Curriculum Standard

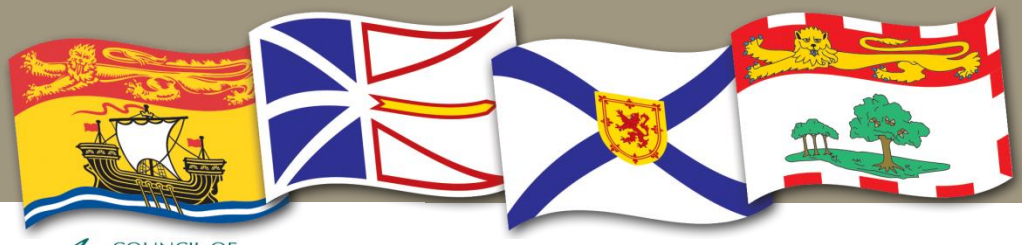
Atlantic Apprenticeship

Atlantic Workforce Partnership

SHEET METAL WORKER

Version: 2021

Revised: N/A



COUNCIL OF ATLANTIC PREMIERS
CONSEIL DES PREMIERS MINISTRES DE L'ATLANTIQUE

Employment and Social Development Canada
Emploi et Développement social Canada

Atlantic Apprenticeship Curriculum Standard

Sheet Metal Worker

PLAN OF TRAINING

Atlantic Apprenticeship Curriculum Standard

Sheet Metal Worker

April 2022

Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Immigration, Population Growth and Skills
Apprenticeship and Trades Certification Division

Approved by:

Leonard Harnum

Chairperson, Provincial Apprenticeship and Certification Board

Date: April 6, 2022

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 Sheet Metal Worker program.

This document contains all the technical training elements required to complete the Sheet Metal Worker apprenticeship program and has been developed based on the 2018 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	2022-2023
Level 2	2023-2024
Level 3	2024-2025
Level 4	2025-2026

** 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 Sheet Metal Worker trade 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. Programs which have been deemed acceptable by the jurisdictional apprenticeship authority will be identified in transfer credit matrix developed through the Atlantic Apprenticeship Harmonization Project.

Acknowledgements

The development of the Atlantic Apprenticeship Curriculum Standard (AACS) is an initiative of the Atlantic Apprenticeship Council's Atlantic Apprenticeship Harmonization Project (AAHP) through the Atlantic Workforce Partnership and Employment and Social Development Canada.

The Atlantic Apprenticeship Council wishes to acknowledge the contributions of the following industry and instructional representatives on the Atlantic Trade Advisory Committee (ATAC) who participated in the development of this document in March, 2020.

Derek DesRochers	New Brunswick
Thomas Goodine	New Brunswick
Paul Lavigne	New Brunswick
Wayne Intveld	Newfoundland and Labrador
Chesley Lucas	Newfoundland and Labrador
Matthew Quilty	Newfoundland and Labrador
Kyle Dempsey	Nova Scotia
Craig Hard	Nova Scotia
Donald Philippo	Nova Scotia
Chris Maye	Prince Edward Island
Kent Walsh	Prince Edward Island

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.

Table of Contents

User Guide

Atlantic Apprenticeship Curriculum Standards (AACS) are developed based on Red Seal Occupational Standards (RSOS), National Occupational Analyses (NOA), Interprovincial Program Guides (IPG), if available, and extensive industry consultation. This document represents the minimum content to be delivered as part of the harmonized Atlantic program for the Sheet Metal Worker trade.

The AACS's are deliberately constructed for ease of use and flexibility of structure in order 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 Examination administered through the jurisdictional Apprenticeship Authority.

User Guide (continued)

The 2018 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 in order 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 in order 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.

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; tell 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 or not it is working correctly.

Essential Skills Profiles

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.

Essential Skills Profiles describe how workers in various occupations use each of the key essential skills. They include:

- a brief description of the occupation;
- examples of tasks that illustrate how each essential skill is applied; and,
- complexity ratings that indicate the level of difficulty of the example tasks.

Essential Skills profiles can be found on the Employment and Social Development Canada (ESDC) website at www.canada.ca/skills-success.

The development and improvement of these Essential Skills is inherent throughout the apprenticeship training program as apprentices work towards achieving journeyperson status.

Level Structure

Level 1 – 8 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SMW-100	Safety	24	18
SMW-105	Tools and Equipment	18	21
SMW-110	Sheet Metal Math Fundamentals	24	23
SMW-115	Communication and Trade Documentation	3	24
SMW-120	Gas Metal Arc Welding (GMAW) I	24	27
SMW-125	Resistance Spot Welding	6	29
SMW-130	Oxy-Fuel and Plasma Arc Cutting	18	31
SMW-135	Soft Soldering	12	33
SMW-140	Stationary and Mobile Work Platforms	6	35
SMW-145	Hoisting, Rigging and Positioning Equipment	21	37
SMW-150	Metallurgy	12	40
SMW-155	Pattern Development (Simple and Straight Line)	33	42
SMW-160	Fabrication and Installation Fundamentals	39	44

Level 2 – 8 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SMW-200	Drawings I	30	48
SMW-205	Hard Soldering and Brazing	3	50
SMW-210	Parallel Line Development (Round Duct Fittings)	30	52
SMW-215	Radial Line Development (Right Cones)	30	54
SMW-220	Triangulation (Plan View)	30	56
SMW-225	Shielded Metal Arc Welding (SMAW)	24	58
SMW-230	Gas Metal Arc Welding (GMAW) II	6	60
SMW-235	Design and Field Modification	12	62
SMW-240	Architectural Metal Systems	12	64
SMW-245	Chimneys, Breeching and Venting	12	68
SMW-250	Air Quality Management	9	70
SMW-255	Air Handling Systems I	39	72
SMW-260	Exterior Components	3	76

Level Structure (continued)

Level 3 – 7 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SMW-300	Parallel Line Development (Architectural Applications)	30	80
SMW-305	Radial Line Development (Oblique Fittings)	30	82
SMW-310	Triangulation (From Elevation)	30	84
SMW-315	Duct System Design	27	85
SMW-320	Gas Tungsten Arc Welding (GTAW)	30	87
SMW-325	Specialty Products	18	89
SMW-330	Air Handling Systems II	6	92
SMW-335	Introduction to Testing and Balancing	12	94
SMW-340	Electrical Principles	12	96
SMW-345	System Maintenance and Repair	12	98
SMW-350	Marine Products	3	101

Level 4 – 6 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SMW-400	Pattern Development (Computer Technology)	6	104
SMW-405	Material Handling Systems	30	105
SMW-410	Thermal Insulation, Lagging/Cladding and Flashing	21	108
SMW-415	Testing, Adjusting and Balancing (TAB)	30	110
SMW-420	Commissioning	9	112
SMW-425	Job Planning	18	114
SMW-430	Drawings II	30	116
SMW-435	Mentoring	6	117
SMW-440	Program Review	30	119

2018 RSOS Sub-task to AACS Unit Comparison

RSOS Sub-Task		AACS Unit	
Task A-1 – Performs safety-related functions.			
A-1.01	Uses personal protective equipment (PPE) and safety equipment.	SMW-100	Safety
A-1.02	Maintains safe work environment.	SMW-100	Safety
			Throughout all levels
A-1.03	Performs lock-out and tag-out procedures.	SMW-100	Safety
Task A-2 – Uses and maintains tools and equipment.			
A-2.01	Uses hand and portable power tools.	SMW-105	Tools and Equipment
			Throughout all levels
A-2.02	Uses shop tools and equipment.	SMW-105	Tools and Equipment
			Throughout all levels
A-2.03	Uses gas metal arc welding (GMAW) equipment.	SMW-120	Gas Metal Arc Welding (GMAW) I
		SMW-230	Gas Metal Arc Welding (GMAW) II
A-2.04	Uses resistance spot welding equipment.	SMW-125	Resistance Spot Welding
A-2.05	Uses gas tungsten arc welding (GTAW) equipment.	SMW-320	Gas Tungsten Arc Welding (GTAW)
A-2.06	Uses shielded metal arc welding (SMAW) equipment.	SMW-225	Shielded Metal Arc Welding (SMAW)
A-2.07	Uses oxy-fuel and plasma arc cutting equipment.	SMW-130	Oxy-Fuel and Plasma Arc Cutting
A-2.08	Uses soldering and brazing equipment.	SMW-135	Soft Soldering
		SMW-205	Hard Soldering and Brazing
A-2.09	Uses measuring and layout equipment.	SMW-105	Tools and Equipment
A-2.10	Uses testing and inspection devices.	SMW-250	Air Quality Management
		SMW-335	Introduction to Testing and Balancing
		SMW-340	Electrical Principles
		SMW-345	System Maintenance and Repair
		SMW-415	Testing, Adjusting and Balancing (TAB)
A-2.11	Uses stationary and mobile work platforms.	SMW-140	Stationary and Mobile Work Platforms
A-2.12	Uses hoisting, rigging and positioning equipment.	SMW-145	Hoisting, Rigging and Positioning Equipment

RSOS Sub-Task		AACS Unit	
Task A-3 – Organizes work.			
A-3.01	Uses trade-related documentation.	SMW-115	Communication and Trade Documentation
		SMW-425	Job Planning
			Throughout all levels
A-3.02	Interprets drawings.	SMW-200	Drawings I
		SMW-425	Job Planning
		SMW-430	Drawings II
			Throughout all levels
A-3.03	Organizes materials and equipment for project.	SMW-115	Communication and Trade Documentation
		SMW-425	Job Planning
A-3.04	Performs basic design and field modifications.	SMW-235	Design and Field Modification
		SMW-315	Duct System Design
		SMW-430	Drawings II
Task A-4 – Uses communication and mentoring techniques.			
A-4.01	Uses communication techniques.	SMW-115	Communication and Trade Documentation
A-4.02	Uses mentoring techniques.	SMW-435	Mentoring
Task B-5 – Performs pattern development.			
B-5.01	Develops patterns using simple and straight line layout.	SMW-155	Pattern Development (Simple and Straight Line)
B-5.02	Develops patterns using parallel line method.	SMW-210	Parallel Line Development (Round Duct Fittings
		SMW-300	Parallel Line Development (Architectural Applications)
B-5.03	Develops patterns using radial line method.	SMW-215	Radial Line Development (Right Cones)
		SMW-305	Radial Line Development (Oblique Fittings)
B-5.04	Develops patterns using triangulation method.	SMW-220	Triangulation (Plan View)
		SMW-310	Triangulation (From Elevation)
B-5.05	Uses computer technology for pattern development.	SMW-400	Pattern Development (Computer Technology)
Task B-6 – Fabricates sheet metal components for air and material handling systems.			
B-6.01	Cuts ductwork, fittings and components.	SMW-160	Fabrication and Installation Fundamentals
B-6.02	Forms ductwork, fittings and components.	SMW-160	Fabrication and Installation Fundamentals
		SMW-150	Metallurgy

RSOS Sub-Task		AACS Unit	
		SMW-255	Air Handling Systems I
		SMW-315	Duct System Design
		SMW-405	Material Handling Systems
B-6.03	Insulates ductwork, fittings and components.	SMW-160	Fabrication and Installation Fundamentals
		SMW-150	Metallurgy
B-6.04	Assembles ductwork, fittings and components.	SMW-160	Fabrication and Installation Fundamentals
		SMW-255	Air Handling Systems I
		SMW-315	Duct System Design
		SMW-405	Material Handling Systems
B-6.05	Fabricates dampers.	SMW-405	Material Handling Systems
B-6.06	Fabricates hanger systems, supports and bases.	SMW-160	Fabrication and Installation Fundamentals
Task B-7 – Fabricates flashing, roofing, sheeting and cladding.			
B-7.01	Cuts metal for flashing, roofing, sheeting and cladding.	SMW-240	Architectural Metal Systems
B-7.02	Forms flashing, roofing, sheeting and cladding.	SMW-240	Architectural Metal Systems
Task B-8 – Fabricates specialty products.			
B-8.01	Cuts material for specialty products.	SMW-325	Specialty Products
B-8.02	Forms specialty products.	SMW-325	Specialty Products
B-8.03	Assembles specialty products.	SMW-325	Specialty Products
B-8.04	Finishes specialty products.	SMW-325	Specialty Products
Task C-9 – Prepares installation site.			
C-9.01	Performs on-site measurements.	SMW-255	Air Handling Systems I
		SMW-330	Air Handling Systems II
		SMW-405	Material Handling Systems
C-9.02	Performs demolitions for renovations.	SMW-255	Air Handling Systems I
		SMW-330	Air Handling Systems II
		SMW-405	Material Handling Systems
C-9.03	Installs penetrations and sleeves.	SMW-255	Air Handling Systems I
		SMW-330	Air Handling Systems II
		SMW-405	Material Handling Systems
C-9.04	Installs supports and bases.	SMW-255	Air Handling Systems I
		SMW-330	Air Handling Systems II
		SMW-405	Material Handling Systems
C-9.05	Installs hangers, cables, braces and brackets.	SMW-255	Air Handling Systems I
		SMW-330	Air Handling Systems II
		SMW-405	Material Handling Systems

RSOS Sub-Task		AACS Unit	
Task C-10 – Installs and connects chimneys, breeching and venting to exhaust appliances and mechanical equipment.			
C-10.01	Installs chimney.	SMW-245	Chimneys, Breeching and Venting
C-10.02	Connects appliances or mechanical equipment to chimney and breeching.	SMW-245	Chimneys, Breeching and Venting
C-10.03	Installs high efficiency appliances and mechanical equipment.	SMW-245	Chimneys, Breeching and Venting
Task C-11 – Installs air handling system components.			
C-11.01	Installs air handling equipment.	SMW-160	Fabrication and Installation Fundamentals
		SMW-255	Air Handling Systems I
		SMW-250	Air Quality Management
		SMW-330	Air Handling Systems II
		SMW-340	Electrical Principles
C-11.02	Installs sheet metal ducts and fittings.	SMW-160	Fabrication and Installation Fundamentals
		SMW-255	Air Handling Systems I
C-11.03	Installs dampers.	SMW-160	Fabrication and Installation Fundamentals
		SMW-255	Air Handling Systems I
C-11.04	Installs fire and fire/smoke dampers.	SMW-255	Air Handling Systems I
C-11.05	Installs registers, grilles, diffusers and louvers.	SMW-160	Fabrication and Installation Fundamentals
		SMW-255	Air Handling Systems I
C-11.06	Installs terminal boxes.	SMW-330	Air Handling Systems II
C-11.07	Installs coils.	SMW-330	Air Handling Systems II
C-11.08	Installs system component accessories.	SMW-250	Air Quality Management
		SMW-255	Air Handling Systems I
		SMW-330	Air Handling Systems II
		SMW-405	Material Handling Systems
C-11.09	Installs plenums.	SMW-160	Fabrication and Installation Fundamentals
		SMW-330	Air Handling Systems II
Task C-12 – Installs material handling system components.			
C-12.01	Installs pneumatic and gravity material handling system components.	SMW-405	Material Handling Systems
C-12.02	Installs mechanized material handling system components.	SMW-405	Material Handling Systems

RSOS Sub-Task		AACS Unit	
Task C-13 – Applies thermal insulation, lagging, cladding and flashing.			
C-13.01	Applies thermal insulation to components.	SMW-410	Thermal Insulation, Lagging/Cladding and Flashing
C-13.02	Applies lagging and cladding to components.	SMW-410	Thermal Insulation, Lagging/Cladding and Flashing
C-13.03	Applies flashing to components.	SMW-410	Thermal Insulation, Lagging/Cladding and Flashing
Task C-14 – Performs leak testing, air balancing and commissioning.			
C-14.01	Performs leak tests.	SMW-335	Introduction to Testing Balancing
		SMW-415	Testing, Adjusting and Balancing (TAB)
C-14.02	Performs testing, adjusting and balancing (TAB).	SMW-335	Introduction to Testing Balancing
		SMW-415	Testing, Adjusting and Balancing (TAB)
C-14.03	Participates in the commissioning of air and material handling systems.	SMW-335	Introduction to Testing Balancing
		SMW-420	Commissioning
Task D-15 – Installs metal roofing and cladding/siding systems.			
D-15.01	Lays out roof and walls.	SMW-240	Architectural Metal Systems
D-15.02	Installs insulation, isolation material and building envelope components.	SMW-240	Architectural Metal Systems
D-15.03	Installs roofing and cladding/siding system components.	SMW-240	Architectural Metal Systems
D-15.04	Seals exposed joints.	SMW-240	Architectural Metal Systems
D-15.05	Installs decking.	SMW-240	Architectural Metal Systems
Task D-16 – Installs exterior components.			
D-16.01	Prepares surface.	SMW-260	Exterior Components
D-16.02	Fastens exterior components.	SMW-260	Exterior Components
Task D-17 – Installs specialty products.			
D-17.01	Installs stainless steel specialty products.	SMW-325	Specialty Products
D-17.02	Installs non-stainless steel specialty products.	SMW-325	Specialty Products
D-17.03	Installs marine products.	SMW-350	Marine Products
Task E-18 – Performs scheduled maintenance.			
E-18.01	Performs maintenance inspections.	SMW-345	System Maintenance and Repair
E-18.02	Services components.	SMW-345	System Maintenance and Repair
Task E-19 – Repairs faulty systems and components.			
E-19.01	Diagnoses system faults.	SMW-345	System Maintenance and Repair
E-19.02	Repairs worn or faulty components.	SMW-345	System Maintenance and Repair

Level 1

SMW-100 Safety

Learning Outcomes:

- Demonstrate knowledge of personal protective equipment (PPE) and safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices and procedures.
- Demonstrate knowledge of regulatory requirements pertaining to PPE, safety and safety equipment.
- Demonstrate knowledge of inspection procedures.
- Demonstrate knowledge of lock-out and tag-out procedures and equipment.

2018 Red Seal Occupational Standard Reference:

1.01 Uses personal protective equipment (PPE) and safety equipment.
1.02 Maintains safe work environment.
1.03 Performs lock-out and tag-out procedures.

Suggested Hours:

24 Hours

Objectives and Content:

1. Identify workplace hazards and describe safe work practices.
   i) fire
   ii) asbestos
   iii) hazardous openings
   iv) overhead hazards

2. Interpret safety regulations pertaining to locking out and tagging out hazardous energy equipment.
   i) electricity
   ii) steam
   iii) fuel sources
   iv) hydraulic systems
   v) pneumatic systems
   vi) magnetic systems
   vii) gravitational systems

3. Interpret safety and health regulations pertaining to PPE, safety and safety equipment.
   i) Workplace Hazardous Materials Information System (WHMIS)
   ii) Occupational Health and Safety (OHS)
   iii) Workers Compensation Board (WCB)

iv) site-specific regulations

4. Identify types of PPE and safety equipment and describe their applications and limitations.
   i) respirators
   ii) fall arrest harnesses
   iii) fall restraint equipment
   iv) welding face shields
   v) hearing
   vi) eye
   vii) foot and hand protection
   viii) high visibility safety vests
   ix) fire extinguishers
   x) welding screens
   xi) barricades
   xii) head protection

5. Identify training requirements for PPE and safety equipment.

6. Describe PPE and safety equipment operations.

7. Describe the roles and responsibilities of employers and employees with respect to the selection and use of PPE and safety equipment.

8. Describe the procedures used to inspect, maintain and store PPE and safety equipment.

9. Identify site-specific lock-out and tag-out procedures.

10. Identify lock-out and tag-out equipment.
    i) lock and key
    ii) lock-out scissor clamps
    iii) lock-box

11. Identify situations, circuits and equipment that require lock-out and tag-out.

12. Describe the procedures used to lock-out and tag-out equipment and for removing lock-out and tag-out devices.

13. Describe company safety policies and procedures.

14. Describe good housekeeping practices.
    i) sweeping
    ii) removing debris
    iii) storing materials and tools and equipment

15. Describe the procedures used to inspect a site.

Practical Objectives:

N/A

SMW-105 Tools and Equipment

Learning Outcomes:

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

2018 Red Seal Occupational Standard Reference:

2.01 Uses hand and portable power tools.
2.02 Uses shop tools and equipment.
2.09 Uses measuring and layout equipment.

Suggested Hours:

18 Hours

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to the use of tools and equipment.

2. Interpret warning and caution labels and manufacturers' specifications pertaining to shop tools and equipment.

3. Identify types of hand tools and describe their applications and procedures for use.

4. Identify types of portable power tools and describe their applications and procedures for use.

5. Identify types of shop tools and equipment and describe their applications and procedures for use.

6. Identify types of Computer Numerical Control (CNC) equipment and describe their applications.
   i) plasma tables
   ii) press brakes

7. Identify types of measuring and layout equipment and describe their applications and procedures for use.
   i) measuring equipment
      - squares
      - scribers
      - measuring tape
      - drafting compass
      - architectural rule
      - t-square
      - set squares
      - drafting board
   ii) layout equipment
      - trammel points
      - scratch awls
      - dividers

8. Identify criteria for replacement or repair of hand and portable power tools.

9. Identify criteria for replacement or repair of shop tools and equipment.

10. Describe the procedures used to inspect and maintain hand and portable power tools.

11. Describe specifications and regulations for the use of powder-actuated tools.

12. Describe the procedures used to inspect and maintain shop tools and equipment.

13. Describe the procedures used to inspect and maintain measuring and layout equipment.

14. Describe drafting tools and their application.

Practical Objectives:

1. Inspect, maintain and use tools to manufacturer's recommendations.

SMW-110 Sheet Metal Math Fundamentals

Learning Outcomes:

- Demonstrate knowledge of basic mathematical calculations and formulas used in the trade.

2018 Red Seal Occupational Standard Reference:

N/A

Suggested Hours:

24 Hours

Objectives and Content:

1. Describe metric and imperial systems of measurement.

2. Perform basic mathematical calculations.
   - i) whole numbers
   - ii) decimals
   - iii) fractions
   - iv) ratios

3. Perform conversions.
   - i) metric to imperial
   - ii) imperial to metric
   - iii) fractions to decimals
   - iv) decimals to fractions

4. Perform geometric calculations.

5. Solve problems using trade formulas.

Practical Objectives:

N/A

SMW-115 Communication and Trade Documentation

Learning Outcomes:

- Demonstrate knowledge of effective communication practices.
- Demonstrate knowledge of trade-related documentation and their application.
- Demonstrate knowledge of procedures used to prepare trade-related documentation.
- Demonstrate knowledge of procedures used to prepare safety-related documentation.

2018 Red Seal Occupational Standard Reference:

3.01 Uses trade-related documentation.
3.03 Organizes materials and equipment for project. (Introduction)
4.01 Uses communication techniques.

Suggested Hours:

3 Hours

Objectives and Content:

1. Describe the importance of using effective verbal and non-verbal communication with people in the workplace.
   - i) other tradespeople
   - ii) colleagues
   - iii) apprentices
   - iv) supervisors
   - v) clients
   - vi) public
   - vii) authority having jurisdiction (AHJ)
   - viii) manufacturers

2. Describe effective communication skills.
   - i) listening
   - ii) speaking
   - iii) written
   - iv) body language

3. Identify personal responsibilities and attitudes that contribute to on-the-job success.
   - i) asking questions
   - ii) working safely
   - iii) accepting constructive feedback
   - iv) time management and punctuality

v) respect for authority
vi) good stewardship of materials
vii) tools and property
viii) efficient work practice

4. Describe the importance of communicating with others to organize materials and supplies on site and effectively plan work tasks.

5. Identify sources of information and trade-related documents.
   i) regulations
   ii) standards
   iii) codes
   iv) occupational health and safety requirements
   v) drawings
   vi) specifications
   vii) company and client documentation
   viii) time cards
   ix) work orders
   x) maintenance/service reports
   xi) stock/inventory reports
   xii) professionals in related trades
   xiii) LEED requirements

6. Explain responsibilities associated with completing and signing trade and safety-related documentation.

7. Describe the procedures used to complete trade and safety-related documentation.

8. Identify the value of diversity in the workplace.

9. Identify communication that constitutes harassment and discrimination.
   i) harassment
      - objectionable conduct
      - comment or display made either on a one-time or continuous basis that demeans, belittles or causes personal humiliation or embarrassment to the recipient
   ii) discrimination
      - race, national or ethnic origin
      - colour
      - religion
      - age
      - sex
      - sexual orientation
      - marital status

- family status
- disability
- conviction for which a pardon has been granted

10. Describe the importance of the mentoring relationship between the journeyperson and the apprentice.

11. Identify communication and learning styles.
    i) seeing it
    ii) hearing it
    iii) trying it

Practical Objectives:

N/A

SMW-120 Gas Metal Arc Welding (GMAW) I

Learning Outcomes:

- Demonstrate knowledge of gas metal arc welding (GMAW) equipment, its applications and maintenance.
- Demonstrate knowledge of the procedures used to weld mild steel using GMAW equipment.

2018 Red Seal Occupational Standard Reference:

2.03 Uses gas metal arc welding (GMAW) equipment.

Suggested Hours:

24 Hours

Objectives and Content:

1. Define terminology associated with gas metal arc welding (GMAW).

2. Identify hazards and describe safe work practices pertaining to the use of GMAW equipment.
   - i) hazards
     - fumes and particulate inhalation
     - arc flash
     - electrical shock
     - burns
     - damage to property
   - ii) safe work practices and procedures
     - required PPE
     - obtaining required permits
     - fire watch
     - positioning welding screens

3. Describe the GMAW process and its applications.

4. Identify types of GMAW equipment, consumables and accessories used to weld mild steel and describe their characteristics and applications.

5. Describe the procedures used to set up, adjust and shut down GMAW equipment.

6. Describe the procedures used to maintain and troubleshoot GMAW equipment

7. Describe the procedures used to weld mild steel using the GMAW process.

8. Identify weld positions and describe their applications.
   i) flat
   ii) vertical
   iii) horizontal
   iv) overhead

Practical Objectives:

1. Perform GMAW welding process on mild steel.

SMW-125 Resistance Spot Welding

Learning Outcomes:

- Demonstrate knowledge of resistance spot welding equipment, its consumables and accessories
- Demonstrate knowledge of the procedures used to weld using resistance spot welding equipment.

2018 Red Seal Occupational Standard Reference:

2.04 Uses resistance spot welding equipment.

Suggested Hours:

6 Hours

Objectives and Content:

1. Define terminology associated with resistance spot welding.

2. Identify hazards and describe safe work practices and procedures pertaining to resistance spot welding.
   - i) hazards
     - pinch points
     - burns
     - electrical shock
     - fire
   - ii) safe work practices
     - using PPE
     - obtaining required permits

3. Identify considerations when determining resistance spot welding equipment setup.
   - i) specification requirements
   - ii) base metal
   - iii) properties
   - iv) thickness

4. Describe the procedures used to set up and adjust resistance spot welding equipment.
   - i) set time
   - ii) determine amperage
   - iii) adjust pressure

5. Describe the procedures used to inspect and maintain resistance spot welding equipment.

6. Describe the procedures used to weld using the resistance spot welding process.

Practical Objectives:

N/A

SMW-130 Oxy-Fuel and Plasma Arc Cutting

Learning Outcomes:

- Demonstrate knowledge of oxy-fuel and plasma arc cutting equipment and accessories.
- Demonstrate knowledge of the procedures used to cut using oxy-fuel equipment.
- Demonstrate knowledge of the procedures used to cut using plasma arc equipment.

2018 Red Seal Occupational Standard Reference:

2.07 Uses oxy-fuel and plasma arc cutting equipment.

Suggested Hours:

18 Hours

Objectives and Content:

1. Define terminology associated with oxy-fuel and plasma arc cutting.

2. Identify hazards and describe safe work practices pertaining to oxy-fuel and plasma arc cutting.
   - i) hazards
     - fumes and particulates inhalation
     - burns
     - damage to property
     - fire
     - electrical shock
   - ii) safe work practices
     - using PPE
     - obtaining required permits
     - fire watch

3. Interpret jurisdictional regulations pertaining to oxy-fuel and plasma arc cutting.

4. Identify types of oxy-fuel and plasma arc cutting equipment and accessories and describe their applications.

5. Describe the procedures used to prepare materials using oxy-fuel equipment and plasma arc equipment.

6. Describe the procedures used to cut materials using oxy-fuel equipment.

7. Describe the procedures used to cut materials using plasma arc equipment.

Practical Objectives:

N/A

SMW-135 Soft Soldering

Learning Outcomes:

- Demonstrate knowledge of soldering equipment and its maintenance.
- Demonstrate knowledge of the procedures used to solder materials.

2018 Red Seal Occupational Standard Reference:

2.08 Uses soldering and brazing equipment.

Suggested Hours:

12 Hours

Objectives and Content:

1. Define terminology associated with soldering.

2. Identify hazards and describe safe work practices pertaining to the use of soldering equipment.
   - i) hazards
     - burns, fumes and particulates inhalation
     - corrosive substances
     - damage to property
   - ii) safe work practices
     - using PPE
     - following WHMIS
     - obtaining required permits, fire watch

3. Identify types of soldering equipment and accessories and describe their applications and procedures for use.
   - i) compressed gas
   - ii) irons/coppers

4. Describe the procedures used to maintain and troubleshoot soldering equipment.

5. Describe the procedures used to set up, adjust and shut down soldering equipment.

6. Describe the procedures used to solder materials.

Practical Objectives:

1. Perform a water-tight soldered joint.

SMW-140 Stationary and Mobile Work Platforms

Learning Outcomes:

- Demonstrate knowledge of stationary and mobile work platforms, their applications, limitations and procedures for use.
- Demonstrate knowledge of regulatory requirements pertaining to stationary and mobile work platforms.
- Demonstrate knowledge of inspection, maintenance and storage procedures for stationary and mobile work platforms.

2018 Red Seal Occupational Standard Reference:

2.11 Uses stationary and mobile work platforms.

Suggested Hours:

6 Hours

Objectives and Content:

1. Describe terminology associated with stationary and mobile work platforms.

2. Identify hazards and describe safe work practices pertaining to stationary and mobile work platforms.
   - i) power lines
   - ii) excess loads
   - iii) uneven surfaces
   - iv) pinch points
   - v) crush injuries
   - vi) working at height

3. Interpret codes and regulations pertaining to stationary and mobile work platforms.

4. Identify types of stationary and mobile work platforms, and describe their characteristics, limitations and applications.
   - i) ladders
   - ii) scaffolds
   - iii) elevated platforms

5. Describe the procedures used to erect and remove stationary and mobile work platforms.

6. Describe the procedures used to inspect, maintain and store stationary and mobile work platforms.

Practical Objectives:

N/A

SMW-145 Hoisting, Rigging and Positioning Equipment

Learning Outcomes:

- Demonstrate knowledge of hoisting, rigging and positioning equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of basic hoisting, rigging and positioning techniques.
- Demonstrate knowledge of safe work practices and procedures pertaining to hoisting, rigging and positioning.
- Demonstrate knowledge of regulatory requirements pertaining to hoisting, rigging and positioning.
- Demonstrate knowledge of inspection, maintenance and storage procedures for hoisting, rigging and positioning equipment.

2018 Red Seal Occupational Standard Reference:

2.12 Uses hoisting, rigging and positioning equipment.

Suggested Hours:

21 Hours

Objectives and Content:

1. Define terminology associated with hoisting, rigging and positioning equipment.

2. Identify hazards and describe safe work practices pertaining to the use of hoisting, rigging and positioning equipment.
   - i) power lines
   - ii) oversize/overweight loads
   - iii) ground conditions
   - iv) overhead hazards
   - v) environmental hazards

3. Interpret codes and regulations pertaining to hoisting, rigging and positioning.

4. Explain sling angle when preparing for hoisting and positioning operations.

5. Identify types of hoisting, rigging and positioning equipment and accessories, and describe their characteristics, limitations and procedures for use.
   - i) duct lift
   - ii) overhead cranes
   - iii) come-alongs

iv) grip hoists
v) chainfalls
vi) ropes
vii) slings
viii) chains
ix) hooks
x) spreader bars
xi) shackles
xii) winches

6. Identify types of knots, hitches, splices and bends, and describe the procedures used to tie them.
   i) bowline
   ii) running bowline
   iii) square/reef
   iv) half-hitch
   v) barrel hitchDu

7. Identify the factors to consider when selecting hoisting, rigging and positioning equipment.
   i) load characteristics
   ii) environment
   iii) safety factors
   iv) anchor points
   v) sling angles

8. Describe the procedures used to attach rigging equipment to a load.

9. Describe the procedures used to perform a basic lift.
   i) load determination
      - center of gravity
      - weight calculations
   ii) communication methods
   iii) pre-lift checks
   iv) placement of load
   v) post-lift inspection

10. Describe the procedures used to communicate during hoisting, rigging and positioning operations.
    i) hand signals
    ii) electronic communications
    iii) audible/visual

11. Describe the procedures used to ensure the work area is safe for hoisting, rigging and positioning operations.
    i) supervision of lift
    ii) securing work area
    iii) communication

12. Describe the procedures used to inspect, maintain and store hoisting, rigging and positioning equipment.

Practical Objectives:

1. Perform hand signals.

SMW-150 Metallurgy

Learning Outcomes:

- Demonstrate knowledge of metallurgic principles.
- Demonstrate knowledge of metals and their properties, characteristics and applications.

2018 Red Seal Occupational Standard Reference:

6.02 Forms ductwork, fittings and flexible connectors.
6.03 Insulates ductwork and fittings.

Suggested Hours:

12 Hours

Objectives and Content:

1. Define terminology associated with metallurgy.

2. Describe the properties of metals.
   - i) ductility
   - ii) malleability
   - iii) elasticity
   - iv) hardness
   - v) composition
   - vi) physical

3. Describe identification systems for metals.
   - i) numbering
   - ii) gauging

4. Identify types of metals and describe their applications.
   - i) steel
     - hot rolled
     - cold rolled
     - coated
   - ii) copper
   - iii) brass
   - iv) aluminum
   - v) stainless steel

5. Identify types of surface finishes and describe their applications.

i) mill
ii) brushed
iii) mirrored
iv) dull

6. Describe the effects metal working has on metallurgic properties.
   i) stress
   ii) contraction
   iii) expansion
   iv) distortion
   v) work hardening
   vi) annealing
   vii) galvanic action

Practical Objectives:

N/A

SMW-155 Pattern Development (Simple and Straight Line)

Learning Outcomes:

- Demonstrate knowledge of simple and straight line layout, its applications and associated calculations.
- Demonstrate knowledge of basic pattern development using simple and straight line layout.

2018 Red Seal Occupational Standard Reference:

5.01 Develops patterns using simple and straight line layout.

Suggested Hours:

33 Hours

Objectives and Content:

1. Define terminology associated with simple and straight line layout.

2. Identify basic geometric shapes and describe their characteristics.

3. Identify layout methods and describe their applications.
   - i) simple/straight line
   - ii) parallel line
   - iii) radial line
   - iv) triangulation
   - v) computerized
   - vi) combination

4. Describe types of basic patterns and fittings that require simple and straight line layout.

5. Identify calculations used in simple and straight line layout and describe the procedures used to perform them.

6. Describe the procedures used to develop patterns using simple and straight line layout.
   - i) determine views
   - ii) label lines and points
   - iii) prepare patterns
   - iv) determine true length of lines
   - v) determine types of seams, joints and edges
   - vi) calculate allowances

vii) determine stretch-outs
viii) check pattern accuracy
ix) cut pattern
x) label pieces

Practical Objectives:

1. Develop patterns using simple and straight line layout.

SMW-160 Fabrication and Installation Fundamentals

Learning Outcomes:

- Demonstrate knowledge of basic sheet metal components and describe their applications.
- Demonstrate knowledge of the procedures used to fabricate basic ductwork, fittings and components.
- Demonstrate knowledge of the procedures used to fabricate hangers, supports and bases.
- Demonstrate knowledge of the procedures used to install basic ductwork, fittings and components.
- Demonstrate knowledge of codes and standards pertaining to the fabrication and installation of ductwork, fittings and components.

2018 Red Seal Occupational Standard Reference:

6.01 Cuts ductwork, fittings and components.
6.02 Forms ductwork, fittings and flexible connectors.
6.03 Insulates ductwork and fittings.
6.04 Assembles ductwork, fittings and flexible connectors.
6.06 Fabricates hanger systems, supports and bases.
11.01 Installs air handling equipment (introduction).
11.02 Installs sheet metal duct and fittings.
11.03 Installs dampers (introduction).
11.05 Installs registers, grilles, diffusers and louvres (introduction).
11.09 Installs plenums (introduction).

Suggested Hours:

39 Hours

Objectives and Content:

1. Define terminology associated with fabricating and installing ductwork, fittings and components.
    i) components
    ii) turning vanes
    iii) splitter vanes
    iv) flex connectors
    v) access doors

2. Identify hazards and describe safe work practices pertaining to ductwork, fittings and components.
   i) cutting
   ii) forming
   iii) insulating
   iv) assembling

3. Interpret codes and standards pertaining to the fabrication, insulation and installation of ductwork, fittings and components.
   i) Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   ii) American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
   iii) National Building Code (NBC)
   iv) National Fire Protection Association (NFPA)
   v) Authority Having Jurisdiction (AHJ)

4. Interpret information pertaining to the fabrication and installation of ductwork, fittings and components found on shop drawings.

5. Identify tools and equipment used to fabricate and install ductwork, fittings and components and describe their applications and procedures for use.

6. Identify sheet metal components associated with air and material handling systems and describe their applications.
   i) ductwork
   ii) fittings
   iii) dampers
   iv) fire dampers
   v) flexible connections
   vi) hangers
   vii) equipment supports/bases
   viii) louvers
   ix) attenuators (silencers)
   x) blast gates
   xi) clean-outs
   xii) access doors
   xiii) plenums
   xiv) terminal boxes
   xv) coils
   xvi) registers, grilles, diffusers and louvers

7. Identify types of materials used to fabricate ductwork, fittings and components and describe their characteristics and applications.

8. Identify types of seams and joints for forming ductwork, fittings and components and describe the procedures used to produce them.
   i) longitudinal
      - Pittsburgh Locks
      - groove seams
      - acme locks, snap/button locks
   ii) transverse
      - slip & drive
      - Transverse Duct Connection/Transverse Duct Flange (TDC/TDF)
      - companion flanges/proprietary connections

9. Identify types of edges for fabrication of ductwork and fittings, and describe the procedures used to produce them.

10. Identify types of fastening methods used to fabricate ductwork, fittings and components and describe their associated procedures.
    i) mechanical
    ii) adhesives
    iii) welding

11. Identify types of duct reinforcement.

12. Identify types and properties of insulation used for insulating ductwork, fittings and components.

13. Calculate measurements required for seam allowances according to air handling requirements.

14. Describe the procedures used to fabricate and install basic ductwork and fittings.
    i) cut
    ii) form
    iii) insulate
    iv) assemble

15. Describe the procedures used to fabricate and install hanger systems, supports and bases.

Practical Objectives:

1. Fabricate and assemble fittings.

Level 2

SMW-200 Drawings I

Learning Outcomes:

- Demonstrate knowledge of drawings and specifications and their applications.
- Demonstrate knowledge of the procedures used to interpret and extract information from drawings.

2018 Red Seal Occupational Standard Reference:

3.02 Interprets drawings.

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with drawings and specifications.

2. Explain the purpose of drawings.

3. Identify types of drawings and describe their applications.
   - i) pictorial
   - ii) orthographic
   - iii) architectural
   - iv) mechanical
   - v) structural
   - vi) electrical
   - vii) shop
   - viii) sketches
   - ix) detail
   - x) prints

4. Identify the views used on drawings.
   - i) elevation
   - ii) plan
   - iii) section
   - iv) detail
   - v) auxiliary

5. Identify the parts of a drawing and describe their purpose and applications.
   - i) lines
   - ii) legends

iii) symbols
iv) abbreviations
v) title block
vi) notes
vii) specifications
viii) schedules

6. Identify and interpret common symbols and abbreviations found on drawings.

7. Extract and interpret information found on drawings.

8. Describe how to use metric and imperial scale rulers.

9. Describe the procedures used to develop basic drawings and sketches.

Practical Objectives:

1. Develop basic drawings and sketches.

SMW-205 Hard Soldering and Brazing

Learning Outcomes:

- Demonstrate knowledge of brazing equipment, its maintenance and procedures for use.
- Demonstrate knowledge of procedures used to braze materials.

2018 Red Seal Occupational Standard Reference:

2.08 Uses soldering and brazing equipment.

Suggested Hours:

3 Hours

Objectives and Content:

1. Define terminology associated with hard soldering and brazing.

2. Identify hazards and describe safe work practices and procedures pertaining to the use of hard soldering and brazing equipment.
   - i) hazards
     - burns, fumes and particulates inhalation
     - hazardous substances
     - damage to property
   - ii) safe work practices
     - using PPE
     - following WHMIS
     - obtaining required permits, fire watch

3. Identify types of hard soldering and brazing equipment and accessories, and describe their applications and procedures for use.
   - i) compressed gas
   - ii) air acetylene torch
   - iii) oxy-acetylene torch
   - iv) GMAW weld (silicon bronze)

4. Describe the procedures used to set up, adjust, and shut down hard soldering and brazing equipment.

5. Describe the procedures used to maintain and troubleshoot hard soldering and brazing equipment.

6. Describe the procedures used to braze/hard solder materials.

7. Identify differences between hard soldering and soft soldering.

Practical Objectives:

N/A

SMW-210 Parallel Line Development (Round Duct Fittings)

Learning Outcomes:

- Demonstrate knowledge of parallel line development for round duct fittings, its applications and associated calculations.
- Demonstrate knowledge of the procedures used to develop and fabricate round duct fittings using parallel line development.

2018 Red Seal Occupational Standard Reference:

5.02 Develops patterns using parallel line method.

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with parallel line development for round duct fittings.

2. Describe types of round duct fittings that require parallel line development.
   i) tee
   ii) round elbow
   iii) round offsets

3. Identify calculations used in parallel line development for round duct fittings and describe the procedures used to perform them.

4. Describe the procedures used to develop patterns and fabricate round duct fittings using parallel line development.
   i) determine views
   ii) label lines and points
   iii) prepare patterns
   iv) determine true length of lines
   v) determine types of seams, joints and edges
   vi) calculate allowances
   vii) determine stretch-outs
   viii) check pattern accuracy
   ix) cut pattern
   x) label pieces

Practical Objectives:

1. Develop patterns and fabricate round duct fittings using parallel line development.

SMW-215 Radial Line Development (Right Cones)

Learning Outcomes:

- Demonstrate knowledge of radial line development for right cones, its applications and associated calculations.
- Demonstrate knowledge of the procedures used to develop patterns and fabricate fittings based on right cones using radial line development.

2018 Red Seal Occupational Standard Reference:

5.03 Develops patterns using radial line method.

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with radial line development for right cones.

2. Describe types of fittings based on right cones that require radial line development.

3. Identify calculations used in radial line development for right cones and describe the procedures used to perform them.

4. Describe the procedures used to develop patterns and fabricate fittings on right cones using radial line development.
   - i) determine views
   - ii) label lines and points
   - iii) prepare patterns
   - iv) determine true length of lines
   - v) determine types of seams, joints and edges
   - vi) calculate allowances
   - vii) determine stretch-outs
   - viii) check pattern accuracy
   - ix) cut pattern
   - x) label pieces

Practical Objectives:

1. Develop patterns and fabricate fittings based on right cones using radial line development.

SMW-220 Triangulation (Plan View)

Learning Outcomes:

- Demonstrate knowledge of triangulation method from plan view, its applications and associated calculations.
- Demonstrate knowledge of the procedures used to develop patterns and fabricate fittings using triangulation method from plan view.

2018 Red Seal Occupational Standard Reference:

5.04 Develops patterns using triangulation method.

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with the triangulation method from plan view.

2. Describe types of fittings that require triangulation method from plan view.
   - i) transitions
   - ii) tapers
   - iii) square-to-rounds

3. Identify calculations used in the triangulation method from plan view and describe the procedures used to perform them.

4. Describe the procedures used to develop patterns and fabricate fittings using triangulation method from plan view.
   - i) determine views
   - ii) label lines and points
   - iii) prepare patterns
   - iv) determine true length of lines
   - v) determine types of seams, joints and edges
   - vi) calculate allowances
   - vii) determine stretch-outs
   - viii) check pattern accuracy
   - ix) cut pattern
   - x) label pieces

Practical Objectives:

1. Develop patterns and fabricate fittings using triangulation method from plan view.

SMW-225 Shielded Metal Arc Welding (SMAW)

Learning Outcomes:

- Demonstrate knowledge of shielded metal arc welding (SMAW) equipment, its applications and maintenance.
- Demonstrate knowledge of the procedures used to weld using SMAW equipment.

2018 Red Seal Occupational Standard Reference:

2.06 Uses shielded metal arc welding (SMAW) equipment.

Suggested Hours:

24 Hours

Objectives and Content:

1. Define terminology associated with Shielded Metal Arc Welding (SMAW).

2. Identify hazards and describe safe work practices pertaining to the use of SMAW equipment.
   - i) hazards
     - fumes and particulate inhalation
     - arc flash
     - burns
     - damage to property
     - fire
     - electrical shock
   - ii) safe practices and procedures
     - using PPE
     - obtaining required permits
     - fire watch
     - positioning welding screens

3. Interpret symbols and information pertaining to the SMAW welding process found on drawings and specifications.

4. Identify SMAW equipment and accessories, and describe their applications, limitations and procedures for use.
   - i) accessories
     - chill plates
     - strongbacks

5. Describe the procedures used to maintain and troubleshoot SMAW equipment.

6. Interpret electrode numbering system for the application.

7. Describe the procedures to set up, adjust and shut down SMAW equipment.

8. Describe the procedures used to weld mild steel and stainless steel using the SMAW process.
   i) plug
   ii) fillet (continuous)
   iii) stitch
   iv) tack
   v) edge
   vi) corner

9. Describe weld defects, their causes and the procedures used to prevent and correct them.
   i) porosity
   ii) cracks
   iii) warping
   iv) undercut

Practical Objectives:

1. Perform welds using the SMAW process.

SMW-230 Gas Metal Arc Welding (GMAW) II

Learning Outcomes:

- Demonstrate knowledge of the procedures used to weld aluminum using GMAW equipment.
- Demonstrate knowledge of the procedures used to weld stainless steel using GMAW equipment.

2018 Red Seal Occupational Standard Reference:

2.03 Uses gas metal arc welding (GMAW) equipment.

Suggested Hours:

6 Hours

Objectives and Content:

1. Define terminology associated with advanced GMAW processes.
   i) pulse mig

2. Interpret symbols and information pertaining to the GMAW welding process found on drawings and specifications.

3. Identify GMAW equipment, consumables and accessories used to weld aluminum and stainless steel and describe their characteristics and applications.

4. Identify the modes of transfer relating to GMAW welding and describe their characteristics and applications.
   i) short circuiting
   ii) globular
   iii) spray
   iv) pulse

5. Describe the procedures used to set-up, adjust and shut-down GMAW equipment for welding aluminum and stainless steel.

6. Describe the procedures used to weld aluminum and stainless steel using the GMAW process.
   i) plug
   ii) fillet (continuous)
   iii) stitch

iv) tack
v) edge
vi) corner

7. Describe weld defects, their causes and the procedures used to prevent and correct them.
   i) porosity
   ii) cracks
   iii) warping
   iv) undercut

Practical Objectives:

1. Perform welds using the GMAW process.

SMW-235 Design and Field Modification

Learning Outcomes:

- Demonstrate knowledge of site inspection procedures.
- Demonstrate knowledge of the procedures used to take field measurements.
- Demonstrate knowledge of performing field modifications.
- Demonstrate knowledge of basic duct design.

2018 Red Seal Occupational Standard Reference:

3.04 Performs basic design and field modifications.

Suggested Hours:

12 Hours

Objectives and Content:

1. Define terminology associated with basic duct design and field modification.

2. Identify hazards and describe safe work practices pertaining to applying field modifications.

3. Interpret codes and standards pertaining to design and field modifications.

4. Identify tools and equipment used to perform field modifications and describe their applications and procedures for use.

5. Identify types of basic duct systems.
   - i) air handling systems
     - single path
     - variable air volume (VAV)
   - ii) material handling systems
     - positive
     - negative

6. Describe the procedures used to take field/site measurements.

7. Describe the procedures used to inspect a site for potential conflicts or design modifications.
   - i) drawings and specifications
   - ii) site conditions

Practical Objectives:

N/A

SMW-240 Architectural Metal Systems

Learning Outcomes:

- Demonstrate knowledge of metal roofing, cladding/siding systems and components.
- Demonstrate knowledge of the procedures used to install metal roofing and cladding/siding system components.
- Demonstrate knowledge of the procedures used to install insulation, isolation material and building envelope components.
- Demonstrate knowledge of the procedures used to install decking.
- Demonstrate knowledge of codes, standards and regulations pertaining to metal roofing and cladding/siding systems.

2018 Red Seal Occupational Standard Reference:

7.01 Cuts metal for flashing, roofing, sheeting and cladding.
7.02 Forms flashing, roofing, sheeting and cladding.
15.01 Lays out roof and walls.
15.02 Installs installations, isolation material and building envelope components.
15.03 Installs roofing and cladding system components.
15.04 Seals exposed joints.
15.05 Installs decking.

Suggested Hours:

12 Hours

Objectives and Content:

1. Define terminology associated with metal roofing, flashing and cladding/siding systems.
   - i) metal roofing and walls
     - transits
     - laser levels
     - framing square
     - chalk lines
   - ii) insulation, isolation materials and building envelope components
     - felt paper
     - ice and water shield
     - self-adhesive membrane
     - wall and roof panels
   - iii) architectural metals
     - scuppers
     - gutters

- down spouts
- cornice and coping work

2. Identify hazards and describe safe work practices pertaining to cutting, forming and installing flashing, roofing, sheeting and cladding.

3. Interpret codes and standards pertaining to metal roofing.
   i) installation of metal roofing and walls
      - AHJ
      - SMACNA
      - NFPA
      - CSA
      - ANSI
      - NBC
      - CWB
   ii) installation of insulation, isolation materials and building envelope components

4. Interpret information pertaining to the installation of metal roofing and cladding/siding systems found on drawings and specifications.
   i) roofing and walls
   ii) insulation, isolation materials and building envelope components
   iii) decking

5. Identify tools and equipment used to install metal roofing and cladding/siding systems and describe their applications and procedures for use.

6. Identify types of components associated with metal roofing and walls and describe their applications.
   i) roof drainage
   ii) flashing
   iii) soffit and fascia
   iv) roof vents
   v) wall panels
   vi) cladding/siding

7. Identify types of materials used to fabricate metal roofing, sheeting, flashing and cladding.

8. Identify types of seams used for metal roofing, sheeting, flashing and cladding installations.

9. Identify considerations and requirements relating to the installation of roofing, cladding/siding system components.

10. Identify types of fasteners used to install metal roofing and cladding/siding systems and describe their applications.
    i) insulation, isolation materials and building envelope components
    ii) roofing and cladding/siding system components
    iii) decking
        - screws
        - dimple tools
        - rivets
        - welds

11. Identify types of roof structures and construction features and describe their applications.
    i) hip
    ii) gable
    iii) pitched
    iv) flat

12. Describe the procedures used to layout metal roofing and walls.
    i) check for square
    ii) determine starting point
    iii) establish reference lines

13. Identify materials to be installed to prepare surfaces for installation of metal roofing, cladding and architectural metals.
    i) insulation
    ii) primer
    iii) waterproof membrane
    iv) isolation material

14. Describe the procedures used to calculate material requirements.

15. Describe the procedures used to install insulation, isolation materials and building envelope components.

16. Identify types of sealants used to seal exposed joints.

17. Identify types of sealing and joining methods and describe their associated procedures.
    i) caulking
    ii) soldering

18. Describe the procedures used to install metal roofing and cladding/siding system components.

19. Identify types of material used for decking and describe their applications.

20. Identify types of decking and describe their applications.
    i) metal pans
    ii) Q decking

21. Describe the procedures used to install decking.

Practical Objectives:

N/A

SMW-245 Chimneys, Breeching and Venting

Learning Outcomes:

- Demonstrate knowledge of the procedures used to install a chimney.
- Demonstrate knowledge of the procedures used to connect appliances and mechanical equipment to chimneys and breeching.
- Demonstrate knowledge of the procedures used to install high efficiency appliances and mechanical equipment.

2018 Red Seal Occupational Standard Reference:

10.01 Installs chimney.
10.02 Connects appliances or mechanical equipment to chimney and breeching.
10.03 Installs high efficiency appliances and mechanical equipment.

Suggested Hours:

12 Hours

Objectives and Content:

1. Define terminology associated with chimneys, breeching and venting.
   i) chimneys
   ii) appliances and mechanical equipment
   iii) high efficiency appliances and mechanical equipment

2. Identify hazards and describe safe work practices pertaining to chimneys, breeching and venting.
   i) installation of chimneys
   ii) connecting appliance and mechanical equipment to chimneys and breeching
   iii) connecting high efficiency appliances or mechanical equipment to breeching

3. Interpret codes, standards and regulations pertaining to the installation of chimneys, breeching and venting.
   i) jurisdictional requirements

4. Interpret information pertaining to chimneys, breeching and venting found on drawings and job and manufacturers' specifications.
   i) installation of chimneys
   ii) connecting appliances and mechanical equipment to chimneys and breeching
   iii) installing high efficiency appliances and mechanical equipment

5. Identify tools and equipment relating to chimneys, breeching and venting and describe their applications and procedures for use.
   i) installation of chimneys
   ii) connecting appliances and mechanical equipment
   iii) installing high efficiency appliances and mechanical equipment

6. Identify types of chimney systems and their components and describe their applications.
   i) B-vent
   ii) BW-vent
   iii) A-vent
   iv) special venting systems
   v) combustion air

7. Describe the procedures used to install chimneys.

8. Identify flashing requirements pertaining to chimneys.

9. Identify types of appliances and mechanical equipment and describe their applications.

10. Identify types of breeching and describe their applications.

11. Describe the procedures used to install breeching.

12. Describe the procedures used to connect appliances and mechanical equipment to chimneys and breeching.

13. Identify types of high efficiency appliances and mechanical equipment and describe their applications.

14. Describe the procedures used to install high efficiency appliances and mechanical equipment.

Practical Objectives:

N/A

SMW-250 Air Quality Management

Learning Outcomes:

- Demonstrate knowledge of air quality management.
- Demonstrate knowledge of regulatory requirements pertaining to air quality management.

2018 Red Seal Occupational Standard Reference:

2.10 Uses testing and inspection devices.
11.01 Installs air handling equipment
11.08 Installs system component accessories.

Suggested Hours:

9 Hours

Objectives and Content:

1. Define terminology associated with air quality management.

2. Identify hazards and describe safe work practices pertaining to air quality management.

3. Interpret codes and standards pertaining to air quality management and air handling equipment.
   i) ASHRAE
   ii) NBC
   iii) CSA
   iv) ULC
   v) AHJ

4. Explain the importance of indoor air quality.

5. Identify devices and instruments used to check/test air quality and describe their procedures for use.

6. Identify considerations and requirements associated with air quality management.
   i) environmental conditions
   ii) intake locations
   iii) exhaust locations

7. Identify areas requiring special air quality ventilation.

i) clean/sterile rooms
ii) industrial/commercial settings

8. Identify methods of improving or correcting problems with air quality.
   i) heating/cooling
   ii) ventilation
   iii) conditioning (filtration, sterilization, purification, humidification/ dehumidification)
   iv) noise attenuation

9. Identify methods used to determine air quality relating to humidity and temperature.

10. Identify air quality problems and describe the procedures used to prevent or correct them.
   i) contamination
   ii) humidity
   iii) temperature (hot/cold zones)
   iv) air motion

11. Describe the impact improper system or component installation can have on air quality.

Practical Objectives:

N/A

SMW-255 Air Handling Systems I

Learning Outcomes:

- Demonstrate knowledge of the procedures used to form and assemble ducts and fittings.
- Demonstrate knowledge of the procedures to prepare the installation site for air handling system components.
- Demonstrate knowledge of the procedures used to install air handling equipment and components.
- Demonstrate knowledge of the procedures used to install ducts and fittings.
- Demonstrate knowledge of the procedures used to install dampers.
- Demonstrate knowledge of the procedures used to install fire and fire/smoke dampers.
- Demonstrate knowledge of the procedures used to install registers, grilles, diffusers and louvers.

2018 Red Seal Occupational Standard Reference:

6.02 Forms ductwork, fittings and flexible connectors.
6.04 Assembles ductwork, fittings and flexible connectors.
9.01 Performs on-site measurements.
9.02 Performs demolitions for renovations.
9.03 Installs penetrations and sleeves.
9.04 Installs supports and bases.
9.05 Installs hangers, cables, braces and brackets.
11.01 Installs air handling equipment.
11.02 Installs sheet metal ducts and fittings.
11.03 Installs dampers.
11.04 Installs fire and fire/smoke dampers.
11.05 Installs registers, grilles, diffusers and louvers.
11.08 Installs system component accessories. (Introduction)

Suggested Hours:

39 Hours

Objectives and Content:

1. Define terminology associated with the fabrication and installation of air handling system components.

2. Identify hazards and describe safe work practices pertaining to the fabrication and installation of air handling system components.

i) air handling equipment
ii) sheet metal ducts and fittings
iii) dampers and fire/smoke dampers
iv) electrical equipment and sources
v) registers, grilles, diffusers and louvers

3. Interpret codes and standards pertaining to the fabrication and installation of air handling system components.
i) SMACNA
ii) ASHRAE
iii) ANSI
iv) NBC
v) NFPA
vi) CSA
vii) ULC
viii) AHJ
ix) CWB

4. Interpret information pertaining to the fabrication and installation of air handling system components found on drawings and specifications.
i) air handling equipment
ii) sheet metal ducts and fittings
iii) dampers
iv) fire/smoke dampers
v) registers, grilles, diffusers and louvers

5. Identify tools and equipment used to fabricate and install air handling system components and accessories and describe their applications and procedures for use.

6. Identify types of air handling equipment and describe their applications and operation.
i) heat recovery ventilator (HRV)
ii) energy recovery ventilator (ERV)
iii) air handlers
iv) make-up air unit (MUA)
v) roof top unit (RTU)
vi) unit heaters
vii) air curtains
viii) fans
ix) furnaces
x) fan coils

7. Identify and describe sheet metal components and accessories associated with air handling systems.
i) ductwork

ii) fittings
iii) dampers
- iris
- balancing
- control
- motorized
- shutoff
- fire/smoke (breakaway joint)
- explosion

iv) flexible connectors
v) hangers, cables, braces and brackets
- anchors
- braces
- cables and locks
- backets
- inserts
- epoxy
- structural shapes
- threaded rod

vi) equipment support/bases
vii) sleeves and seismic restraints
viii) registers, grilles, diffusers and louvers
ix) attenuators (silencer)
x) system component accessories
- burglar bars
- humidifiers
- dehumidifiers
- air, noise and odour filtration systems
- access doors
- airflow sensors
- temperature sensors
- controls

8. Identify types of materials used to fabricate sheet metal components for air handling systems and describe their characteristics and applications.

9. Identify considerations and requirements when fabricating sheet metal components for air handling systems.
i) load bearing capacities
ii) system specifications
iii) environmental conditions
iv) architectural conditions

10. Describe the procedures used to fabricate sheet metal components for air handling systems.
    i) cut
    ii) label
    iii) form
    iv) insulate
    v) assemble

11. Describe the procedures used to prepare the site for the installation of air handling systems and components.
    i) perform on-site measurements
    ii) performs demolitions for renovations
    iii) installs penetrations and sleeves
    iv) installs supports and bases
    v) installs hangers, cables, braces and brackets
    vi) conducts final inspection

12. Identify considerations and requirements for installing air handling system components.
    i) manufacturers' specifications
    ii) isolators
    iii) building materials
    iv) environmental conditions
    v) field design modifications

13. Describe procedures used to install air handling equipment.

14. Describe the procedures used to install sheet metal ducts and fittings.

15. Describe the procedures used to install dampers.

16. Describe the procedures used to install fire and fire/smoke dampers.

17. Describe the procedures used to install registers, grilles, diffusers and louvers.

Practical Objectives:

N/A

SMW-260 Exterior Components

Learning Outcomes:

- Demonstrate knowledge of the procedures to prepare surfaces for the installation of exterior components.
- Demonstrate knowledge of the procedures to fasten exterior components.

2018 Red Seal Occupational Standard Reference:

16.01 Prepares surface.
16.02 Fastens exterior components.

Suggested Hours:

3 Hours

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to exterior components.

2. Identify tools and equipment used to install exterior components and describe their applications and procedures for use.
   - i) cleaning tools
     - scrapers
     - grinders
     - wire brushes
   - ii) chemicals
     - degreasers
     - acids
     - primers
     - paint
   - iii) preparing the surface
   - iv) installing fastening systems

3. Identify types of exterior components and describe their applications.
   - i) awnings
   - ii) signage

4. Identify types of fastening systems used to install exterior components.
   - i) backing material
   - ii) structural supports
   - iii) stand-offs

iv) clips

5. Describe the procedures used to prepare surfaces for installation of exterior components.

6. Identify types of fasteners used to fasten exterior components.
   i) anchors
   ii) nail-ins
   iii) screws
   iv) adhesives

7. Identify types of sealants used to seal joints and describe their procedures for use.
   i) soldering
   ii) caulking

8. Describe the procedures used to fasten exterior components.

Practical Objectives:

N/A

Level 3

SMW-300 Parallel Line Development (Architectural Applications)

Learning Outcomes:

- Demonstrate knowledge of parallel line development for architectural applications and its associated calculations.
- Demonstrate knowledge of the procedures used to develop patterns and fabricate advanced or complex fittings for architectural applications using parallel line development.

2018 Red Seal Occupational Standard Reference:

5.02 Develops patterns using parallel line method.

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with parallel line development for architectural applications.

2. Describe types of fittings and components for architectural applications that require parallel line development.
   - i) coping
   - ii) gutters
   - iii) mitred flashings
   - iv) finials

3. Identify calculations used in parallel line development for architectural applications and describe the procedures used to perform them.

4. Describe the procedures used to develop patterns and fabricate advanced fittings for architectural applications using parallel line development.
   - i) determine views
   - ii) label lines and points
   - iii) prepare patterns
   - iv) determine true length of lines
   - v) determine types of seams, joints and edges
   - vi) calculate allowances
   - vii) determine stretch-outs
   - viii) check pattern accuracy

ix) cut pattern
x) label pieces

Practical Objectives:

1. Develop patterns and fabricate fittings for architectural applications using parallel line development.

SMW-305 Radial Line Development (Oblique Fittings)

Learning Outcomes:

- Demonstrate knowledge of radial line development for oblique fittings and components and its associated calculations.
- Demonstrate knowledge of the procedures used to develop patterns and fabricate oblique fittings and components using radial line development.

2018 Red Seal Occupational Standard Reference:

5.03 Develops patterns using radial line method.

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with radial line development for oblique fittings and components.

2. Describe types of oblique fittings and components that require radial line development.

3. Identify calculations used in radial line development for oblique fittings and components and describe the procedures used to perform them.

4. Describe the procedures used to develop patterns and fabricate oblique fittings and components using radial line development.
   - i) determine views
   - ii) label lines and points
   - iii) prepare patterns
   - iv) determine true length of lines
   - v) determine types of seams, joints and edges
   - vi) calculate allowances
   - vii) determine stretch-outs
   - viii) check pattern accuracy
   - ix) cut pattern
   - x) label pieces

Practical Objectives:

1. Develop patterns and fabricate oblique fittings using radial line development.

SMW-310 Triangulation (From Elevation)

Learning Outcomes:

- Demonstrate knowledge of triangulation method from elevation, its applications and associated calculations.
- Demonstrate knowledge of the procedures used to develop patterns and fabricate advanced or complex fittings using triangulation method from elevation.

2018 Red Seal Occupational Standard Reference:

5.04 Develops patterns using triangulation method.

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with the triangulation method from elevation.

2. Describe types of fittings that require triangulation from elevation.

3. Identify calculations used in the triangulation method from elevation and describe the procedures used to perform them.

4. Describe the procedures used to develop patterns and fabricate advanced fittings and components using triangulation from elevation.
   - i) determine views
   - ii) label lines and points
   - iii) prepare patterns
   - iv) determine true length of lines
   - v) determine types of seams, joints and edges
   - vi) calculate allowances
   - vii) determine stretch-outs
   - viii) check pattern accuracy
   - ix) cut pattern
   - x) label pieces

Practical Objectives:

1. Develop patterns and fabricate fittings using triangulation from elevation.

SMW-315 Duct System Design

Learning Outcomes:

- Demonstrate knowledge of duct systems and their associated design principles.

2018 Red Seal Occupational Standard Reference:

3.04 Performs basic design and field modifications.
6.02 Forms ductwork, fittings and components.
6.04 Assembles ductwork, fittings components.

Suggested Hours:

27 Hours

Objectives and Content:

1. Define terminology associated with duct system design.

2. Explain air pressure and its impact on the operation of duct systems.

3. Identify types of duct systems and describe their associated design principles.
   - i) air handling systems
     - dual duct
     - single path
     - VAV (variable air volume)
   - ii) material handling systems
     - positive
     - negative

4. Identify air patterns and describe their impact on the operation of duct systems.

5. Identify formulas used in duct system design and describe their applications.
   - i) fan laws
   - ii) velocity
   - iii) quantity
   - iv) pressure

6. Identify considerations and requirements used to determine duct system design.
   - i) equal friction
     - air duct calculator
   - ii) static regain

iii) constant velocity

7. Describe the procedures used to verify duct design to achieve airflow capacity.

8. Describe the procedures used to perform heat gain/loss calculations and their applications.

Practical Objectives:

1. Perform calculations pertaining to duct system design.

SMW-320 Gas Tungsten Arc Welding (GTAW)

Learning Outcomes:

- Demonstrate knowledge of gas tungsten arc welding (GTAW) equipment, its applications and maintenance.
- Demonstrate knowledge of the procedures used to weld using GTAW equipment.

2018 Red Seal Occupational Standard Reference:

2.05 Uses gas tungsten arc welding (GTAW) equipment.

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with gas tungsten arc welding (GTAW).
   i) square wave

2. Identify hazards and describe safe work practices pertaining to the use of GTAW equipment.
   i) hazards
      - fumes and particulate inhalation
      - arc flash
      - burns
      - damage to property
      - fire
      - electrical shock
   ii) safety
      - use of PPE
      - obtaining required permits
      - fire watch
      - positioning welding screens

3. Interpret symbols and information pertaining to the GTAW process found on drawings and specifications.

4. Identify GTAW equipment, consumables and accessories, and describe their characteristics and applications.

5. Identify types of welds performed using the GTAW process.

i) plug
ii) fillet (continuous)
iii) stitch
iv) tack
v) edge
vi) corner

6. Describe the procedures used to maintain and troubleshoot GTAW equipment.

7. Describe the procedures used to set up, adjust and shut down GTAW equipment.

8. Describe the procedures used to weld mild steel, aluminum and stainless steel using the GTAW process.

9. Describe weld defects, their causes and the procedures used to prevent and correct them.
   i) porosity
   ii) cracks
   iii) warping
   iv) undercut

Practical Objectives:

1. Perform GTAW welds on mild steel, aluminum and stainless steel.

SMW-325 Specialty Products

Learning Outcomes:

- Demonstrate knowledge of specialty products and their applications.
- Demonstrate knowledge of the procedures used to fabricate specialty products and components.
- Demonstrate knowledge of the procedures used to install specialty products and their components.
- Demonstrate knowledge of procedures used to finish specialty products and their components.

2018 Red Seal Occupational Standard Reference:

8.01 Cuts material for specialty products.
8.02 Forms specialty products.
8.03 Assembles specialty products.
8.04 Finishes specialty products.
17.01 Installs stainless steel specialty products.
17.02 Installs non-stainless steel specialty products.

Suggested Hours:

18 Hours

Objectives and Content:

1. Define terminology associated with the fabrication and installation of specialty products.

2. Identify hazards and describe safe work practices pertaining to the fabrication and installation of specialty products.

3. Interpret codes, regulations, standards and job specifications pertaining to the fabrication and installation of specialty products.
   i) codes, regulations and standards
      - AHJ
      - SMACNA
      - ASHRAE
      - NFPA
      - CSA
      - ANSI
      - NBC

- CWB
- Health Canada

ii) job specifications
- engineering
- architectural and manufacturers' specifications
- penetrations
- structural supports
- drawings
  - shop drawings
  - details
  - sketches

4. Identify tools and equipment used to fabricate and install specialty products and describe their applications, limitations and procedures for use.

5. Identify types of specialty products and describe their applications.
   i) kitchen
   ii) medical
   iii) food processing
   iv) pharmaceutical
   v) laboratory
   vi) decorative
   vii) underground ductwork

6. Identify types of materials used in specialty products and components, and describe their properties and applications.
   i) ferrous
   ii) non-ferrous
   iii) plastics/PVC
   iv) composites

7. Calculate and measure material to be cut.

8. Describe the procedures used to fabricate specialty products and their components.

9. Identify surface finishing methods and describe their associated procedures.
   i) grinding
   ii) filing
   iii) buffing
   iv) chemical compounds
   v) sealants

10. Describe the procedures used to install specialty products and components.
    i) stainless steel

ii) non-stainless steel

Practical Objectives:

1. Fabricate specialty products.

SMW-330 Air Handling Systems II

Learning Outcomes:

- Demonstrate knowledge of the procedures to prepare the installation site for air handling system components.
- Demonstrate knowledge of the procedures used to install terminal boxes.
- Demonstrate knowledge of the procedures used to install coils.
- Demonstrate knowledge of the procedures used to install system component accessories.
- Demonstrate knowledge of the procedures used to install plenums.

2018 Red Seal Occupational Standard Reference:

9.01 Performs on-site measurements.
9.02 Performs demolitions for renovations.
9.03 Installs penetrations and sleeves.
9.04 Installs supports and bases.
9.05 Installs hangers, cables, braces and brackets.
11.01 Installs air handling equipment.
11.06 Installs terminal boxes.
11.07 Installs coils.
11.08 Installs system component accessories.
11.09 Installs plenums.

Suggested Hours:

6 Hours

Objectives and Content:

1. Define terminology and describe products associated with the installation of air handling components and accessories.
   i) terminal boxes
   ii) coils
   iii) plenums

2. Identify hazards and describe safe work practices pertaining to the installation of air handling components and accessories.

3. Interpret codes and standards pertaining to the installation of air handling components and accessories.
   i) SMACNA

ii) ASHRAE
iii) ANSI
iv) NBC
v) CSA
vi) ULC
vii) AHJ

4. Interpret information pertaining to the installation of air handling system components and accessories found on drawings and specifications.
   i) terminal boxes
   ii) coils
   iii) plenums

5. Identify tools and equipment used for the installation of air handling components and accessories and describe their application and procedures for use.

6. Describe the procedures used to prepare the site for the installation of terminal boxes, coils and plenums.

7. Identify considerations and requirements for installing terminal boxes, coils and plenums.

8. Describe the procedures used to install terminal boxes.

9. Describe the procedures used to install coils.

10. Describe the procedures used to install plenums.

Practical Objectives:

N/A

SMW-335 Introduction to Testing and Balancing

Learning Outcomes:

- Demonstrate knowledge of testing and inspection devices and their applications.
- Demonstrate knowledge of testing and balancing requirements.
- Demonstrate knowledge of the procedures to perform leak testing.

2018 Red Seal Occupational Standard Reference:

2.10 Uses testing and inspection devices.
14.01 Performs leak tests.
14.02 Performs testing, adjusting and balancing (TAB). (Introduction)
14.03 Participates in the commissioning of air and material handling systems. (Introduction)

Suggested Hours:

12 Hours

Objectives and Content:

1. Define terminology associated with testing and balancing.

2. Identify hazards and describe safe work practices pertaining to testing and balancing.
   i) leak testing
   ii) air balancing

3. Interpret codes and standards pertaining to testing and balancing on air and material handling systems.
   i) SMACNA
   ii) ASHRAE
   iii) AHJ
   iv) NBC
   v) Testing, Adjusting and Balancing Bureau (TABB)
   vi) Atlantic Air Balance Council (AABC)

4. Identify tools and equipment used in testing and balancing and describe their applications and procedures for use.
   i) electrical testing devices
   ii) smoke emitting device
   iii) velometers
   iv) flow hoods/balometers
   v) multimeters

vi) thermometers
vii) anemometers
viii) psychrometers
ix) pitot tubes
x) manometers
xi) tachometers
xii) gas detection
xiii) camera

5. Identify types of leak tests relating to air handling system components and describe the procedures used to perform them.
   i) pressure test
   ii) smoke test

6. Identify requirements and limitations pertaining to leak testing.

7. Identify requirements and limitations pertaining to air balancing.

8. Explain the importance of testing and balancing to ensure optimal system performance.

9. Explain the purpose of commissioning.

Practical Objectives:

1. Practice testing and balancing methods.

SMW-340 Electrical Principles

Learning Outcomes:

- Demonstrate knowledge of basic concepts of electricity.
- Demonstrate knowledge of electrical devices and testing instruments and their applications.

2018 Red Seal Occupational Standard Reference:

2.10 Uses testing and inspection devices.
11.01 Installs air handling equipment.

Suggested Hours:

12 Hours

Objectives and Content:

1. Define terminology associated with electricity.

2. Identify hazards and describe safe work practices pertaining to working on or around electrical equipment and sources.

3. Explain the basic principles of electricity.

4. Explain the mathematical relationship between amps, volts, ohms and watts.

5. Identify electrical devices and describe their purpose.
   - i) circuit breakers
   - ii) disconnects
   - iii) overload heaters
   - iv) ground fault interrupters (GFI)
   - v) fuses
   - vi) programmable logic controllers (PLC)
   - vii) motors
   - viii) capacitors
   - ix) motor starters
   - x) variable speed drives (VSD)
   - xi) flow switches
   - xii) thermostats

6. Identify types of electrical test meters and describe their applications and procedures for use.

Practical Objectives:

1. Use metering devices.

SMW-345 System Maintenance and Repair

Learning Outcomes:

- Demonstrate knowledge of testing and inspection devices and their applications.
- Demonstrate knowledge of the procedures used to maintain and service air handling system components.
- Demonstrate knowledge of the procedures used to diagnose and repair air handling system components.

2018 Red Seal Occupational Standard Reference:

2.10 Uses testing and inspection devices.
18.01 Performs maintenance inspections.
18.02 Services components.
19.01 Diagnoses system faults.
19.02 Repairs worn or faulty components.

Suggested Hours:

12 Hours

Objectives and Content:

1. Define terminology associated with the maintenance and repair of air and material handling systems.

2. Identify hazards and describe safe work practices pertaining to the maintenance and repair of air and material handling systems.

3. Interpret codes and standards pertaining to the maintenance and repair of air and material handling systems.
   i) SMACNA
   ii) ASHRAE
   iii) NBC
   iv) ANSI
   v) CSA
   vi) NFPA

4. Identify tools and equipment used to maintain and repair system components and describe their applications and procedures for use.
   i) maintenance inspection
   ii) service

iii) diagnostic
iv) repair

5. Identify considerations for the inspection of system components.
   i) sounds
   ii) vibrations
   iii) odours
   iv) heat build-up

6. Identify types of testing and inspection devices and describe their applications and procedures for use.
   i) thermal imaging devices
   ii) multimeters
   iii) tachometers
   iv) belt-tensioning tools
   v) thermometers
   vi) stethoscope
   vii) refrigeration gauges
   viii) leak detectors
   ix) manometer

7. Describe the procedures used to service system components.
   i) changing consumables
      - filters
      - pads
      - trays
      - seals
   ii) cleaning components
   iii) lubricating
   iv) making adjustments
   v) performing lock-out

8. Identify symptoms of system faults.
   i) sounds
   ii) vibration
   iii) odours
   iv) heat build-up
   v) increased amperage draw
   vi) mould
   vii) decreased airflow

9. Identify types of tests and readings required to diagnose system faults.
   i) amperage draws
   ii) air pressure readings

iii) vibration
iv) temperature
v) resistance
vi) voltage
vii) gas pressure
viii) humidity

10. Identify considerations for the repair of worn or faulty components.
    i) type of replacement components
    ii) manufacturers' specifications
    iii) location of components
    iv) downtime during repair

11. Describe the procedures used to repair or replace worn or faulty components.

12. Perform calculations to determine system performance.

Practical Objectives:

N/A

SMW-350 Marine Products

Learning Outcomes:

- Demonstrate knowledge of marine products and their applications.
- Demonstrate knowledge of safe work practices and procedures pertaining to installing marine products.
- Demonstrate knowledge of the procedures to install marine products.

2018 Red Seal Occupational Standard Reference:

17.03 Installs marine products.

Suggested Hours:

3 Hours

Objectives and Content:

1. Define terminology associated with marine products.

2. Identify hazards and describe safe work practices pertaining to the installation of marine products.

3. Interpret job specifications pertaining to the installation of marine products.
   - i) specifications
     - engineering
     - architectural
     - manufacturers'
   - ii) penetrations
   - iii) structural supports
   - iv) drawings
     - shop drawings
     - details
     - sketches

4. Identify tools and equipment used to install marine products, and describe their applications, limitations and procedures for use.

5. Identify types of marine products and materials and describe their applications.

6. Identify types of fasteners and fastening methods used to install marine products and describe their applications.

7. Identify special considerations for installing marine products.
    i) working without levels or squares on non-level or square surfaces
    ii) increased awareness of PPE, confined space
    iii) ventilation and life safety including flotation devices
    iv) working from a single benchmark

8. Describe the procedures used to install marine products.

9. Describe differences in installing in dry dock versus floating locations.

Practical Objectives:

N/A

Level 4

SMW-400 Pattern Development (Computer Technology)

Learning Outcomes:

- Demonstrate knowledge of computer technology used for pattern development and layout.

2018 Red Seal Occupational Standard Reference:

5.05 Uses computer technology for pattern development.

Suggested Hours:

6 Hours

Objectives and Content:

1. Define terminology associated with computerized pattern development and layout.

2. Identify types of computerized software and equipment used for pattern development and describe their applications.

3. Describe the procedures used to perform pattern development using computer technology.

Practical Objectives:

1. Demonstrate method of pattern input using computer technology.

SMW-405 Material Handling Systems

Learning Outcomes:

- Demonstrate knowledge of material handling systems and components.
- Demonstrate knowledge of the procedures used to prepare the site for installation of material handling systems and components.
- Demonstrate knowledge of the procedures used to fabricate dampers and components.
- Demonstrate knowledge of the procedures used to install pneumatic and gravity material handling system components.
- Demonstrate knowledge of the procedures used to install mechanized material handling system components.

2018 Red Seal Occupational Standard Reference:

6.02 Forms ductwork, fittings and components.
6.04 Assembles ductwork, fittings and components.
6.05 Fabricates dampers.
9.01 Performs on-site measurements.
9.02 Performs demolitions for renovations.
9.03 Installs penetrations and sleeves.
9.04 Installs supports and bases.
9.05 Installs hangers, cables, braces and brackets.
11.08 Installs system components.
12.01 Installs pneumatic and gravity material handling system components.
12.02 Installs mechanized material handling system components.

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with material handling systems and components.

2. Identify hazards and describe safe work practices pertaining to the fabrication and installation of material handling system components.
   - i) grounding
   - ii) pneumatic
   - iii) gravity
   - iv) mechanized
     - lock-out and tag-out
     - identifying pinch point

- working around moving equipment

3. Interpret codes and standards pertaining to the fabrication and installation of material handling system components.
   i) SMACNA
   ii) ASHRAE
   iii) NBC
   iv) ANSI
   v) CSA
   vi) NFPA

4. Interpret information pertaining to installing material handling system components found on drawings and specifications.

5. Identify tools and equipment used to fabricate and install pneumatic and gravity material handling system components and describe their procedures for use.

6. Identify basic duct systems used in material handling systems and describe their associated design principles.
   i) positive
   ii) negative

7. Identify types of material handling systems and describe their applications.
   i) pneumatic
   ii) gravity
   iii) mechanized

8. Identify types of pneumatic and gravity material handling system components and describe their purpose and operation.
   i) chutes
   ii) explosion ducts
   iii) blast gates/dampers
   iv) relief vents
   v) explosion dampers
   vi) blowers
   vii) separating devices (bag houses, cyclones)
   viii) air locks
   ix) isolators
   x) hoppers
   xi) bins

9. Identify types of mechanized material handling system components and describe their purpose and operation.
   i) chutes

ii) slides
iii) conveyors
iv) augers

10. Identify types of materials used to fabricate dampers and components for material handling systems and describe their characteristics and applications.

11. Identify considerations and requirements when fabricating sheet metal components for material handling systems.
    i) load bearing capacities
    ii) system specifications
    iii) environmental conditions
    iv) architectural conditions

12. Identify calculations related to material handling system and damper fabrication and describe the procedures used to perform them.
    i) frame size
    ii) bend allowances
    iii) number of blades
    iv) material thickness

13. Describe the procedures used to prepare for the installation of material handling system components.

14. Identify considerations when installing material handling system components. manufacturers' specifications.
    i) isolators
    ii) building materials
    iii) environmental conditions
    iv) field design modifications

15. Describe the procedures used to install pneumatic and gravity material handling system components.

16. Describe the procedures used to install mechanized material handling system components.

Practical Objectives:

1. Perform basic system design and related calculations.

SMW-410 Thermal Insulation, Lagging/Cladding and Flashing

Learning Outcomes:

- Demonstrate knowledge of the procedures used to apply thermal insulation to components.
- Demonstrate knowledge of the procedures used to apply lagging and cladding to components.
- Demonstrate knowledge of the procedures used to apply flashing to components.

2018 Red Seal Occupational Standard Reference:

13.01 Applies thermal insulation to components.
13.02 Applies lagging and cladding to components.
13.03 Applies flashing to components.

Suggested Hours:

21 Hours

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to applying thermal insulation, lagging/cladding and flashing to components.

2. Interpret codes and standards pertaining to insulating components.
   i) SMACNA
   ii) NFPA
   iii) NBC
   iv) TIAC

3. Interpret information pertaining to thermal insulation, lagging/cladding and flashing found on drawings and specifications.

4. Identify tools and equipment used to apply thermal insulation, lagging/cladding and flashing to components, and describe their applications, limitations and procedures for use.

5. Identify types and properties of thermal insulation, lagging/cladding and flashing used to insulate components.

6. Identify methods used to secure and seal material, seams and joints and describe their associated procedures.

7. Identify methods used to apply flashing and describe their associated procedures.

8. Identify considerations when installing flashing to components.
   i) isolation
   ii) building materials
   iii) environmental conditions
   iv) field design modifications

9. Describe layout methods.

10. Calculate measurements of materials before cutting.

Practical Objectives:

N/A

SMW-415 Testing, Adjusting and Balancing (TAB)

Learning Outcomes:

- Demonstrate knowledge of testing and inspection devices and their applications.
- Demonstrate knowledge of the procedures used to perform testing, adjusting and balancing (TAB) on air handling systems.

2018 Red Seal Occupational Standard Reference:

2.10 Uses testing and inspection devices.
14.01 Performs leak tests.
14.02 Performs testing, adjusting and balancing (TAB).

Suggested Hours:

30 Hours

Objectives and Content:

1. Define terminology associated with testing, adjusting and balancing (TAB).

2. Identify hazards and describe safe work practices pertaining to TAB.

3. Interpret codes and standards pertaining to TAB.
   i) Testing, Adjusting and Balancing Bureau (TABB)
   ii) SMACNA
   iii) Atlantic Air Balance Council (AABC)

4. Interpret information pertaining to performing TAB found on drawings and specifications.

5. Identify tools and testing equipment used in TAB and describe their applications and procedures for use.

6. Explain the importance of TAB to ensure optimal system performance.

7. Identify types of tests relating to air handling system equipment and components and describe the procedures used to perform them.
   i) airflow
   ii) leak/pressure
   iii) velocity
   iv) volume

8. Identify requirements and limitations pertaining to TAB.

9. Identify calculations pertaining to balancing air handling systems and describe the procedures used to perform them.

10. Describe the procedures and techniques used to perform balancing on handling systems.
    i) sequential balancing
    ii) proportional balancing

11. Describe the procedures used to adjust air handling system equipment and components to optimize performance.
    i) motor pulleys
    ii) dampers
    iii) blower pulleys
    iv) three-stage motors
    v) variable frequency drives (VFD)
    vi) test port
    vii) inlet vanes

12. Identify problems pertaining to air handling systems and describe procedures used to prevent and correct them.
    i) lack of air pressure
    ii) excessive air pressure
    iii) improper installation
        - duct sizing
        - noise

Practical Objectives:

1. Perform calculations related to balancing of air handling systems.

SMW-420 Commissioning

Learning Outcomes:

- Demonstrate knowledge of commissioning and its purpose.
- Demonstrate knowledge of the procedures used to commission air and material handling systems and components.

2018 Red Seal Occupational Standard Reference:

14.03 Participates in the commissioning of air and material handling systems.

Suggested Hours:

9 Hours

Objectives and Content:

1. Define terminology associated with commissioning.

2. Interpret documentation pertaining to commissioning.
   - i) equipment shop drawings
   - ii) as-built drawings
   - iii) test results

3. Explain the purpose of commissioning and identify the types of air and material handling systems and components.

4. Describe the procedures used to commission air and material handling systems and components.
   - i) pre start-up checklist
     - remove all shipping bolts
     - check rotation and operation
     - check filters
     - remove all plastic from ends of ductwork
   - ii) confirm controls are terminated
   - iii) equipment start-up
   - iv) system training and verification

5. Identify requirements for project turnover.

Practical Objectives:

N/A

SMW-425 Job Planning

Learning Outcomes:

- Demonstrate knowledge of the procedures used to plan and organize jobs.

2018 Red Seal Occupational Standard Reference:

3.01 Uses trade-related documentation.
3.02 Interprets drawings.
3.03 Organizes materials and equipment for project.

Suggested Hours:

18 Hours

Objectives and Content:

1. Identify sources of information relevant to job planning.
   - i) documentation
   - ii) drawings
   - iii) specifications
   - iv) related professionals
   - v) clients
   - vi) LEED requirements
   - vii) computer technology

2. Describe the considerations for determining job requirements.
   - i) personnel
   - ii) tools and equipment
   - iii) material and supplies
   - iv) permits

3. Describe considerations for determining material and supply requirements.
   - i) plans
   - ii) specifications
   - iii) drawings
   - iv) environment

4. Describe the procedures used to plan job tasks.
   - i) scheduling
   - ii) estimating

5. Describe the procedures used to organize, store and maintain inventory.

6. Describe safety requirements for handling materials and equipment.

7. Describe the procedures used to plan for a job.
    i) determining equipment requirements
    ii) verifying duct sizing
    iii) determining penetration locations
    iv) performing site measurements
    v) demolishing and removing existing systems and components
    vi) performing on-site coordination
    vii) staging (storing material)
    viii) planning
    ix) distributing (material to installation area)
    x) sectioning (pre-assembling on-site)
    xi) erecting
    xii) completing final inspection

Practical Objectives:

N/A

SMW-430 Drawings II

Learning Outcomes:

- Demonstrate knowledge of the procedures used to interpret and extract information from drawings.
- Demonstrate knowledge of the procedures used to take field measurements.
- Demonstrate knowledge of the procedures used to produce material take-off lists.

2018 Red Seal Occupational Standard Reference:

3.02 Interprets drawings.
3.04 Performs basic design and field modifications.

Suggested Hours:

30 Hours

Objectives and Content:

1. Identify types of drawings and describe their purpose and applications.
   i) submittals
   ii) shop drawings
   iii) interference
   iv) as-builts

2. Describe the procedures used to interpret and extract information from drawings

3. Describe the procedures used to take field measurements.

4. Identify types of material take-off lists and describe their applications and the procedures used to produce them.
   i) material estimation
   ii) material installation

Practical Objectives:

1. Read and interpret drawings and specifications.

2. Produce material take-off list.

SMW-435 Mentoring

Learning Outcomes:

- Demonstrate knowledge of strategies for learning skills in the workplace.
- Demonstrate knowledge of strategies for teaching workplace skills.

2018 Red Seal Occupational Standard Reference:

4.02 Uses mentoring techniques.

Suggested Hours:

6 Hours

Objectives and Content:

1. Describe the importance of individual experience.

2. Describe the shared responsibilities for workplace learning.

3. Determine one's own learning preferences and explain how these relate to learning new skills.

4. Describe the importance of different types of skills in the workplace.

5. Describe the importance of essential skills in the workplace.
   - i) reading
   - ii) writing
   - iii) document use
   - iv) oral communication
   - v) numeracy
   - vi) thinking
   - vii) working with others
   - viii) digital technology
   - ix) continuous learning

6. Identify different learning styles.
   - i) seeing it
   - ii) hearing it
   - iii) trying it

7. Identify different learning needs and strategies to meet learning needs.

i) learning disabilities
ii) learning preferences
iii) language proficiency

8. Identify strategies to assist in learning a skill.
   i) understanding the basic principles of instruction
   ii) developing coaching skills
   iii) being mature and patient
   iv) providing feedback

9. Identify different roles played by a workplace mentor.

10. Describe teaching skills.
    i) identifying the point of the lesson
    ii) linking the lesson
    iii) demonstrating the skill
    iv) providing practice
    v) giving feedback
    vi) assessing skills and progress

11. Identify how to choose a good time to present a lesson.

12. Identify the components of the skill (the context).

13. Describe considerations in setting up opportunities for skill practice.

14. Explain the importance of providing feedback.

15. Identify techniques for giving effective feedback.

16. Describe a skills assessment.

17. Identify methods of assessing progress.

18. Explain how to adjust a lesson to different situations.

Practical Objectives:

N/A

SMW-440 Program Review

Learning Outcomes:

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

2018 Red Seal Occupational Standard Reference:

Entire Red Seal Occupational Standard

Suggested Hours:

30 Hours

Objectives and Content:

1. Define and explain 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 Interprovincial Red Seal Examination.
   - i) development
   - ii) validation
   - iii) MWA and task weighting
   - iv) examination breakdown (pie-chart)

3. Identify Red Seal products and describe their use for preparing for the Interprovincial Red Seal Examination.
   - i) Red Seal website
   - ii) examination preparation guide
   - iii) sample questions
   - iv) examination counselling sheets

4. Explain the relationship between the RSOS and the Atlantic Apprenticeship Curriculum Standard (AACS).

5. Review common occupational skills for the Sheet Metal Worker trade as identified in the RSOS.
   - i) safety-related functions

ii) tools and equipment
iii) organizes work
iv) communication and mentoring

6. Review process to perform fabrication for the Sheet Metal Worker trade as identified in the RSOS.
   i) pattern development
   ii) sheet metal components for air and material handling systems
   iii) flashing, roofing, sheeting and cladding
   iv) specialty products

7. Review process to install air and material handling systems for the Sheet Metal Worker trade as identified in the RSOS.
   i) installation site
   ii) chimneys, breeching and venting to exhaust appliances and mechanical equipment
   iii) air handling system components
   iv) material handling system components
   v) thermal insulations, lagging, cladding and flashing
   vi) leak testing, air balancing and commissioning

8. Review process to install roofing and specialty products for the Sheet Metal Worker trade as identified in the RSOS.
   i) metal roofing and cladding/siding systems
   ii) exterior components
   iii) specialty products

9. Review process to perform maintenance and repair for the Sheet Metal Worker trade as identified in the RSOS.
   i) scheduled maintenance
   ii) faulty systems and components

Practical Objectives:

N/A

Feedback and Revisions

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

New Brunswick:
Apprenticeship and Occupational Certification
Post-Secondary Education, Training and Labour
470 York St., Rm. 110, 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
Atlantic Technology Centre
212-176 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
Immigration, Population Growth and Skills
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 AACS and will be detailed in the following section.

Version Changes

Revision Date	Section	Description of Change