



SHEET METAL WORKER

2020

Based on Harmonization Recommendations
(Levels 1 & 2 based on 2018 updates. Levels 3 & 4 based on 2020 updates.)



Nova Scotia
Curriculum Standard

Sheet Metal Worker

Preface

This 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 Apprenticeship Program.

This document contains all of the technical training elements required to complete the program and has been developed based on the 2017 Red Seal Occupational Standard (RSOS). The RSOS can be found on the Red Seal website (www.red-seal.ca),

Implementation of this Apprenticeship Curriculum Standard for apprenticeship training is outlined in the following table.

Level	Implementation Effective
Level 1	2018-2019
Level 2	2019-2020
Level 3	2020-2021
Level 4	2021-2022

*** 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 Automotive Service Technician 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.

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Introduction

Jurisdictions have long recognized the benefit of pooling resources in the development and maintenance of apprenticeship training standards. A successful example of this is the Interprovincial Standards Red Seal Program, which is administered by the Canadian Council of Directors of Apprenticeship (CCDA). Essential to the establishment of standards is the development of suitable training systems and programs which enable tradespeople to acquire certification based on these standards. While certification is the responsibility of Apprenticeship administrators throughout Canada, the development and delivery of technical training is the responsibility of jurisdictions.

With the support of Employment Services and Development Canada (ESDC), the provinces and territories have been working collaboratively to harmonize apprenticeship training programs across Canada. Four main areas of harmonization include:

- Use of the Red Seal trade name
- Consistent total training hours
- Same number of training levels
- Consistent sequencing of training content (at each level) using the most recent 2017 Red Seal Occupational Standard/National Occupational Analysis for the trade

This Apprenticeship Curriculum Standard is in alignment with the national CCDA harmonization recommendations.

Provincial-Territorial Apprentice Mobility Agreement and Protocol

The provincial-territorial apprenticeship mobility agreement and protocol obligates Apprenticeship Authorities across Canada to recognize hours worked and technical training successfully completed by apprentices, regardless of the jurisdiction in which they were completed. The protocol applies to apprentices moving permanently or temporarily, and to recent graduates of college trades program.

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 Red Seal Occupational Standard References (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 you 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.
DIAGNOSE	To analyze or identify a problem or malfunction.
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	<p>Routine inspection and replacement of worn or deteriorating parts.</p> <p>An act or business function provided to a customer in the course of one's profession. (e.g., haircut).</p>
TECHNIQUE	<p>Within a procedure, the manner in which technical skills are applied.</p>
TEST	<p>v. To subject to a procedure that ascertains effectiveness, value, proper function, or other quality.</p> <p>n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.</p>
TROUBLESHOOT	<p>To follow a systematic procedure to identify and locate a problem or malfunction and its cause.</p>

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 (ESDA) website at www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

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

Profile Chart

OCCUPATIONAL SKILLS			
SMW-100 Safety	SMW-105 Stationary and Mobile Work Platforms	SMW-110 Hoisting, Lifting and Positioning Equipment	SMW-115 Tools and Equipment
SMW-120 Communication and Trade Documents	SMW-125 Sheet Metal Math Fundamentals	SMW-170 Mentoring 1	SMW-445 Mentoring 2
SMW-130 Introduction to Welding	SMW-135 Resistance Spot Welding	SMW-140 Plasma Arc Cutting	SMW-145 Metallurgy
SMW-150 Soft Soldering	SMW-155 Drafting	SMW-200 Drawings 1	SMW-300 Drawings 2
SMW-230 Introduction to GMAW	SMW-235 Oxy-fuel Cutting, Heating and Brazing/Hard Soldering	SMW-240 SMAW	SMW-305 Advanced GMAW
SMW-310 Introduction to GTAW	SMW-315 Advanced GTAW	SMW-435 Trade Related Documents	SMW-440 Job Planning
SHEET METAL FABRICATION			
SMW-155 Drafting	SMW-160 Pattern Development 1 (Simple and Straight Line)	SMW-165 Fabrication Installation Fundamentals	SMW-205 Parallel Line Development (Round Duct Fittings)
SMW-210 Radial Line Development (Right Cones)	SMW-215 Triangulation (From Plan View)	SMW-220 Air Handling Systems (Fabrication) 1	SMW-320 Parallel Line Development (Architectural Applications)
SMW-325 Radial Line Development (Oblique Fittings)	SMW-330 Triangulation (From Elevation)	SMW-400 Triangulation (Rectangular Fittings and Computerized Technology)	SMW-335 Duct System Design
AIR AND MATERIAL HANDLING SYSTEM INSTALLATION			
SMW-245 Air Quality Management	SMW-250 Chimneys, Breeching and Venting	SMW-225 Air Handling Systems (Installation) 1	SMW-345 Air Handling Systems (Installation) 2
SMW-350 Air Handling Systems (Maintenance & Repair)	SMW-405 Material Handling Systems (Fabrication)	SMW-410 Material Handling Systems (Installation)	SMW-415 Material Handling Systems (Maintenance & Repair)

Profile Chart *(continued)*

ROOFING, ARCHITECTURAL METAL AND SPECIALTY PRODUCT INSTALLATION			
SMW-255 Metal Roofing and Architectural Metal	SMW-340 Specialty Products		
MAINTENANCE AND REPAIR			
SMW-350 Air Handling Systems (Maintenance and Repair)	SMW-415 Material Handling Systems (Maintenance and Repair)	SMW-420 Testing and Balancing	SMW-425 Introduction to Commissioning
SMW-430 Electrical Principles			

Program Structure (Levels 1 & 2) based on the 2018 Updates

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Units to be Covered			
			Unit Title		Sugg. Hrs	Pg. #
Level 1 (8 Weeks, 6 Courses)						
MENT-1801	Integrated Milestone	None	SMW-170	Mentoring 1		22
SMWA-1824	Safety and Elevating Devices	None	SMW-100	Safety	15	24
			SMW-105	Stationary and Mobile Work Platforms	7	27
			SMW-110	Hoisting, Lifting and Positioning Equipment	8	29
SMWA-1850	Tools and Equipment	SMWA-1824	SMW-115	Tools and Equipment	30	32
SMWA-1854	Trade Practice	None	SMW-120	Communication and Trade Documents	5	34
			SMW-125	Sheet Metal Math Fundamentals	25	37
SMWA-1855	Welding 1	SMWA-1824, 1850	SMW-130	Introduction to Welding	10	38
			SMW-135	Resistance Spot Welding	5	40
			SMW-140	Plasma Arc Cutting	5	42
			SMW-145	Metallurgy	5	44
			SMW-150	Soft Soldering	5	46
SMWA-1856	Pattern Development 1 (Simple and Straight Line)	SMWA-1824, 1850	SMW-155	Drafting	30	48
			SMW-160	Pattern Develop 1 (Simple & Straight Line)	45	49
SMWA-1857	Fabrication and Installation Fundamentals	SMWA-1856	SMW-165	Fabrication and Installation Fundamentals	45	51
Level 2 (7 Weeks, 8 Courses)						
SMWA-1858	Drawings 1	SMWA-1856	SMW-200	Drawings 1	24	55
SMWA-1833	Pattern Development 2 (Parallel Line)	SMWA-1857	SMW-205	Parallel Line Develop (Round Duct Fittings)	24	57
SMWA-1834	Pattern Development 2 (Radial Line)	SMWA-1857	SMW-210	Radial Line Development (Right Cones)	24	58
SMWA-1835	Pattern Development 2 (Triangulation)	SMWA-1857	SMW-215	Triangulation (From Plan View)	24	59
SMWA-1859	Air Handling Systems 1	SMWA-1824, 1850 & 1857	SMW-220	Air Handling Systems (Fabrication) 1	24	60
			SMW-225	Air Handling Systems (Installation) 1	12	62
SMWA-1860	Welding 2	SMWA-1855	SMW-230	Introduction to GMAW	18	65
			SMW-235	Oxy-fuel Cut, Heating & Braze/Hard Solder	12	67
			SMW-240	SMAW	6	69
SMWA-1861	Chimneys, Breeching and Venting	SMWA-1859	SMW-245	Air Quality Management	6	71
			SMW-250	Chimneys, Breeching and Venting	18	73
SMWA-1846	Metal Roofing and Architectural Metal	SMWA-1833, 1834, 1835	SMW-255	Metal Roofing and Architectural Metal	18	75

Level Structure (Levels 3 & 4) based on the draft 2020 AACCS

Level 3 – 7 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SMW-300	Parallel Line Development (Architectural Applications)	30	79
SMW-305	Radial Line Development (Oblique Fittings)	30	81
SMW-310	Triangulation 2	30	83
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 3	6	92
SMW-335	Introduction to Leak Testing, Air Balancing and Commissioning	12	94
SMW-340	Electrical Principles	12	97
SMW-345	System Maintenance and Repair	12	99
SMW-350	Marine Products	3	103

Level 4 – 6 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
SMW-400	Pattern Development (Computer Technology)	6	106
SMW-405	Material Handling Systems	30	107
SMW-410	Thermal Insulation, Lagging/Cladding and Flashing	21	111
SMW-415	Testing, Adjusting and Balancing (TAB)	30	113
SMW-420	Commissioning	9	115
SMW-425	Job Planning	18	117
SMW-430	Drawings 2	30	119
SMW-435	Mentoring	6	120
SMW-440	Program Review	30	123

Draft 2017 RSOS Sub-task to AACS Unit Comparison

NOA Sub-task		IPG Unit	
Task 1 – Performs safety-related functions.			
1.01	Uses personal protective equipment (PPE) and safety equipment.	SMW-100	Safety
1.02	Maintains safe work environment.	SMW-100	Safety
1.03	Performs lock-out/tag-out procedures.	SMW-100	Safety
Task 2 – Uses and maintains tools and equipment.			
2.01	Uses hand and portable power tools.	SMW-115	Tools and Equipment
2.02	Uses shop tools and equipment.	SMW-115	Tools and Equipment
2.03	Uses gas metal arc welding (GMAW) equipment.	SMW-230	Introduction to GMAW
		SMW-305	Advanced GMAW
2.04	Uses resistance spot welding equipment.	SMW-135	Resistance Spot Welding
2.05	Uses gas tungsten arc welding (GTAW) equipment.	SMW-310	Introduction to GTAW
		SMW-315	Advanced GTAW
2.06	Uses shielded metal arc welding (SMAW) equipment.	SMW-130	Introduction to Welding
		SMW-240	SMAW
2.07	Uses oxy-fuel and plasma arc cutting equipment.	SMW-150	Soft Soldering
		SMW-140	Plasma Arc Cutting
		SMW-235	Oxy-fuel Cutting, Heating and Brazing/Hard Soldering
2.08	Maintains measuring and layout equipment.	SMW-115	Tools and Equipment
		SMW-155	Drafting
2.10	Uses testing and inspection devices.	SMW-350	Air Handling Systems (Maintenance and Repair)
		SMW-415	Material Handling Systems (Maintenance and Repair)
		SMW-420	Testing and Balancing
		SMW-430	Electrical Principles
2.11	Uses stationary and mobile work platforms.	SMW-105	Stationary and Mobile Work Platforms
2.12	Uses hoisting, rigging and positioning equipment.	SMW-110	Hoisting, Rigging and Positioning Equipment
Task 3 – Organizes work.			
3.01	Uses trade-related documentation.	SMW-120	Communication and Trade Documents
		SMW-435	Trade Related Documents
		SMW-440	Job Planning
3.02	Interprets drawings.	SMW-120	Communication and Trade Documents
		SMW-200	Drawings 1
		SMW-300	Drawings 2

NOA Sub-task		IPG Unit	
		SMW-440	Job Planning
3.03	Organizes materials and equipment for project.	SMW-120	Communication and Trade Documents
		SMW-440	Job Planning
3.04	Performs basic design and field modifications.	SMW-225	Air Handling Sys (Installation) 1
		SMW-410	Material Handling Systems (Installation)
Task 4 – Uses communication and mentoring techniques.			
4.01	Uses communication techniques.	SMW-120	Communication and Trade Documents
4.02	Uses mentoring techniques.	SMW-170	Mentoring 1
		SMW-445	Mentoring 2
Task 5 – Performs pattern development.			
5.01	Develops patterns using simple and straight-line layout.	SMW-160	Pattern Development 1 (Simple and Straight Line)
5.02	Develops patterns using parallel line method.	SMW-205	Parallel Line Development (Round Duct Fittings)
		SMW-320	Parallel Line Development (Architectural Applications)
5.03	Develops patterns using radial line method.	SMW-210	Radial Line Development (Right Cones)
		SMW-325	Radial Line Development (Oblique Fittings)
5.04	Develops patterns using triangulation method.	SMW-215	Triangulation (From Plan View)
		SMW-330	Triangulation (From Elevation)
		SMW-400	Triangulation (Rectangular Fittings) and Computerized Technology
5.05	Uses computer technology for pattern development.	SMW-400	Triangulation (Rectangular Fittings) and Computerized Technology
Task 6 – Fabricates sheet metal components for air and material handling systems.			
6.01	Cuts ductwork, fittings and components.	SMW-165	Fabrication and Installation Fundamentals
		SMW-220	Air Handling Systems (Fabrication) 1
		SMW-405	Material Handling Systems (Fabrication)
6.02	Forms ductwork, fittings and components.	SMW-165	Fabrication and Installation Fundamentals
		SMW-220	Air Handling Systems (Fabrication) 1
		SMW-335	Duct System Design
		SMW-405	Material Handling Systems (Fabrication)

NOA Sub-task		IPG Unit	
6.03	Insulates ductwork, fittings and components.	SMW-165	Fabrication and Installation Fundamentals
		SMW-220	Air Handling Systems (Fabrication) 1
		SMW-405	Material Handling Systems (Fabrication)
6.04	Assembles ductwork, fittings and components.	SMW-165	Fabrication and Installation Fundamentals
		SMW-220	Air Handling Systems (Fabrication) 1
		SMW-335	Duct System Design
		SMW-405	Material Handling Systems (Fabrication)
6.05	Fabricates dampers.	SMW-165	Fabrication and Installation Fundamentals
		SMW-220	Air Handling Systems (Fabrication) 1
		SMW-405	Material Handling Systems (Fabrication)
6.06	Fabricates hanger systems, supports and bases.	SMW-165	Fabrication and Installation Fundamentals
		SMW-220	Air Handling Systems (Fabrication) 1
		SMW-405	Material Handling Systems (Fabrication)
Task 7 – Fabricates flashing, roofing, sheeting and cladding.			
7.01	Cuts metal for flashing, roofing, sheeting and cladding.	SMW-250	Chimneys, Breeching and Venting
7.02	Forms flashing, roofing, sheeting and cladding.	SMW-250	Chimneys, Breeching and Venting
Task 8 – Fabricates specialty products.			
8.01	Cuts material for specialty products.	SMW-340	Specialty Products
8.02	Forms specialty products.	SMW-340	Specialty Products
8.03	Assembles specialty products.	SMW-340	Specialty Products
8.04	Finishes specialty products.	SMW-340	Specialty Products
Task 9 – Prepares installation site.			
9.01	Performs on-site measurements.	SMW-225	Air Handling Sys (Installation) 1
		SMW-410	Material Handling Sys (Install)
9.02	Performs demolitions for renovations.	SMW-225	Air Handling Sys (Installation) 1
		SMW-250	Chimneys, Breeching and Venting
		SMW-410	Material Handling Sys (Install)
9.03	Installs penetrations and sleeves.	SMW-225	Air Handling Sys (Installation) 1
		SMW-410	Material Handling Sys (Install)
9.04	Installs supports and bases.	SMW-225	Air Handling Sys (Installation) 1
		SMW-410	Material Handling Sys (Install)

NOA Sub-task		IPG Unit	
9.05	Installs hangers, cables, braces and brackets.	SMW-225	Air Handling Sys (Installation) 1
		SMW-410	Material Handling Sys (Install)
Task 10 – Installs and connects chimneys, breeching and venting to exhaust appliances & mechanical equipment.			
10.01	Installs chimney.	SMW-250	Chimneys, Breeching and Venting
10.02	Connects single appliance or mechanical equipment to chimney and breeching.	SMW-250	Chimneys, Breeching and Venting
10.03	Installs high efficiency appliances and mechanical equipment.	SMW-250	Chimneys, Breeching and Venting
Task 11 – Installs air handling system components.			
11.01	Installs air handling equipment.	SMW-165	Fabrication and Installation Fundamentals
		SMW-225	Air Handling Sys (Installation) 1
11.02	Installs sheet metal ducts and fittings.	SMW-165	Fabrication and Installation Fundamentals
		SMW-225	Air Handling Sys (Installation) 1
11.03	Installs dampers.	SMW-165	Fabrication and Installation Fundamentals
		SMW-225	Air Handling Sys (Installation) 1
11.04	Installs fire and fire/smoke dampers.	SMW-165	Fabrication and Installation Fundamentals
		SMW-225	Air Handling Sys (Installation) 1
11.05	Installs registers, grilles, diffusers and louvers.	SMW-165	Fabrication and Installation Fundamentals
		SMW-225	Air Handling Sys (Installation) 1
11.06	Installs terminal boxes.	SMW-165	Fabrication and Installation Fundamentals
		SMW-345	Air Handling Systems (Installation) 2
11.07	Installs coils.	SMW-165	Fabrication and Installation Fundamentals
		SMW-345	Air Handling Sys (Installation) 2
11.08	Installs system component accessories.	SMW-165	Fabrication and Installation Fundamentals
		SMW-345	Air Handling Sys (Installation) 2
11.09	Installs plenums		
Task 12 – Installs material handling system components.			
12.01	Installs pneumatic and gravity material handling system components.	SMW-410	Material Handling Sys (Install)
12.02	Installs mechanical material handling system components.	SMW-410	Material Handling Sys (Install)
Task 13 – Applies thermal insulation, lagging, cladding and flashing.			

NOA Sub-task		IPG Unit	
13.01	Applies thermal insulation to components.	SMW-225	Air Handling Systems (Installation) 1
13.02	Applies lagging and cladding to components.	SMW-250	Chimneys, Breeching & Venting
		SMW-405	Material Handling Systems (Fabrication)
13.03	Applies flashing to components.	SMW-250	Chimneys, Breeching & Venting
		SMW-255	Metal Roofing & Architect. Metal
		SMW-405	Material Handling Systems (Fabrication)
Task 14 – Performs leak testing, air balancing and commissioning.			
14.01	Performs leak tests.	SMW-420	Testing and Balancing
14.02	Performs testing, adjusting and balancing (TAB).	SMW-420	Testing and Balancing
14.03	Participates in the commissioning of air and material handling systems.	SMW-425	Introduction to Commissioning
Task 15 – Installs metal roofing and cladding/siding systems.			
15.01	Lays out roof and walls.	SMW-255	Metal Roof. and Archit. Metal
15.02	Installs insulation, isolation material and building envelope components.	SMW-255	Metal Roof. and Archit. Metal
15.03	Installs roofing and cladding/siding system components.	SMW-255	Metal Roof. and Archit. Metal
15.04	Seals exposed joints.	SMW-255	Metal Roof. and Archit. Metal
15.05	Installs decking.	SMW-255	Metal Roof. and Archit. Metal
Task 16 – Installs exterior components.			
16.01	Prepares surface.	SMW-255	Metal Roof. and Archit. Metal
16.02	Fastens exterior components.	SMW-255	Metal Roof. and Archit. Metal
Task 17 – Installs specialty products.			
17.01	Installs stainless steel specialty products.	SMW-340	Specialty Products
17.02	Installs non-stainless steel specialty products.	SMW-340	Specialty Products
17.03	Installs marine products (Not Common Core)	Not covered.	
Task 18– Performs scheduled maintenance.			
18.01	Performs maintenance inspections.	SMW-350	Air Handling Systems (Maintenance and Repair)
		SMW-415	Material Handling Systems (Maintenance and Repair)
18.02	Services components.	SMW-350	Air Handling Systems (Maintenance and Repair)
		SMW-415	Material Handling Systems (Maintenance and Repair)
Task 19 – Repairs faulty systems and components.			

NOA Sub-task		IPG Unit	
19.01	Diagnoses system faults.	SMW-350	Air Handling Systems (Maintenance and Repair)
		SMW-415	Material Handling Systems (Maintenance and Repair)
19.02	Repairs worn or faulty components.	SMW-350	Air Handling Systems (Maintenance and Repair)
		SMW-415	Material Handling Systems (Maintenance and Repair)

LEVEL 1

SMW-170 Mentoring 1

Learning Outcomes:

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

2017 Red Seal Occupational Standard Reference:

4.02 Uses mentoring techniques.

Suggested Hours:

3 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 related 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 trade.
 - 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) learning 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

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.
- Demonstrate knowledge of regulatory requirements pertaining to PPE and safety equipment.
- Demonstrate knowledge of lock-out and tag-out procedures and equipment.

2017 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:

15 hours

Objectives and Content:

- 2. Identify types of personal protective equipment (PPE) and safety equipment and describe their applications and limitations.
 - i) respirators
 - ii) fall arrest harnesses
 - iii) fall restraint equipment
 - iv) welding face shields and screens
 - v) hearing
 - vi) eye
 - vii) foot and hand protection
 - viii) high visibility safety vests
 - ix) fire extinguishers
 - x) barricades
- 2. Describe the procedures used to care for, maintain and store PPE and safety equipment.
- 3. Identify workplace hazards and describe safe work practices and equipment.
 - i) personal
 - ii) workplace

- electrical
 - confined space (awareness of)
 - fire
 - lock-out/tag-out
 - fall arrest
 - hoisting (awareness of)
 - asbestos
 - hazardous openings
 - overhead hazards
- iii) environmental
4. Describe good housekeeping practices.
- i) sweeping
 - ii) removing debris
 - iii) storing materials and tools and equipment
5. Identify and interpret safety and health regulations and responsibilities with respect to the use of PPE and safety equipment.
- i) Workplace Hazardous Material Information System (WHMIS Material)
 - ii) Occupational Health and Safety (OH&S)
 - iii) Workers compensation Board (WCB)
 - iv) site-specific regulations
6. Describe the roles and responsibilities of employers and employees with respect to the selection and use of PPE and safety equipment.
7. Identify situations, circuits and equipment that require lock-out and tag-out.
8. Identify lock-out and tag-out equipment.
- i) lock and key
 - ii) chains and tags
 - iii) lock-out scissor clamps
 - iv) lock-box
9. Describe the procedures used to lock-out and tag-out equipment and remove lock-out and tag-out devices.
10. Identify safety regulations pertaining to locking out and tagging hazardous energies equipment.
- i) electricity
 - ii) steam
 - iii) fuel sources
 - iv) hydraulic systems

- v) pneumatic systems
- vi) magnetic systems
- vii) gravitational systems

SMW-105

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 safe work practices and procedures pertaining to stationary and mobile work platforms.
- Demonstrate knowledge of regulatory requirements pertaining to stationary and mobile work platforms.

2017 Red Seal Occupational Standard Reference:

2.11 Uses stationary and mobile work platforms

Suggested Hours:

6 hours

Objectives and Content:

1. Define terminology associated with stationary and mobile work platforms.
2. Identify hazards and describe safe work practices pertaining to stationary and mobile work platforms.
 - i) fall protection and arrest
 - ii) power lines
 - iii) excess loads
 - iv) uneven surfaces
 - v) pinch points
 - vi) crush injuries
3. Interpret codes and regulations pertaining to stationary and mobile platforms.
4. Identify types of stationary and mobile 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.

SMW-110

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 used for hoisting, rigging and positioning equipment.
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2017 Red Seal Occupational Standard Reference:

2.12 Uses hoisting, rigging and positioning equipment.

Suggested Hours:

9 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) excess loads
 - iii) ground conditioning
 - iv) overhead hazards
 - v) environmental hazards
3. Interpret codes and regulations pertaining to hoisting, rigging and positioning.
 - i) training and certification requirements
4. Identify types of rigging equipment and accessories and describe their applications, limitations and procedures for use.
 - i) ropes

- ii) slings
 - iii) chains
 - iv) hooks
 - v) spreader bars
 - vi) shackles
5. Identify factors to consider when selecting rigging equipment.
- i) load characteristics
 - ii) environment
 - iii) safety factors
6. Describe the considerations when rigging material/equipment for lifting.
- i) load characteristics
 - ii) equipment and accessories
 - iii) environmental factors
 - iv) anchor points
 - v) sling angles
7. Identify types of slings.
8. 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
 - vi) barrel hitch
9. Identify types of hoisting and positioning equipment and accessories, and describe their applications, limitations and procedures for use.
- i) duct lift
 - ii) overhead cranes
 - iii) come-alongs
 - iv) grip hoists
 - v) chainfalls
10. Describe the procedures used to inspect, maintain and store hoisting, rigging and positioning equipment.
11. Explain sling angle when preparing for hoisting and positioning operations.
12. Describe the procedures used to attach rigging equipment to the load.

13. Identify and interpret basic hand signals used for hoisting and positioning operations.
14. Identify the procedures used to communicate during hoisting, rigging and positioning operations.
 - i) hand signals
 - ii) electronic communications
 - iii) audible/visual
15. Describe the procedures used to ensure the work area is safe for hoisting, rigging and positioning operations.
 - i) supervision of lift
 - ii) securing of work area
 - iii) communication
16. Describe the procedures used to perform a lift.
 - i) load determination
 - ii) communication methods
 - iii) pre-lift checks
 - iv) placement of load
 - v) post-lift inspection
17. Describe the procedures used to perform calculations to determine the weight of a load.

SMW-115 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.

2017 Red Seal Occupational Standard Reference:

- 2.01 Maintains hand and portable power tools.
- 2.02 Maintains shop tools and equipment.
- 2.04 Maintains measuring and layout equipment.

Suggested Hours:

24 hours

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to tools and equipment.
2. Identify types of hand and tools and describe their applications and procedures for use.
3. Identify types of portable power tools and describe their applications and procedures for use.
4. Identify types of powder actuated tools and describe their applications.
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) punches
 - iii) brake presses

7. Identify types of measuring and layout tools and equipment and describe their applications and procedures for use.
8. Identify criteria for replacement or repair of tools and equipment.
9. Describe the procedures used to inspect, maintain and store tools and equipment.

SMW-120

Communication and Trade Documentation

Learning Outcomes:

- Demonstrate knowledge of effective communication practices.
- Demonstrate knowledge of communication equipment and their applications.
- Demonstrate knowledge of trade documents and their use.
- Demonstrate knowledge of planning and organizing work tasks.

2017 Red Seal Occupational Standard Reference:

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

Suggested Hours:

6 hours

Objectives and Content:

1. Describe the importance of using effective verbal and non-verbal communication practices in the workplace.
 - i) other tradespeople
 - ii) colleagues/co-workers
 - iii) apprentices
 - iv) supervisors
 - v) customers
 - vi) authorities having jurisdiction
 - vii) manufacturers
2. Describe the importance of the coaching and mentoring relationship between journey person and apprentice.
2. Describe effective listening and speaking skills.
4. 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
5. Describe the importance of communicating with others to organize materials and supplies on site and effectively plan work tasks.
6. Identify types of sources of information and trade documents and describe their use.
- i) time cards
 - ii) as-builts
 - iii) work orders
 - iv) change orders
 - v) change directive
 - vi) invoices
 - vii) requests for information (RFI)
 - viii) manufacturers' specifications
 - ix) codes and regulations
 - x) specifications
 - xi) company and client documentation
 - xii) drawings
7. Explain responsibilities associated with completing and signing safety-related documentation.
- i) accident/incident reports
 - ii) near-miss reports
 - iii) safety inspection reports
 - iv) WHMIS labels
 - v) safety data sheets (SDS)
 - vi) job hazard assessments
8. Identify the value of diversity in the workplace.
9. Identify communication that constitutes harassment and discrimination
- i) 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) race
 - iii) national or ethnic origin

- iv) colour
- v) religion
- vi) age
- vii) sex
- viii) sexual orientation
- ix) marital status
- x) family status
- xi) disability or conviction for which a pardon has been granted

Learning Outcomes:

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

2017 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 (see *Sample Formula Sheet at end of document*).

SMW-130 Introduction to Welding

Learning Outcomes:

- Demonstrate knowledge of welding processes and their applications.

2017 Red Seal Occupational Standard Reference:

2.06 Uses shielded metal arc welding (SMAW) equipment.

Suggested Hours:

9 hours

Objectives and Content:

1. Identify certification requirements for performing welding.
2. Identify codes and standards pertaining to welding.
 - i) Canadian Standards Association (CSA).
 - ii) American Society of Mechanical Engineers (ASME)
3. Identify welding processes and describe their applications.
 - i) Shielded metal arc welding (SMAW)
 - ii) Gas metal arc welding (GMAW)
 - iii) Gas tungsten arc welding (GTAW)
 - iv) Oxy-fuel welding (OFW)
 - v) Resistance spot welding (RSW)
4. Identify welding consumables.
 - i) Welding rods
 - ii) Flux
 - iii) Grinding discs
5. Identify basic welds and describe their applications.
 - i) Plug
 - ii) Fillet
 - iii) Stitch
 - iv) Tack

- v) Edge
- vi) Corner

6. Describe the procedures used to tack weld using GMAW equipment.

Practical Objectives:

1. Perform a tack weld using GMAW equipment.

SMW-135 Resistance Spot Welding

Learning Outcomes:

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

2017 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 pertaining to resistance spot welding.
3. Interpret information pertaining to resistance spot welding found on drawings and specifications.
4. Describe the resistance spot welding process and its applications.
5. Identify resistance spot welding equipment and accessories and describe their applications.
6. Identify considerations when determining resistance spot welding equipment set-up.
 - i) specification requirements
 - ii) base metal
 - properties
 - thickness
 - iii) electrode size
7. Describe the procedures used to set-up and adjust resistance spot welding equipment.
 - i) set time
 - ii) determine amperage

- iii) adjust pressure
8. Describe the procedures used to inspect and maintain resistance spot welding equipment.
 9. Describe the procedures used to prepare base metals for resistance spot welding.
 10. Describe the procedures used to weld using the resistance spot welding process.

SMW-140 Plasma Arc Cutting

Learning Outcomes:

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

2017 Red Seal Occupational Standard Reference:

2.07 Uses oxy-fuel and plasma arc cutting equipment.

Suggested Hours:

6 hours

Objectives and Content:

1. Define terminology associated with plasma arc cutting.
2. Identify hazards and describe safe work practices pertaining to the use of plasma arc cutting equipment.
 - i) personal
 - ii) shop/facility
 - iii) equipment
 - iv) ventilation
3. Interpret codes and regulations pertaining to plasma arc cutting.
4. Identify types of plasma arc cutting equipment and accessories and describe their applications, limitations and procedures for use.
5. Identify types of consumables and accessories used with plasma arc cutting equipment and describe their applications.
6. Describe the procedures used to set-up, adjust and shut-down plasma arc cutting equipment.
7. Describe the procedures used to maintain and troubleshoot plasma arc cutting equipment.
8. Describe the procedures used to cut using plasma arc cutting equipment.

9. Describe cutting defects, their causes and the procedures to prevent and correct them.

SMW-145 Metallurgy

Learning Outcomes:

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

2017 Red Seal Occupational Standard Reference:

N/A

Suggested Hours:

6 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
 - iii) colour coding
4. Identify types of metals and describe their applications.
 - i) steel
 - hot rolled
 - cold rolled
 - coated
 - ii) copper
 - iii) brass
 - iv) aluminum

- v) cast iron
 - iv) stainless steel
5. 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
6. Identify types of basic surface finishes and describe their applications.
- i) mill
 - ii) brushed
 - iii) mirrored
 - iv) dull
7. Identify methods used to work with metals.
- i) forming
 - ii) cutting/shearing
 - iii) punching
 - iv) drilling
 - v) joining
8. Identify practices that can create problems when working with metals and describe the procedures used to prevent or correct these problems.
- i) forming
 - ii) cutting/shearing
 - iii) punching
 - iv) drilling
 - v) joining
 - vi) storage and handling

SMW-150 Soft Soldering

Learning Outcomes:

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

2017 Red Seal Occupational Standard Reference:

2.07 Uses oxy-fuel and plasma arc cutting equipment.

Suggested Hours:

6 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) personal
 - ii) shop/facility
 - iii) equipment
 - iv) ventilation
3. Describe soldering processes and their applications.
 - i) soft
 - ii) hard
4. Identify types of soldering equipment and accessories and describe their applications and procedures for use.
5. Describe the procedures used to set-up, adjust and shut-down soldering equipment.
6. Describe the procedures used to maintain and troubleshoot soldering equipment.
7. Identify materials used to solder and describe their applications.
 - i) fluxes
 - ii) solders

iii) fillers

8. Describe the procedures used to solder materials.

SMW-155 Drafting

Learning Outcomes:

- Demonstrate knowledge of basic drafting.
- Demonstrate knowledge of basic drafting tools and equipment and their procedures for use.
- Demonstrate basic knowledge of Computer Aided Drafting (CAD) and its use.

2017 Red Seal Occupational Standard Reference:

2.04 Maintains measuring and layout equipment.

Suggested Hours:

30 hours

Objectives and Content:

1. Define terminology associated with drafting.
2. Identify basic drafting tools and equipment and describe their applications and procedures for use.
3. Identify different views used when drafting and describe their applications.
 - i) elevation
 - ii) plan
 - iii) section
 - iv) auxiliary
4. Describe the procedures used to develop basic drawings and sketches.
 - i) pictorial
 - ii) orthographic

SMW-160

Pattern Development 1 (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.
- Demonstrate knowledge of pattern development methods.
- Demonstrate knowledge of basic geometric shapes.

2017 Red Seal Occupational Standard Reference:

5.01 Develops patterns using simple and straight line layout.

Suggested Hours:

45 hours

Objectives and Content:

1. Define terminology associated with pattern development and layout.
2. Identify layout tools and describe their applications and procedures for use.
3. Identify basic geometric shapes and describe their characteristics.
4. Identify layout methods and describe their applications.
 - i) simple/straight line
 - ii) parallel line
 - iii) radial line
 - iv) triangulation
 - v) computerized
 - vi) combination
5. Identify types of basic patterns and fittings that require simple and straight line layout.
6. Identify calculations used in simple and straight line layout and describe the procedures used to perform them.

7. Describe the procedures used to develop basic patterns using simple and straight line layout.
- i) determine views
 - ii) label lines and points
 - iii) prepare pattern
 - 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

SMW-165

Fabrication and Installation Fundamentals

Learning Outcomes:

- Demonstrate knowledge of air handling system components, their accessories and applications.
- Demonstrate knowledge of the procedures used to fabricate basic ductwork and fittings.
- Demonstrate knowledge of the procedures used to fabricate hangers and supports.
- Demonstrate knowledge of the procedures used to install basic ductwork and fittings.

2017 Red Seal Occupational Standard Reference:

- 6.01 Cuts ductwork, fittings and components.
- 6.02 Forms ductwork, fittings and components.
- 6.03 Insulates ductwork, fittings and components.
- 6.04 Assembles ductwork, fittings and components.
- 6.05 Fabricates dampers.
- 6.06 Fabricates hanger systems, supports and bases.
- 11.01 Installs air handling equipment. (Introduction)
- 11.02 Installs sheet metal ducts and fittings.
- 11.03 Installs dampers. (Introduction)
- 11.04 Installs fire and fire/smoke dampers. (Introduction)
- 11.05 Installs registers, grilles, diffusers and louvers. (Introduction)
- 11.06 Installs terminal boxes. (Introduction)
- 11.07 Installs coils. (Introduction)
- 11.08 Installs system component accessories. (Introduction)
- 11.09 Installs plenums. (Introduction)

Suggested Hours:

45 hours

Objectives and Content:

1. Define terminology associated with fabricating and installing sheet metal components.
2. Identify hazards and describe safe work practices associated with fabricating and installing basic sheet metal components.

3. Interpret codes and regulations pertaining to the fabrication and installation of basic sheet metal components.
4. Interpret information pertaining to the fabrication and installation of basic sheet metal components found on drawings and specifications.
5. Identify tools and equipment used to fabricate and install basic sheet metal components and describe their applications and procedures for use.
6. Identify basic air handling system components and accessories fabricated and installed by sheet metal workers and describe their applications.
 - i) air handling equipment
 - furnaces
 - fans
 - rooftop units
 - built-up systems
 - air conditioners
 - ii) ducts and fittings
 - iii) flexible connectors
 - iv) hanger systems
 - v) supports and braces
 - vi) dampers
 - vii) registers, grilles, diffusers and louvers
 - viii) fire and fire/smoke dampers
 - ix) terminal boxes
 - x) coils
 - xi) system component accessories
 - humidifiers
 - dehumidifiers
 - air, noise and odour filtration systems
 - air flow sensors
 - temperature sensors
 - controls
 - xii) plenums
7. Identify types of fastening and joining methods used to fabricate sheet metal components and describe their associated procedures.
 - i) mechanical
 - ii) adhesives
 - iii) welding

8. Identify types of seams for fabrication of basic sheet metal components and describe the procedures and connectors used to produce them.
 - i) longitudinal
 - Pittsburgh Lock
 - groove seam
 - acme lock
 - snap/button lock
 - ii) transverse
 - slip & drive
 - duct mate
 - TDC/TDF
 - companion flanges
 - flexible connector
9. Identify types of edges for fabrication of basic sheet metal components and describe the procedures used to produce them.
10. Identify types of duct reinforcement.
11. Describe the procedures used to fabricate basic ductwork and fittings.
12. Describe the procedures used to fabricate hanger systems, supports and bases.
13. Describe the procedures used to install basic ductwork and fittings.

Practical Objectives:

1. Layout and fabricate a basic duct system.
2. Fabricate hangers and supports.

LEVEL 2

SMW-200 Drawings 1

Learning Outcomes:

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

2017 Red Seal Occupational Standard Reference:

3.02 Interprets drawings.

Suggested Hours:

24 hours

Objectives and Content:

1. Define terminology associated with drawings.

1. Explain the purpose of drawings.

2. Identify types of drawings and describe their applications.
 - i) pictorial
 - ii) orthographic
 - iii) architectural
 - iv) mechanical
 - v) structural
 - vi) electrical
 - vii) shop drawings
 - viii) sketches
 - ix) as-built
 - 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) legend
 - iii) symbols and abbreviations
 - duct
 - welding
 - electrical
 - plumbing
 - architectural
 - iv) title block
 - v) notes
 - vi) specifications
6. Identify and interpret common symbols and abbreviations found on drawings.
7. Describe how to use scale rulers.
8. Describe metric and imperial systems of measurement.
9. Interpret and extract information from drawings.

SMW-205

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.

2017 Red Seal Occupational Standard Reference:

5.02 Develops patterns using parallel line method.

Suggested Hours:

24 hours

Objectives and Content:

1. Define terminology associated with parallel line development.
2. Describe the 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 and describe the procedures used to perform them.
4. Describe the procedures used to develop and fabricate round duct fittings using parallel line development.
 - i) determine views
 - ii) label lines and points
 - iii) prepare pattern
 - 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

SMW-210 Radial Line Development (Right Cones)

Learning Outcomes:

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

2017 Red Seal Occupational Standard Reference:

5.03 Develops patterns using radial line method.

Suggested Hours:

24 hours

Objectives and Content:

1. Define terminology associated with radial line development.
2. Identify calculations used in radial line development and describe the procedures used to perform them.
3. Describe the procedures used to develop and fabricate fittings based on right cones using radial line development.
 - i) determine views
 - ii) label lines and points
 - iii) prepare pattern
 - 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

SMW-215 Triangulation (From 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 and fabricate fittings using triangulation from plan view.

2017 Red Seal Occupational Standard Reference:

5.04 Develops patterns using triangulation method.

Suggested Hours:

24 hours

Objectives and Content:

1. Define terminology associated with the triangulation method.
2. Describe the types of fittings that require triangulation from plan view.
 - i) transitions
 - ii) tapers
 - iii) square-to-rounds
3. Identify calculations used in the triangulation method and describe the procedures used to perform them.
4. Describe the procedures used to develop and fabricate fittings using triangulation from plan view.
 - i) determine views
 - ii) label lines and points
 - iii) prepare pattern
 - 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

SMW-220 Air Handling Systems (Fabrication) 1

Learning Outcomes:

- Demonstrate knowledge of the procedures used to fabricate sheet metal components for air handling systems.

2017 Red Seal Occupational Standard Reference:

- 6.01 Cuts ductwork, fittings and components.
- 6.02 Forms ductwork, fittings and components.
- 6.03 Insulates ductwork, fittings and components.
- 6.04 Assembles ductwork, fittings and components.
- 6.05 Fabricates dampers.
- 6.06 Fabricates hanger systems, supports and bases.

Suggested Hours:

24 hours

Objectives and Content:

1. Define terminology associated with air handling systems.
2. Identify hazards and describe safe work practices when fabricating sheet metal components for air handling systems.
3. Interpret codes and regulations pertaining to the fabrication of sheet metal components for air handling systems.
 - i) SMACNA
 - ii) ASHRAE
 - iii) NBC
4. Interpret information pertaining to the fabrication of sheet metal components for air handling systems found on drawings and specifications.
5. Identify tools and equipment used to fabricate sheet metal components for air handling systems, and describe their applications, limitations and procedures for use.
6. Identify types of materials used to fabricate sheet metal components for air handling systems and describe their characteristics and applications.

7. Identify sheet metal components and accessories associated with air handling systems and describe their applications.
 - i) air handling equipment
 - ii) ducts and fittings
 - iii) dampers
 - iv) fire and fire/smoke dampers
 - v) registers, grilles, diffusers and louvers
 - vi) plenums
 - vii) flexible connections
 - viii) hangers
 - ix) equipment supports/bases
 - x) attenuators (silencer)

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

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

SMW-225

Air Handling Systems (Installation) 1

Learning Outcomes:

- Demonstrate knowledge of basic design and field modifications.
- Demonstrate knowledge of the procedures used to prepare the installation site.
- Demonstrate knowledge of the procedures used to install air handling equipment.
- 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 registers, grilles, diffusers and louvers.

2017 Red Seal Occupational Standard Reference:

- 3.04 Performs basic design and field modifications.
- 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.
- 13.01 Applies thermal insulation to components.

Suggested Hours:

12 hours

Objectives and Content:

1. Define terminology associated with the installation of air handling systems and components.
2. Identify hazards and describe safe work practices pertaining to the installation of air handling systems and components.
3. Interpret codes and regulations pertaining to the installation of air handling systems and components.

4. Interpret information, pertaining to the installation of air handling systems found on drawings and specifications.
5. Identify tools and equipment used for the installation of air handling systems, and describe their application and procedures for use.
6. Identify types of air handling systems, and describe their applications, principles and operation.
 - i) exhaust
 - ii) make-up air
 - iii) supply/return air (central)
7. Identify air handling system components and describe their applications.
 - i) sheet metal components
 - ducts and fittings
 - hangers
 - equipment supports/braces
 - brackets
 - sheet and cladding
 - flashing
 - ii) system components
 - units
 - dampers
 - fire and fire/smoke dampers
 - registers, grilles, diffusers and louvers
 - terminal boxes
 - coils
 - heat and energy recovery ventilators
 - automatic controls and instruments
 - insulation
 - thermal
 - acoustical
8. Identify types of fasteners and describe their applications.
 - i) concrete
 - ii) metal
 - iii) wood
9. Describe the procedures used to prepare the installation site.
 - 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
10. 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
 11. Describe the procedures used to install air handling equipment.
 12. Describe the procedures used to install ducts and fittings.
 13. Describe the procedures used to install dampers.
 14. Describe the procedures used to install fire and fire/smoke dampers.
 15. Describe the procedures used to install registers, grilles, diffusers and louvers.
 16. Describe the procedures used to perform basic design and field modifications.

SMW-230 Introduction to GMAW

Learning Outcomes:

- Demonstrate knowledge of GMAW equipment, its applications and maintenance.
- Demonstrate knowledge of the procedures used to weld mild steel using the GMAW process.

2017 Red Seal Occupational Standard Reference:

2.03 Uses gas metal arc welding (GMAW) equipment.

Suggested Hours:

18 hours

Objectives and Content:

1. Define terminology associated with GMAW.
2. Identify hazards and describe safe work practices pertaining to the use of GMAW equipment.
 - i) personal
 - ii) shop/facility
 - iii) equipment
 - iv) ventilation
3. Interpret codes and regulations pertaining to the use of GMAW equipment for welding mild steel.
4. Describe the GMAW process and its applications.
5. Identify types of GMAW equipment, consumables and accessories used to weld mild steel, and describe their characteristics and applications.
6. Describe the procedures used to set-up, adjust and shut-down GMAW equipment for welding mild steel.
7. Describe the procedures used to maintain and troubleshoot GMAW equipment.
8. Identify the types of welds performed using the GMAW process.
 - i) plug

- ii) fillet (continuous)
 - iii) stitch
 - iv) tack
 - v) edge
 - vi) corner
9. Describe the procedures used to weld mild steel using the GMAW process.
10. Describe weld defects, their causes and the procedures to prevent and correct them.
- i) porosity
 - ii) cracks
 - iii) warping
 - iv) undercut
11. Identify weld positions and describe their applications.
- i) flat
 - ii) vertical
 - iii) horizontal
 - iv) overhead

SMW-235 Oxy-fuel Cutting, Heating and Brazing/Hard Soldering

Learning Outcomes:

- Demonstrate knowledge of oxy-fuel cutting and heating equipment, its maintenance and procedures for use.
- Demonstrate knowledge of brazing/hard soldering equipment, its maintenance and procedures for use.

2017 Red Seal Occupational Standard Reference:

2.07 Uses oxy-fuel and plasma arc cutting equipment.

Suggested Hours:

12 hours

Objectives and Content:

1. Define terminology associated with oxy-fuel cutting, heating and brazing/hard soldering.
2. Identify hazards and describe safe work practices pertaining to the use of oxy-fuel cutting, heating and brazing/hard soldering equipment.
 - i) personal
 - ii) shop/facility
 - iii) equipment
 - iv) ventilation
3. Interpret codes and regulations pertaining to oxy-fuel cutting, heating and brazing/hard soldering.
4. Interpret information pertaining oxy-fuel cutting, heating and brazing/hard soldering found on drawings and specifications.
5. Identify types of oxy-fuel cutting, heating and brazing/hard soldering equipment and accessories and describe their applications, limitations and procedures for use.
6. Describe the procedures used to set-up, adjust and shut-down oxy-fuel cutting and heating equipment.

7. Describe the procedures used to maintain and troubleshoot oxy-fuel cutting and heating equipment.
8. Describe the procedures used to set-up, adjust, and shut-down brazing/hard soldering equipment.
9. Describe the procedures used to maintain and troubleshoot brazing/hard soldering equipment.
10. Describe the procedures used to cut using oxy-fuel equipment.
11. Identify types of materials used for brazing/hard soldering.
12. Describe the procedures used to braze/hard solder materials.
13. Describe weld defects, their causes and the procedures used to prevent and correct them.
 - i) porosity
 - ii) cracks
 - iii) warping
 - iv) undercut

SMW-240 SMAW

Learning Outcomes:

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

2017 Red Seal Occupational Standard Reference:

2.06 Uses shielded metal arc welding (SMAW) equipment.

Suggested Hours:

6 hours

Objectives and Content:

1. Define terminology associated with SMAW.
2. Identify hazards and describe safe work practices pertaining to the use of SMAW equipment.
 - i) personal
 - ii) shop/facility
 - iii) equipment
 - iv) ventilation
3. Interpret codes and regulations pertaining to SMAW.
4. Interpret information pertaining to SMAW found on drawings and specifications.
5. Describe the SMAW process and its applications.
6. Identify types of SMAW equipment and accessories, and describe their applications, limitations and procedures for use.
7. Describe the procedures to set-up, adjust and shut-down SMAW equipment.
8. Describe the procedures used to maintain and troubleshoot SMAW equipment.

9. Identify the types of welds performed using SMAW equipment.
 - i) plug
 - ii) fillet (continuous)
 - iii) stitch
 - iv) tack
 - v) edge
 - vi) corner

10. Describe the procedures used to weld materials using the SMAW process.

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

SMW-245 Air Quality Management

Learning Outcomes:

- Demonstrate knowledge of air quality management.

2017 Red Seal Occupational Standard Reference:

N/A

Suggested Hours:

6 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 regulations pertaining to air quality management.
4. Describe considerations and requirements associated with air quality management.
 - i) environmental conditions
 - ii) intake locations
 - iii) exhaust locations
5. Describe the importance of indoor air quality.
6. Identify methods of improving or correcting problems with air quality.
 - i) heating/cooling
 - ii) ventilation
 - iii) conditioning
 - filtration
 - sterilization
 - purification
 - humidification/dehumidification
7. Identify areas requiring special air quality ventilation.
 - i) clean/sterile rooms
 - ii) industrial/commercial settings

8. Identify the methods used to determine air quality relating to humidity and temperature.
9. 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
10. Describe the impact improper system or component installation can have on air quality.

SMW-250

Chimneys, Breeching and Venting

Learning Outcomes:

- Demonstrate knowledge of the procedures used to install a chimney.
- Demonstrate knowledge of the procedures used to connect chimney, breeching and venting to an appliance.
- Demonstrate knowledge of flashing requirements.
- Demonstrate knowledge of the procedures used to install cladding and lagging.
- Demonstrate knowledge of the procedures used to install high efficiency appliances and mechanical equipment.

2017 Red Seal Occupational Standard Reference:

- 7.01 Cuts metal for flashing, roofing, sheeting and cladding.
- 7.02 Forms flashing, roofing, sheeting and cladding.
- 8.02 Performs demolitions for renovations.
- 10.01 Installs chimney.
- 10.02 Connects appliances and mechanical equipment to chimney and breeching.
- 10.03 Installs high efficiency appliances and mechanical equipment.
- 13.02 Applies lagging and cladding to components.
- 13.03 Applies flashing to components.

Suggested Hours:

18 hours

Objectives and Content:

1. Define terminology associated with chimneys, breeching and venting.
2. Identify hazards and describe safe work practices associated with chimneys, breeching and venting.
3. Interpret codes, standards and regulations pertaining to the installation of chimneys, breeching and venting.
 - i) jurisdictional requirements
4. Interpret information pertaining to the installation of chimneys, breeching and venting, found on drawings and specifications.

5. Identify tools and equipment relating to the installation of chimneys, breeching and venting, and describe their applications and procedures for use.
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 remove and install chimneys.
8. Identify flashing requirements pertaining to chimneys.
9. Describe the procedures used to connect chimneys to the appliance.
10. Identify types of appliances and mechanical equipment and describe their applications.
11. Describe the procedures used to connect appliances and mechanical equipment to chimneys and breeching.
12. Identify types of breeching and describe their applications.
13. Describe the procedures used to install breeching.
14. Identify cladding and lagging materials and describe their characteristics and applications.
15. Describe the procedures used to install cladding and lagging.
16. Describe the procedures used to install high efficiency appliances and mechanical equipment.

SMW-255 Metal Roofing and Architectural Metal

Learning Outcomes:

- Demonstrate knowledge of metal roofing and walls.
- Demonstrate knowledge of the procedures used to install metal roofing and cladding/siding systems.
- 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 exterior components and their applications.
- Demonstrate knowledge of the procedures used to fasten exterior components.

2017 Red Seal Occupational Standard Reference:

- 12.03 Applies flashing to components.
- 15.01 Lays out roof and walls.
- 15.02 Installs insulation, isolation material and building envelope components.
- 15.03 Installs roofing and cladding/siding system components.
- 15.04 Seals exposed joints.
- 15.05 Installs decking.
- 16.01 Prepares surface.
- 16.02 Fastens exterior components.

Suggested Hours:

18 hours

Objectives and Content:

1. Define terminology associated with metal roofing, cladding and architectural metal.
2. Identify hazards and describe safe work practices pertaining to the fabrication and installation of metal roofing, cladding and architectural metal.
3. Interpret codes and regulations pertaining to the installation of metal roofing, cladding and architectural metal.
4. Interpret information pertaining to metal roofing, cladding and architectural metal found on drawings and specifications.

5. Identify tools and equipment used to fabricate and install metal roofing, cladding and architectural metals and describe their applications and procedures for use.
6. Identify types of materials used in fabricating metal roofing, cladding and architectural metals.
7. Identify types of components associated with metal roofing, cladding and architectural metals, and describe their applications.
 - i) roof drainage
 - ii) flashing
 - iii) soffit and fascia
 - iv) roof vents
8. Describe the procedures used to fabricate metal roofing, cladding and architectural metals and their associated components.
 - i) layout
 - ii) determine seam
 - iii) cut
 - iv) form
9. Identify considerations and requirements relating to installing metal roofing, cladding and architectural metals.
 - i) building materials
 - ii) roof slope
 - iii) expansion and contraction
10. Identify types of fasteners for installing metal roofing, cladding and architectural metals and describe their applications.
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, cladding and architectural metals.
 - 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) waterproof membrane
 - iii) isolation material
 - iv) building envelope
14. Describe the procedures used to install materials to roofs or walls in preparation for installation of metal roofing, cladding and architectural metals.
15. Describe the procedures used to install metal roofing, cladding and architectural metals.
 - i) cut
 - ii) fit
 - iii) secure
 - iv) seal
16. Identify types of sealants and procedures used to seal exposed joints.
17. Identify types of material used for decking and describe their applications.
 - i) metal pans
 - ii) Q decking
18. Describe the procedures used to install decking.
19. Identify types of exterior components and describe their applications.
 - i) awnings
 - ii) signage.
20. Identify types of fasteners used to fasten exterior components.
 - i) anchors
 - ii) nail-ins
 - iii) screws
 - v) adhesives
21. Describe the procedures used to prepare surface for installation of exterior components.
 - i) check alignment of exterior surface.
 - ii) identify fastening points
 - iii) clean installation area
 - iv) score surface
 - v) apply waterproofing membrane and flashing
 - vi) install fastening system
22. Describe the procedures used to fasten exterior components.

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 for 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:

Theoretical Objectives

1. Define terminology associated with parallel line development for architectural applications.
2. Identify the 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.
4. Describe the procedures used to perform calculations used in parallel line development for architectural applications.
 - i) determining views
 - ii) labelling lines and points

- iii) preparing patterns
 - iv) determining true length of lines
 - v) determining types of seams, joints and edges
 - vi) calculating allowances
 - vii) determining stretch-outs
 - viii) checking pattern accuracy
 - ix) cutting pattern
 - x) labelling pieces
5. Describe the procedures used to develop patterns for architectural applications using parallel line development.

Practical Objectives

1. Develop patterns and fabricate fittings 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 for 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:

Theoretical Objectives

1. Define terminology associated with radial line development for oblique fittings and components.
2. Identify the types of oblique fittings and components that require radial line development.
3. Identify calculations used in radial line development for oblique fittings and components.
4. Describe the procedures used to perform calculations used in radial line development for oblique fittings and components.
5. Describe the procedures used to develop patterns for oblique fittings and components using radial line development.
 - i) determining views
 - ii) labelling lines and points
 - iii) preparing patterns
 - iv) determining true length of lines

- v) determining types of seams, joints and edges
- vi) calculating allowances
- vii) determining stretch-outs
- viii) checking pattern accuracy
- ix) cutting pattern
- x) labelling pieces

Practical Objectives

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

SMW-310 Triangulation 2

Learning Outcomes:

- Demonstrate knowledge of triangulation method from elevation, its applications and associated calculations.
- Demonstrate knowledge of the procedures used to develop patterns for 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:

Theoretical Objectives

1. Define terminology associated with the triangulation method from elevation.
2. Identify the types of fittings that require triangulation method from elevation.
3. Identify calculations used in the triangulation method from elevation and describe the procedures used to perform them.
4. Identify types of rectangular fittings that require the triangulation method.
5. Describe the procedures used to develop patterns for fittings and components using triangulation method from elevation and rectangular fittings.
 - i) determining views
 - ii) labelling lines and points
 - iii) preparing patterns
 - iv) determining true length of lines
 - v) determining types of seams, joints and edges
 - vi) calculating allowances
 - vii) determining stretch-outs

- viii) checking pattern accuracy
- ix) cutting pattern
- x) labelling pattern

Practical Objectives

1. Develop patterns and fabricate fittings using triangulation.

SMW-315 Duct System Design

Learning Outcomes:

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

2018 Red Seal Occupational Standard Reference:

- 6.02 Forms ductwork, fittings and components.
- 6.04 Assembles ductwork, fittings components.

Suggested Hours:

27 Hours

Objectives and Content:

Theoretical Objectives

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
 - VAV (variable air volume)
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 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 GTAW equipment, its applications, maintenance and procedures for use.
- Demonstrate knowledge of the procedures used to weld using the GTAW process.
- Demonstrate knowledge of safe work practices and procedures pertaining to the use of GTAW equipment.

2018 Red Seal Occupational Standard Reference:

2.05 Uses gas tungsten arc welding (GTAW) equipment.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with GTAW.
2. Identify hazards and describe safe work practices and procedures 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 use of GTAW equipment found on drawings and specifications.
4. Identify GTAW equipment, consumables and accessories used to weld, and describe their characteristics and applications.
5. Identify the 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 weld on mild steel, aluminum and stainless steel.

SMW-325 Specialty Products

Learning Outcomes:

- Demonstrate knowledge of industry standards pertaining to specialty products.
- Demonstrate knowledge of safe work practices and procedures pertaining to cutting material, forming, assembling and finishing specialty products.
- Demonstrate knowledge of calculations required to measure material for cutting.
- Demonstrate knowledge of materials and their properties, characteristics and applications.
- Demonstrate knowledge of inspection procedures.

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:

Theoretical Objectives

1. Define terminology associated with specialty products and associated materials.
2. Identify hazards and describe safe work practices and procedures associated with cutting material, forming, assembling and finishing specialty products.
3. Identify 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 including shop drawings, details, sketches
4. Identify tools and equipment used with 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
 - viii) marine
 - ix) awnings
 - x) signage
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 associated 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 finish specialty products and inspect to recognize deficiencies.

Practical Objectives

1. Fabricate specialty products.

SMW-330

Air Handling Systems 3

Learning Outcomes:

- Demonstrate knowledge of installation procedures for terminal boxes, coils, plenums and the associated tools and equipment.
- Demonstrate knowledge of safe work practices and procedures related to installing terminal boxes, coils and plenums.
- Demonstrate knowledge of regulatory requirements pertaining to the installation of terminal boxes and plenums.

2018 Red Seal Occupational Standard Reference:

- 11.01 Installs air handling equipment.
- 11.06 Installs terminal boxes.
- 11.07 Installs coils.
- 11.08 Installs system component accessories.
- 11.09 Installs plenum.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

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. Identify considerations and requirements for installing terminal boxes, coils and plenums.
 7. Describe the procedures used to install terminal boxes, coils and plenums.

Practical Objectives

1. N/A

SMW-335 Introduction to Leak Testing, Air Balancing and Commissioning

Learning Outcomes:

- Demonstrate knowledge of the procedures used to perform leak tests and the associated tools and equipment.
- Demonstrate knowledge of drawings and specifications.
- Demonstrate knowledge of safe work practices and procedures pertaining to performing leak tests.
- Demonstrate knowledge of codes and regulations pertaining to performing leak tests.
- Demonstrate knowledge of the procedures used to perform testing, adjusting and balancing (TAB) on air handling systems, and the associated tools and testing equipment.
- Demonstrate knowledge of codes and regulations pertaining to performing TAB.
- Demonstrate knowledge of commissioning and its purpose.
- Demonstrate knowledge of the procedures used to commission air and material handling systems and components.
- Demonstrate knowledge of specifications.

2018 Red Seal Occupational Standard Reference:

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

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with TAB/commissioning.

2. Identify tools and equipment used in performing TAB and describe their applications and procedures for use.
 - i) testing and monitoring equipment
 - ii) electrical testing devices
 - iii) smoke bombs
 - iv) velometers
 - v) flow hoods
 - vi) multimeters
 - vii) thermometers
 - viii) anemometers
 - ix) psychrometers
 - x) pitot tubes
 - xi) manometers
 - xii) tachometers
3. Identify requirements and limitations pertaining to performing leak tests.
4. Identify types of tests relating to air and material handling system components and describe the procedures used to perform them.
 - i) pressure test
 - ii) smoke test
5. Identify hazards and describe safe work practices and procedures associated with performing leak tests.
6. Identify codes and standards pertaining to performing TAB 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)
7. Define terminology associated with TAB.
8. Identify requirements and limitations pertaining to TAB.
9. Explain the importance of TAB to ensure optimal system performance.

10. Describe the procedures and techniques used to perform balancing on air handling systems.
11. Identify types of tests relating to air handling system equipment and components and describe the procedures used to perform them.
 - i) airflow
 - ii) pressure
 - iii) velocity
 - iv) volume
12. Explain the purpose of commissioning.

Practical Objectives

1. Practice TAB methods.

SMW-340 Electrical Principles

Learning Outcomes:

- Demonstrate knowledge of basic concepts of electricity.
- Demonstrate knowledge of safe work practices and procedures related to installing air handling equipment (or working with electrical equipment and sources).

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:

Theoretical Objectives

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. 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

5. Explain the mathematical relationship between amps, volts, ohms and watts.
6. Identify the 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:

Theoretical Objectives

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. Describe the procedures for using testing devices.
 - 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. Identify electrical devices and describe their purpose.
- i) circuit breakers
 - ii) disconnects,
 - iii) overload heaters
 - iv) GFI
 - v) fuses
 - vi) PLC
 - vii) motors
 - viii) variable speed drives (VSD)
 - ix) flow switches
 - x) thermostats
13. Perform calculations to determine system performance.

Practical Objectives

1. 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 regulatory requirements pertaining to marine products.
- Demonstrate knowledge of drawing interpretation.

2018 Red Seal Occupational Standard Reference:

17.03 Installs marine products.

Suggested Hours:

3 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with marine products.
2. Identify hazards and safe work practices and procedures pertaining to the installation of marine products.
3. Interpret job specifications pertaining to the installation of marine products.
 - i) engineering, architectural and manufacturers' specifications
 - ii) penetrations
 - iii) structural supports
 - iv) drawings including 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. Describe the procedures used to install marine products.
8. 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
9. Describe differences in installing in dry dock versus floating locations.

Practical Objectives

1. N/A

Level 4

SMW-400 Pattern Development (Computer Technology)

Learning Outcomes:

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

Theoretical Objectives

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 the procedures used to fabricate dampers.
- Demonstrate knowledge of calculations related to dampers.
- Demonstrate knowledge of installation procedures for pneumatic, gravity and mechanized material handling system components, and the associated tools and equipment.
- Demonstrate knowledge of drawings and job specifications.
- Demonstrate knowledge of safe work practices and procedures related to fabricating dampers and components and installing pneumatic, gravity and mechanized material handling systems.
- Demonstrate knowledge of regulatory requirements pertaining to pneumatic, gravity and 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.
- 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:

Theoretical Objectives

1. Define terminology associated with the installation of material handling system components.
 - 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
2. Identify hazards and describe safe work practices and procedures pertaining to fabricating and installing material handling system components.
 - i) grounding
 - ii) pneumatic
 - iii) gravity
 - iii) mechanized
 - lock-out and tag-out
 - identifying pinch point
 - working around moving equipment
 3. Identify tools and equipment used for fabrication and installation of pneumatic and gravity material handling systems and procedures for use.
 4. Identify codes and standards pertaining to the installation of material handling system components.
 - i) SMACNA
 - ii) ASHRAE
 - iii) NBC
 - iv) ANSI
 - v) CSA
 - vi) NFPA
 3. Identify types of material handling systems and describe their associated design principles.
 - i) positive
 - ii) negative
 4. Identify types of materials used to fabricate dampers and components for material handling systems, and describe their characteristics and applications.
 5. Identify types of material handling system components, and describe their applications.
 - i) pneumatic

- ii) gravity
 - ii) mechanized
5. 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
 6. Explain calculations related to material handling system and damper fabrication.
 - i) frame size
 - ii) bend allowances
 - iii) number of blades
 - iv) material thickness
 7. Describe the procedures used to prepare for installation of pneumatic and gravity material handling system components.
 - 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
 8. Identify considerations when installing pneumatic, gravity and mechanized material handling system components.
 9. Describe the procedures used to install pneumatic and gravity material handling system components.
 10. Interpret information pertaining to installing pneumatic, gravity and mechanized material handling system components found on drawings and specifications.

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, lagging/cladding, and flashing to components and the associated tools and equipment.
- Demonstrate knowledge of safe work practices and procedures pertaining to applying thermal insulation to components.
- Demonstrate knowledge of regulatory requirements pertaining to insulating components.
- Demonstrate knowledge of calculations required to apply lagging/cladding, and 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:

Theoretical Objectives

1. Identify hazards and describe safe work practices and procedures associated with applying thermal insulation to components.
2. Identify 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 for insulating components.
6. Identify the methods used to secure and seal material, and seams and joints.
7. Identify the methods used to apply flashing.
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

1. N/A

SMW-415 Testing, Adjusting and Balancing (TAB)

Learning Outcomes:

- Demonstrate knowledge of the procedures used to perform testing, adjusting and balancing (TAB) on air handling systems, and the associated tools and testing equipment.
- Demonstrate knowledge of drawings and specifications.
- Demonstrate knowledge of codes and regulations pertaining to performing TAB.

2018 Red Seal Occupational Standard Reference:

- 14.02 Performs testing, adjusting and balancing (TAB).
- 2.10 Uses testing and inspection devices.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with TAB.
2. Identify hazards and describe safe work practices pertaining to testing and balancing.
3. Interpret codes and standards pertaining to testing and balancing.
 - i) Testing, adjusting and balancing bureau (TABBB)
 - ii) SMACNA
 - i) Atlantic Air Balance Council (AABC)
4. Interpret information pertaining to performing testing and balancing found on drawings and specifications.
5. Explain the importance of TAB to ensure optimal system performance.

6. Identify tools and testing equipment used in TAB, and describe their applications and procedures for use.
7. Identify types of tests relating to air handling system equipment and components and describe the procedures used to perform them.
 - i) airflow
 - ii) pressure
 - iii) velocity
 - iv) volume
8. Identify requirements and limitations pertaining to TAB.
9. 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
10. Describe the procedures and techniques used to perform balancing on air 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

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.
2.10 Uses testing and inspection devices.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with commissioning.
2. Interpret documentation pertaining to commissioning.
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
 - 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

1. N/A

SMW-425 **Job Planning**

Learning Outcomes:

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

- 3.01 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 the procedures used to plan job tasks.
 - i) scheduling

- ii) estimating
- 4. Describe the procedures used to organize, store and maintain inventory.
- 5. Describe safety requirements for handling materials and equipment.
- 6. 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

- 1. N/A

SMW-430 Drawings 2

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.

Suggested Hours:

30 hours

Objectives and Content:

1. Describe the procedures used to interpret and extract information from drawings.
2. Identify the purpose of submittals and shop drawings and describe the procedures used to interpret them.
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:

Theoretical Objectives

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

1. N/A

SMW-440 Program Review

Learning Outcomes:

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

2018 Red Seal Occupational Standard Reference:

Entire Red Seal Occupational Standard

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

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 (AACCS).
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

Nova Scotia Document Evaluation Form

Thank you for your interest in the development and revision of this document. Upon review of the document, please record your feedback in relation to the following items:

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