releasing alarm
8. Identify tools and equipment used to inspect, test, troubleshoot, repair and maintain specialty fire suppression systems and equipment and their components, and describe their procedures for use.
9. Identify frequency of inspection, testing and maintenance of specialty fire suppression systems and equipment.
10. Identify common causes of specialty fire suppression systems and equipment failures.
11. Identify types of impairments and deficiencies, and explain associated recommendations and requirements.
 - i) pre-plan
 - ii) emergency
 - iii) critical
 - iv) noncritical
12. Identify testing requirements for signaling devices.
13. Identify testing and troubleshooting methods for signaling and actuation devices.
14. Identify requirements for testing specialty fire suppression systems and equipment that have been modified or repaired.

15. Describe operation of release devices.
 - i) hydraulic
 - ii) pneumatic
 - iii) electrical
 - iv) manual
16. Describe operation of actuation devices.
17. Describe procedures to inspect, test, troubleshoot and repair specialty fire suppression systems and equipment and their components.
18. Describe procedures to perform functional test of repaired specialty fire suppression systems and equipment and their components.
19. Describe scheduled maintenance procedures for specialty fire suppression systems and equipment and their components.
20. Describe procedures used to shut down and reactivate specialty fire suppression systems and equipment and associated alarms and supervisory devices.
21. Describe procedures used to shut down and reactivate associated alarms and supervisory devices for specialty fire suppression systems and equipment.
22. Describe procedures to verify operational status of system after troubleshooting.
23. Describe procedures to dispose of and recycle specialty fire suppression systems and equipment and their components and materials.

Practical Objectives:

N/A

SSI-445

Modifying Existing Systems

Learning Outcomes:

- Demonstrate knowledge of modifications to existing systems and their components.
- Demonstrate knowledge of procedures to perform existing system modifications.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

- 3.01 Interprets codes, standards, regulations and procedures.
14.08 Modifies existing system.

Suggested Hours:

9 Hours

Theoretical Objectives:

1. Define terminology associated with modifying existing systems.
2. Identify hazards and describe safe work practices for existing system modifications.
3. Identify codes, standards and regulations for existing system modifications.
4. Identify sprinklers that can be reused in existing system modifications.
5. Identify system components that are acceptable to reuse or recondition.
 - i) sprinklers
 - ii) hose valves and hoses
 - iii) alarm valves
6. Identify tools, equipment and PPE related to existing system modifications.
7. Identify types of existing system modifications, and describe their characteristics and applications.
 - i) removing components
 - ii) replacing components
 - iii) relocating components
 - iv) adding components
8. Describe procedures to perform existing system modifications.

9. Describe procedures to coordinate impairment and restoration
10. Describe procedures to remove systems from service for the purpose of abandonment.
11. Describe procedures to test system additions and revamping.
12. Identify hydraulic performance impact of retrofitting cross-connection assemblies on existing systems.
13. Identify practices that contribute to environmental protection when dealing with used water discharge and drainage.
14. Identify practices that contribute to net-zero and carbon neutral commitments with reuse, reconditioning or recycling components.

Practical Objectives:

N/A

SSI-450

Job Planning

Learning Outcomes:

- Demonstrate knowledge of the procedures to plan and organize jobs.
- Demonstrate knowledge of procedures to receive materials and verify orders.
- Demonstrate knowledge of procedures used to store, secure, organize and maintain materials.
- Demonstrate knowledge of procedures used to plan for and prepare work sites.
- Demonstrate knowledge of regulatory requirements for planning and organizing jobs and preparing work sites.
- Demonstrate knowledge of sustainability and environmental stewardship practices.

2025 Red Seal Occupational Standard Reference:

3.04 Plans job tasks and procedures.

3.05 Prepares work site.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Define terminology associated with job planning activities.
2. Identify hazards, and describe safe work practices to store, secure, organize and maintain materials.
3. Identify hazardous materials and supplies, and describe safe work practices to handle, store, secure, transport and dispose of them.
4. Identify location and types of site safety equipment.
 - i) fire extinguishers
 - ii) eye-wash stations
 - iii) first aid kits
 - iv) spill kits
 - v) air monitoring devices
5. Identify codes, standards and regulations for preparing work sites.
6. Identify sources of information relevant to job planning.
 - i) documentation

- ii) drawings
 - iii) related professionals
 - iv) clients
 - v) codes
 - vi) standards and regulations
7. Identify the factors to consider for determining job requirements.
 - i) tools and equipment
 - ii) personnel
 - iii) materials
 - iv) permits
 8. Identify factors that affect material take-off lists, and describe their applications and the procedures used to produce them.
 - i) material estimation
 - ii) material installation
 - iii) job specifications
 9. Describe procedures used to plan job tasks.
 - i) scheduling
 - ii) estimating
 - iii) coordinating site access
 10. Describe the procedures used to receive and verify delivered materials.
 11. Describe the procedures used to store, organize and maintain inventory.
 12. Describe procedures used to prepare work sites.
 13. Describe the procedures used to prepare work sites.
 14. Identify practices that contribute to environmental protection.
 15. Identify materials that can be reconditioned, reused or recycled.
 16. Describe procedures to dispose of and recycle materials.

Practical Objectives:

1. Generate a complete job plan.
 - i) tools list
 - ii) labour quantities
 - iii) site access
 - iv) safety requirements
 - v) regulatory requirements

SSI-455

Continuous Learning

Learning Outcomes:

- Demonstrate knowledge of upgrading in new trade practices and procedures.
- Demonstrate knowledge of personal and professional development plan.
- Demonstrate knowledge of upgrading in emerging technologies.

2020 Red Seal Occupational Standard Reference:

- 5.01 Upskills in new trade practices and procedures.
- 5.02 Upskills in emerging technologies.

Suggested Hours:

3 Hours

Theoretical Objectives:

1. Identify continuous learning methods.
2. Describe the importance of staying current on new trade practices and procedures.
3. Identify supports and resources for learning.
 - i) professional networks and associations
 - ii) manufacturers' seminars
 - iii) collaboration with colleagues and community members
 - iv) counselling
 - v) mentoring
 - vi) peer support groups
 - vii) online resources
 - viii) language supports
 - ix) accommodations
4. Identify elements of a professional portfolio.
 - i) résumé
 - ii) certificates
 - iii) licenses
 - iv) diplomas
 - v) degrees
 - vi) transcripts
 - vii) marketable skills
 - viii) professional accomplishments
 - ix) work samples

- x) awards
 - xi) references
5. Identify link between professionalism and continuous learning.
 6. Describe how to assess personal learning needs.
 7. Identify factors that may impact learning needs and goals.
 - i) new technology
 - ii) sector trends and practice
 - iii) skills updating
 - iv) legislative and regulatory changes
 - v) barriers to learning
 8. Identify types of information on emerging technologies.
 9. Identify types of emerging technologies.
 - i) Robotic Total Stations (RTS)
 - ii) Building Information Management (BIM)
 - iii) laser scanning
 - iv) remote inspection software
 - v) digital document management systems
 10. Describe importance of staying current on emerging technologies.
 11. Explain the use of emerging technologies.
 12. Identify emerging technologies for specific tasks.
 13. Describe emerging technologies pertaining to worksite tasks.

Practical Objectives:

N/A

MENT-701 Mentoring II

Learning Outcomes:

- Demonstrate knowledge of effective communication practices as a mentor.
- Demonstrate knowledge of strategies for teaching workplace skills.

2020 Red Seal Occupational Standard Reference:

- 6.01 Uses communication techniques.
- 6.02 Uses mentoring techniques.

Suggested Hours:

6 Hours

Theoretical Objectives:

1. Identify the different roles played by a workplace mentor.
2. Identify strategies to create a supportive learning environment.
3. Identify techniques for effective communication as a mentor.
 - i) constructive feedback
 - ii) active listening
 - iii) leading meetings and one-on-one sessions
4. Describe the steps in teaching a skill.
 - i) identifying the point of lesson
 - ii) linking the lesson
 - iii) demonstrating the skill
 - iv) providing practice
 - v) giving feedback
 - vi) assessing skill and progress
5. Identify strategies to assist in teaching a skill while meeting individual learning needs.
 - i) principles of instruction
 - ii) coaching skills
6. Explain how to adjust a lesson for various situations.

Practical Objectives:

N/A

SSI-470

Program Review

Learning Outcomes:

- Demonstrate knowledge of the Red Seal Occupational Standard and its relationship to the Red Seal Examination.
- Demonstrate knowledge of overall comprehension of the trade in preparation for the Red Seal Examination.

2025 Red Seal Occupational Standard Reference:

Entire Red Seal Occupational Standard (RSOS)

Suggested Hours:

30 Hours

Theoretical Objectives:

1. Define terminology associated with an RSOS.
 - i) major work activities (MWA)
 - ii) tasks
 - iii) sub-tasks
2. Explain how an RSOS is developed and the link it has with the Red Seal Examination.
 - i) development
 - ii) validation
 - iii) MWA, task and subtask weightings
 - iv) examination breakdown (pie-chart)
3. Identify Red Seal products and describe their use for preparing for the Red Seal Examination.
 - i) Red Seal website
 - ii) examination preparation guide
 - iii) sample questions
 - iv) Red Seal exam breakdown
 - v) self-assessment
4. Explain the relationship between the RSOS and the Atlantic Apprenticeship Curriculum Standard (AACCS).
5. Review processes to perform common occupational skills for the Sprinkler Fitter trade as identified in the RSOS.
 - i) maintenance of safe and healthy workplace

- ii) use of tools and equipment
 - iii) organization of work
 - iv) commissioning systems
 - v) maintenance of continuous learning
 - vi) use of communication and mentoring techniques
6. Review processes to perform water supply installation for the Sprinkler Fitter trade as identified in the RSOS.
- i) underground water supplies
 - ii) fire pump units
 - iii) fire department connections
 - iv) private water supply systems
7. Review processes to perform piping installation for the Sprinkler Fitter trade as identified in the RSOS.
- i) preparation of pipe, tube and fittings
 - ii) installation of pipe, tube and fittings
 - iii) installation of piping components
8. Review processes to perform installations and layout of fire protection systems and devices for the Sprinkler Fitter trade as identified in the RSOS.
- i) installation of water-based systems
 - ii) installation of specialty fire suppression systems
 - iii) installation of detection devices
 - iv) installation of signal-initiating devices
9. Review processes to inspect, test and maintain (ITM) fire protection systems for the Sprinkler Fitter trade as identified in the RSOS.
- i) inspection and testing of fire protection systems
 - ii) maintenance and repair of fire protection systems
 - iii) inspection and testing of specialty fire suppression systems
 - iv) maintenance and repair of specialty fire suppression systems

Practical Objectives:

N/A

Feedback and Revisions

This AACCS will be amended periodically; comments or suggestions for improvements should be directed to:

New Brunswick:

Skilled Trades NB
Post-Secondary Education, Training and
Labour
470 York St. PO Box 6000
Fredericton, NB E3B 5H1
Tel: 506-453-2260
Toll Free in NB: 1-855-453-2260
www.gnb.ca

Prince Edward Island:

Apprenticeship, Training and Certification
Workforce, Advanced Learning and
Population
176 Great George St., PO Box 2000
Charlottetown, PE C1A 7N8
Tel: 902-368-4460
www.apprenticeship.pe.ca

Newfoundland and Labrador:

Apprenticeship and Trades Certification
Confederation Bldg., West Block
Prince Philip Dr., PO Box 8700
St. John's, NL A1B 4J6
Toll Free: 1-877-771-3737
www.gov.nl.ca/atcd

Nova Scotia:

Nova Scotia Apprenticeship Agency
1256 Barrington St.
Halifax, NS B3J 1Y6
Tel: 902-424-5651
Toll Free in NS: 1-800-494-5651
www.nsapprenticeship.ca

Any comments or suggestions received will be reviewed and considered to determine the course of action required. If the changes are deemed to be minor, they will be held for implementation during the next review cycle. If immediate change is deemed appropriate and approved by the Atlantic Trade Advisory Committee, it will result in a revision to this version of the AACCS and will be detailed in the following section.

Version Changes

Revision Date	Section	Description of Change
2025	All sections	Updated from three to four levels. In substantive alignment with national sequencing.