Sheet Metal Worker

Guide to Course Content

2022

1-877-363-0536
apprenticeship@gov.sk.ca
saskapprenticeship.ca

Saskatchewan Apprenticeship and Trade Certification Commission

Online: www.saskapprenticeship.ca

Recognition:
To promote transparency and consistency, this document has been adapted from the 2016 Sheet Metal Worker Red Seal Occupational Standard (Employment and Social Development Canada).

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

STRUCTURE OF THE GUIDE TO COURSE CONTENT

To facilitate understanding of the occupation, this guide to course content contains the following sections:

Description of the Sheet Metal Worker Trade: an overview of the trade's duties and training requirements.

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

Elements of harmonization of apprenticeship training: includes adoption of Red Seal trade name, number of levels of apprenticeship, total training hours (on-the-job and in-school) and consistent sequencing of technical training content. Implementation for harmonization will take place progressively. Level one to be implemented in 2018/2019, level two 2019/2020, level three 2020/2021, and level four in 2021/2022.

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

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

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

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

Training Profile Chart: a chart which outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training.

Technical Training Course Content for the Sheet Metal Worker Trade: a chart which outlines the model for SATCC technical training sequencing. For the harmonized level of training, a cross reference to the Harmonized apprenticeship technical training sequencing, at the learning outcome level, is provided.

Appendix A: Post Harmonization Training Profile Chart: a chart which outlines the finalized model for SATCC technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

The Red Seal Sheet Metal Worker Curriculum Outline, which provides additional detail of the Harmonized technical training, can be found at www.red-seal.ca

DESCRIPTION OF THE SHEET METAL WORKER TRADE

Metal Workers use metal of 10 gauge or lighter to make and repair products and buildings.

Sheet metal workers design, fabricate, assemble, install and repair sheet metal products and systems. In fabrication work, sheet metal workers lay out and measure pieces to specifications. They use tools such as hand tools, portable power tools and shop equipment to cut and shape material. They assemble and join the pieces with various techniques such as welding and using mechanical fasteners.

They work with black iron, galvanized steel, satin-coated steel, stainless steel, aluminum, copper, brass, nickel, tin plate and other alloys. Some may also work with composites, fibreglass, ceramics and plastics.

Pieces may be laid out and cut in the shop and assembled on construction or industrial sites. Sheet metal workers may specialize in on-site installation, heating, ventilation and air conditioning (HVAC) and material handling system design, shop manufacture, and servicing and maintenance of installed equipment and systems. Those who work in installation may specialize in HVAC, boiler lagging / vessel cladding, roofing products, architectural sheet metal, custom metal products, food service products, secondary systems for environmental projects, pneumatic conveyance or signage.

Employers in this trade include sheet metal fabrication shops, manufacturing companies of sheet metal, installation contractors, and HVAC contractors. Sheet metal workers may be involved in residential, industrial, commercial, institutional and construction sectors.

Key attributes for people entering this trade are mechanical and mathematical aptitude, hand-eye coordination, spatial perception and manual dexterity. The work often requires considerable standing, climbing, kneeling, lifting and carrying.

Hazards of the trade include working with sharp metal pieces, at heights, around excessive noise and vibration, as well as exposure to heat and fumes. Sheet metal workers often have to work in adverse weather and environmental conditions.

This standard recognizes some transferable skills between the sheet metal worker trade and other trades such as ironworkers, boilermakers, refrigeration and air conditioning mechanics, plumbers, insulators (heat and frost), gasfitters, oil heat system technicians, electricians, roofers, carpenters and welders.

With experience, sheet metal workers act as mentors and trainers to apprentices in the trade. They may also become specialists in design and layout, and move into other positions such as estimators, supervisors or business owners.

Training Requirements: To graduate from each level of the apprenticeship program, an apprentice must successfully complete the required technical training and compile enough on-the-job experience to total at least 1800 hours each year. Total trade time required is 7200 hours and at least 4 years in the trade.

There are four levels of technical training delivered by Saskatchewan Polytechnic in Saskatoon.

Level One: 8 weeks
Level Two: 8 weeks
Level Three: 8 weeks
Level Four: 8 weeks

***Any person who is not a journeyperson Sheet Metal Worker must become registered as an apprentice to work in this trade.**

The information contained in this guide to course content details the technical training delivered for each level of apprenticeship. An apprentice spends approximately 15% of their apprenticeship term in a technical training institute learning the technical and theoretical aspects of the trade. The hours and percentages of technical and practical training may vary according to class needs and progress.

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

Entrance Requirements for Apprenticeship Training

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

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

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

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

Designated Trade Name	**Math Credit** at the Indicated Grade Level❶	**Science Credit** at Grade Level
Sheet Metal Worker	Grade 11	Grade 10

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

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

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

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

ESSENTIAL SKILLS SUMMARY

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

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

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

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

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

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

READING

Sheet metal workers require reading skills to gather information from forms and labels. They also need to read to understand more complex texts such as equipment and policy and procedure manuals, specifications, codes and standards. They also refer to project specifications and work orders when planning a job.

DOCUMENT USE

Document use is a significant essential skill for this trade. Sheet metal workers need to be able to locate and interpret information in several types of documents such as labels, signs, forms, lists, tables, technical drawings and schematics. They also need to create documents such as orthographic projections, sketches and work forms.

WRITING

Writing skills are used by sheet metal workers to write short texts, usually less than one paragraph. Some examples of written work include safety documentation, logbook entries, invoices, inventory lists, takeoffs, bids, forms and summaries of work projects.

ORAL COMMUNICATION

Some tasks performed by sheet metal workers require oral communication skills, including discussing project requirements with suppliers, discussing specifications and plans with co-workers, supervisors and general contractors, and supervising and directing the work of apprentices. Sheet metal workers may explain the fabrication, construction, installation and repair procedures to customers as well.

NUMERACY

Numeracy skills are extremely important in the everyday work of sheet metal workers. Substantial mathematical skills are used in taking measurements, doing material layout, using formulas and performing trade calculations such as heat loss/gain, air flows, capacities and air pressures. Numeracy is used significantly in system design. Sheet metal workers may create project timelines, calculating time requirements for tasks in the project. They may also calculate amounts for supplies, estimates and overall costs.

THINKING

Sheet metal workers solve problems in situations where work may be delayed due to equipment breakdowns, shortages in materials and work of other trades. They may perform modifications to project designs to correct flaws. They need the ability to think spatially and visualize in three dimensions. Problem-solving and thinking sequentially are important skills in fabrication and installation activities. Sheet metal workers need to be able to plan their work and organize tasks and materials.

WORKING WITH OTHERS

Sheet metal workers coordinate job tasks and share workspace and equipment with groups of co-workers and colleagues. Those working in fabrication shops may work alone on small projects, and also work as members of a team on larger projects. During installation work, tasks must be coordinated with other tradespersons such as crane operators, carpenters, drywall finishers and plasterers, bricklayers, plumbers and electricians.

DIGITAL TECHNOLOGY

Sheet metal workers may use computers and computer-assisted design (CAD) and building information modelling (BIM) software in their work. They may also use computers to perform word processing and electronic communication devices to communicate with others, record job changes and daily activities, track job progress, order materials and perform Internet research. Increasingly sheet metal workers are required to have digital skills when performing daily tasks which may require the use of numerically-controlled equipment and electronic devices.

CONTINUOUS LEARNING

Sheet metal workers are required to stay current with new technology, trends and product developments as well as changes in fabrication, installation and production processes. They also need to stay updated on codes and trade standards.

ELEMENTS OF HARMONIZATION FOR APPRENTICESHIP TRAINING

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

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

1. Trade name

The official Red Seal name for this trade is Sheet Metal Worker.

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for the Sheet Metal Worker trade is four.

3. Total Training Hours during Apprenticeship Training

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

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

Implementation for harmonization will take place progressively. Level one to be implemented in 2018/2019, level two 2019/2020, level three 2020/2021, and level four in 2021/2022. See Appendix A for the finalized curriculum comparisons.

White boxes are “Topics,” grey boxes are “In Context”. In context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in context topics are accomplished in other topics in that level.

Level 1 (2018/2019 implementation)	Level 2 (2019/2020 implementation)	Level 3 (2020/2021 implementation)	Level 4 (2021/2022 implementation)
	Safety-Related Functions	Safety-Related Functions	Safety-Related Functions
		Installation Site (prepares)	Installation Site (prepares)
		Organizes Work	Organizes Work
	Communication	Communication	Communication
			Specialty Products (fabricates)

Level 1 (2018/2019 implementation)	Level 2 (2019/2020 implementation)	Level 3 (2020/2021 implementation)	Level 4 (2021/2022 implementation)
			Specialty Products (installs)
		Chimney, Breeching, Venting (installs, connects)	Chimney, Breeching, Venting (installs, connects)
		Chimney, Breeching, Venting (installs, connects)	Scheduled Maintenance
			Repair
Safety-Related Functions	Tools and Equipment	Tools and Equipment	
Tools and Equipment	Organizes Work		
Organizes Work			
Communication	Pattern Development	Pattern Development	Pattern Development
Pattern Development	Air/Material handling components (fabricates)	Air/Material handling components (fabricates)	Air/Material handling components (fabricates)
Air/Material handling components (fabricates)	Flashing, roofing, sheeting, and cladding (fabricates)		
		Specialty Products (fabricates)	
		Specialty Products (installs)	
	Installation Site (prepares)		
	Chimney, Breeching, Venting (installs, connects)		
Air Handling System Components (installs)	Air Handling System Components (installs)	Air Handling System Components (installs)	Air Handling System Components (installs)
			Material Handling System Components (installs)
			Thermal Insulation, Lagging, Cladding and Flashing

Level 1 (2018/2019 implementation)	Level 2 (2019/2020 implementation)	Level 3 (2020/2021 implementation)	Level 4 (2021/2022 implementation)
		Leak Testing, Air Balancing, Commissioning	Leak Testing, Air Balancing, Commissioning
	Metal Roofing and Cladding Systems		
	Exterior Components (installs)		
		Scheduled Maintenance*	
		Repair*	

SHEET METAL WORKER TASK MATRIX

This chart outlines the major work activities, tasks and sub-tasks from the 2016 Sheet Metal Worker Red Seal Occupational Standard. Each sub-task details the corresponding essential skill and level of training where the content is covered. *

* Sub tasks with numbers in the boxes is where the content will be delivered in training. The Task Matrix Chart will be updated every year until Harmonization implementation is complete. Implementation for harmonization will take place progressively. Level one to be implemented in 2018/2019, level two 2019/2020, level three 2020/2021, and level four in 2021/2022.

A – Performs common occupational skills — 20%

Task A-1 Performs safety-related functions	**A-1.01 Uses personal protective equipment (PPE) and safety equipment** **1** **(In Context 2, 3, 4)**	**1.02 Uses personal protective equipment (PPE) and safety equipment** **1** **(In Context 2, 3, 4)**	**A-1.03 Performs lock-out and tag-out procedures** **1** **(In Context 2, 3, 4)**		
Task A-2 Uses and maintains tools and equipment	**A-2.01 Uses hand and portable power tools** **1**	**A-2.02 Uses shop tools and equipment** **1, 2, 3**	**A-2.03 Uses gas metal arc welding (GMAW) equipment** **1, 2, 3, 4**	**A-2.04 Uses resistance spot welding equipment** **1**	**A-2.05 Uses gas tungsten arc welding (GTAW) equipment** **3**
	A-2.06 Uses shielded metal arc welding (SMAW) equipment **2**	**A-2.07 Uses oxy-fuel and plasma arc cutting equipment** **1**	**A-2.08 Uses soldering and brazing equipment** **1, 2**	**A-2.09 Uses measuring and layout equipment** **1**	**A-2.10 Uses testing and inspection devices** **2, 3, 4**
	A-2.11 Uses stationary and mobile work platforms **1**	**A-2.12 Uses hoisting, rigging and positioning equipment** **1**			
A-3 Organizes work	**A-3.01 Uses trade-related documentation** **1, 2** **(In Context 3, 4)**	**A-3.02 Interprets drawings** **1, 2** **(In Context 3, 4)**	**A-3.03 Organizes materials and equipment for project** **1**	**A-3.04 Performs basic design and field modifications** **1, 2** **(In Context 3, 4)**	
Task A-4 Uses communication and mentoring techniques	**A-4.01 Uses communication techniques** **1** **(In Context 2, 3)**	**4A-4.02 Uses mentoring techniques** **4** **(In Context 2, 3)**			

B – Performs fabrication

31%

Task B-5 Performs pattern development	**B-5.01 Develops patterns using simple and straight line layout** 1	**B-5.02 Develops patterns using parallel line method** 2	**B-5.03 Develops patterns using radial line method** 2	**B-5.04 Develops patterns using triangulation method** 2	**B-5.05 Uses computer technology for pattern development** 4
Task B-6 Fabricates sheet metal components for air and material handling systems	**B-6.01 Cuts ductwork, fittings and components** 1	**B-6.02 Forms ductwork, fittings and components** 1, 2, 3, 4	**B-6.03 Insulates ductwork, fittings and components** 1	**B-6.04 Assembles ductwork, fittings and components** 1, 2, 3, 4	**B-6.05 Fabricates dampers** 4
	B-6.06 Fabricates hanger systems, supports and bases 1				
Task B-7 Fabricates flashing, roofing, sheeting and cladding	**B-7.01 Cuts metal for flashing, roofing, sheeting and cladding** 2	**B-7.02 Forms flashing, roofing, sheeting and cladding** 2			
Task B-8 Fabricates specialty products	**B-8.01 Cuts material for specialty products** 3	**B-8.02 Forms specialty products** 3	**B-8.03 Assembles specialty products** 3	**B-8.04 Finishes specialty products** 3	

C – Installs air and material handling systems

35%

Task C-9 Prepares installation site	**C-9.01 Performs on-site measurements** 2 (In Context 3, 4)	**C-9.02 Performs demolitions for renovations** 2 (In Context 3, 4)	**C-9.03 Installs penetrations and sleeves** 2 (In Context 3, 4)	**C-9.04 Installs supports and bases** 2 (In Context 3, 4)	**C-9.05 Installs hangers, cables, braces and brackets** 2 (In Context 3, 4)
Task C-10 Installs and connects chimneys, breeching and venting to exhaust appliances and mechanical equipment	**C-10.01 Installs chimney** 2 (In Context 3, 4)	**C-10.02 Connects appliances or mechanical equipment to chimney and breeching** 2 (In Context 3, 4)	**C-10.03 Installs high efficiency appliances and mechanical equipment** 2 (In Context 3, 4)		
Task C-11 Installs air handling system components	**C-11.01 Installs air handling equipment** 1, 2, 3, 4	**C-11.02 Installs sheet metal ducts and fittings** 1	**C-11.03 Installs dampers** 1	**C-11.04 Installs fire and fire/smoke dampers** 2	**C-11.05 Installs registers, grilles, diffusers and louvers** 1
	C-11.06 Installs terminal boxes 3	**C-11.07 Installs coils** 3	**C-11.08 Installs system component accessories** 2, 3, 4	**C-11.09 Installs plenums** 1, 3	
Task C-12 Installs material handling system components	**C-12.01 Installs pneumatic and gravity material handling system components** 4	**C-12.02 Installs mechanized material handling system components** 4			
Task C-13 Applies thermal insulation, lagging, cladding and flashing	**C-13.01 Applies thermal insulation to components** 4	**C-13.02 Applies lagging and cladding to components** 4	**C-13.03 Applies flashing to components** 4		
Task C-14 Performs leak testing, air balancing and commissioning	**C-14.01 Performs leak tests** 3, 4	**C-14.02 Performs testing, adjusting and balancing (TAB)** 3, 4	**C-14.03 Participates in the commissioning of air and material handling systems** 3, 4		

D – Installs roofing and specialty products — 8%

Task D-15 Installs metal roofing and cladding/siding systems	D-15.01 Lays out roof and walls 2	D-15.02 Installs insulation, isolation material and building envelope components 2	D-15.03 Installs roofing and cladding/siding system components 2	D-15.04 Seals exposed joints 2	D-15.05 Installs decking 2
Task D-16 Installs exterior components	D-16.01 Prepares surface 2	D-16.02 Fastens exterior components 2			
Task D-17 Installs specialty products	D-17.01 Installs stainless steel specialty products 3	D-17.02 Installs non-stainless steel specialty products 3	D-17.03 Installs marine products 3		

E – Performs maintenance and repair — 6%

Task E-18 Performs scheduled maintenance	E-18.01 Performs maintenance inspections 3 (In Context 4)	E-18.02 Services components 3 (In Context 4)
Task E-19 Repairs faulty systems and components	E-19.01 Diagnoses system faults 3	E-19.02 Repairs worn or faulty components 3

TRAINING PROFILE CHART

This Training Profile Chart represents Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training at the topic level.

Level One	Transcript Code	Hours
Trade Theory	SHME 100	59
Pattern Drafting	DRFT 100 - Theory	10
	DRFT 101 - Practical	47
Welding and Cutting	WELD 139	12
Bench and Shop Work	BESK 102 - Theory	14
	BESK 103 - Practical	80
Trade Mathematics (Exceeds)	MATH 198	18
		240

Level Two	Transcript Code	Hours
Print Reading	PRNT 204	14
Trade Theory	SHME 200	40
Pattern Drafting	DRFT 203 - Theory	8
	DRFT 204 - Practical	44
Welding	WELD 208	8
Bench and Shop Work	BESK 200 - Theory	8
	BESK 201 – Practical	80
Scheduled Maintenance & Repair	MAIN 204	24
Trade Mathematics (Exceeds)	MATH 293	14
		240

Level Three	Transcript Code	Hours
Welding	WELD 303	12
Pattern Drafting Theory	DRFT 300 - Theory	8
	DRFT 301 – Practical	40
Print Reading	PRNT 303	18
Trade Theory	SHME 381	56
Bench and Shop Work Theory	BESK 300 - Theory	10
	BESK 301 – Practical	68
Scheduled Maintenance & Repair	MAIN 300	14
Trade Mathematics	MATH 381	14
		240

Level Four	Transcript Code	Hours
Scheduled Maintenance & Repair	MAIN 400	18
Communication	COMM 480	8
Pattern Drafting Theory	DRFT 400 – Theory	8
Pattern Drafting Practical	DRFT 401 – Practical	30
Print Reading	PRNT 401	18
Trade Theory	SMHE 481	56
Bench and Shop Work Theory	BESK 400 – Theory	8
Bench and Shop Work Practical	BESK 401 – Practical	80
Trade Mathematics	MATH 481	14
		240

TECHNICAL TRAINING COURSE CONTENT

This chart outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing. For the harmonized level of training, a cross reference to the Red Seal Occupational Standard (RSOS) apprenticeship technical training sequencing, at the learning outcome level, is provided.

Sub-tasks listed are the minimum to be covered in a topic. Related sub-tasks not listed may be used as a reference and taught “in context” in other topics.

Implementation for harmonization will take place progressively. Level one to be implemented in 2018/2019, level two 2019/2020, level three 2020/2021, and level four in 2021/2022.

The Red Seal Sheet Metal Worker Curriculum Outline, which provides additional detail of the Harmonized technical training, can be found at www.red-seal.ca

Level One — 8 weeks — 240 hours

Trade Theory — 59 hours

- demonstrate proper use of safety equipment and safe work practices
- identify common sheet metal hand tools and equipment
- describe the characteristics of shop tools and equipment
- recognize sheet metal seams, locks, and edges
- recognize appropriate fasteners for various sheet metal applications
- describe fabrication procedures used in typical sheet metal shops
- discuss the techniques and materials used to solder various metals
- describe factors affecting building ventilation
- demonstrate the knowledge and procedures required to rig and hoist materials safely
- discuss techniques and equipment for brazing
- discuss measurement and layout of equipment
- discuss organizing materials and equipment
- use effective communication techniques
- discuss installation of air handling equipment
- discuss installation of duct and duct accessories
- discuss installation of plenums

RSOS topics covered in this section of training:

A-1 Safety-Related Functions

A-1.01 Uses personal protective equipment (PPE) and safety equipment

- PPE and safety equipment, their applications, maintenance, storage, and procedures for use
- regulatory requirements pertaining to PPE and safety equipment

A-1.02 Maintains safe work environment

- safe work practices
- regulatory requirements pertaining to hazards and emergency situations

A-1.03 Performs lock-out and tag-out procedures

- lock-out and tag-out procedures and legislation governing minimum standards
- safety checks of equipment
- procedures for voltage testing

A-3 Organizes Work– Trade Theory

A-3.01 Uses trade-related documentation

- interpretation and extraction of information from schematics, and specifications

A-3.02 Interprets drawings

- interpretation and extraction of information from schematics, and specifications

A-3.03 Organizes materials and equipment for project

- prepares work site
- performs job hazard assessment
- determines location and layout of equipment and systems

A-4 Communication – Trade Theory

A-4.01 Uses communication techniques

- demonstrates knowledge of effective communication practices

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Bench and Shop Work Theory — 14 hours

- discuss the appropriate sheet metal hand tools and machines for specific shop applications.
- identify powered metal forming equipment for a specific metal forming function.
- discuss Gas Metal Arc Welding GMAW operations.
- discuss hot process metal cutting using plasma and oxy-fuel equipment

RSOS topics covered in this section of training:

B-6 Air/Material handling components (fabricates)

B-6.01 Cuts ductwork, fittings and components

- procedures used to fabricate ductwork and fittings
- codes and regulations pertaining to the fabrication of sheet metal components
- procedures used to cut ductwork, fittings and components
- safe work practices and procedures pertaining to cutting ductwork, fittings and components
- calculations required to measure ductwork, fittings and components

B-6.02 Forms ductwork, fittings and flexible connectors

- procedures used to form ductwork, fittings and components
- safe work practices pertaining to forming ductwork, fittings and components
- metallurgic principles

B-6.03 Insulates ductwork and fittings

- procedures used to insulate ductwork, fittings and components
- safe work practices and procedures pertaining to insulating ductwork, fittings and components
- metals and their properties, characteristics and applications
- standards pertaining to insulating ductwork, fittings and components

B-6.04 Assembles ductwork, fittings and flexible connectors

- procedures used to assemble ductwork, fittings
- welding equipment, its application, maintenance and procedure for use
- safe work practices and procedures pertaining to the assembly of ductwork, fittings and components
- industry standards pertaining to the assembly of ductwork, fittings and components

B-6.06 Fabricates hanger systems, supports and bases

- procedures used to fabricate hanger systems, supports and bases
- safe work practices and procedures pertaining to the fabrication of hanger systems, supports and bases
- drawing interpretation
- trade standards pertaining to the fabrication of hanger systems, supports and bases

Bench and Shop Work Practical **80 hours**

- explain fabrication procedures for various sheet metal seams, locks, and edges
- fabricate basic sheet metal items using simple layout procedures
- use a spot welder to seam sheet metal objects
- assemble a simple duct complete with takeoffs using standard sheet metal tools and equipment
- layout degree and ninety degree rectangular elbows using basic layout methods
- fabricate regular and “ogee” offsets using basic layout methods
- explain safety related functions within a work environment
- fabricate sheet metal products using soldering and brazing
- use hoisting, rigging and positioning equipment
- fabricate insulated ducts and fittings
- fabricate hangers, supports, and bases
- install air handling equipment
- install dampers
- install outlets and louvers
- install plenums

RSOS topics covered in this section of training:

C-11 Air Handling System Components (installs)

C-11.01 Installs air handling equipment

- installation procedures for air handling equipment and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing air handling equipment
- basic concepts of electricity

C-11.02 Installs sheet metal ducts and fittings

- installation procedures for sheet metal ducts and fittings and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing sheet metal ducts and fittings
- regulatory requirements pertaining to the installation of sheet metal ducts and fittings

C-11.03 Installs dampers

- installation procedures for dampers and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing dampers
- regulatory requirements pertaining to the installation of dampers

C-11.05 Installs registers, grilles, diffusers and louvers

- installation procedures for registers, grilles, diffusers and louvers, and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing registers, grilles, diffusers and louvers
- regulatory requirements pertaining to the installation of registers, grilles, diffusers and louvers

C-11.09 Installs plenums

- installation procedures for plenums and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing plenums
- regulatory requirements pertaining to the installation of plenums

Pattern Drafting Theory — 10 hours

- discuss the various drafting tools used to make drawings for the sheet metal industry
- recognize the types of lines, angles, and lettering used for drawings in the sheet metal industry
- recognize pictorial drawings and orthographic projections
- define terminology associated with drafting
- explain characteristics and measurements of various transverse connections
- identify complex layout methods

RSOS topics covered in this section of training:

B-5 Pattern Development◆

B-5.01 Develops patterns using simple and straight line layout

- simple and straight line layout, its applications and associated calculations
- basic pattern development using simple layout

Pattern Drafting Practical — 47 hours

- discuss geometric principles to construct lines, angles, and common shapes used in layout work
- illustrate orthographic drawings from pictorial drawings
- lay out patterns for sheet metal fittings using basic layout
- lay out patterns for rectangular elbows
- lay out patterns for regular and transitional cheek ogee offsets
- describe three main methods of pattern development.

RSOS topics covered in this section of training:

B-5 Pattern Development◆

B-5.01 Develops patterns using simple and straight line layout

- simple and straight line layout, its applications and associated calculations
- basic pattern development using simple layout

Welding and Cutting — 12 hours

- use Gas Metal Arc Welding (GMAW) equipment
- use welding and cutting protective equipment
- operate oxy- acetylene cutting equipment
- operate plasma arc cutting equipment

RSOS topics covered in this section of training:

A-2 Tools and Equipment

A-2.01 Uses hand and portable power tools

- hand and portable power tools, their applications, maintenance and procedures for use

A-2.02 Uses shop tools and equipment

- shop tools and equipment, their applications, maintenance and procedures for use
- inspection procedures and criteria

A-2.03 Uses gas metal arc welding (GMAW) equipment

- GMAW equipment, its applications, maintenance and procedures for use
- safe work practices and procedures pertaining to the use of GMAW equipment

A-2.04 Uses resistance spot welding equipment

- resistance spot welding equipment, consumables, accessories and procedures for use
- procedures used to weld using resistance spot welding equipment
- safe work practices and procedures pertaining to the use of resistance spot welding equipment

A-2.07 Uses oxy-fuel and plasma arc cutting equipment

- oxy-fuel and plasma arc cutting equipment and accessories
- oxy-fuel and plasma arc cutting procedure
- safety practices and procedures related to oxy- fuel and plasma arc cutting

A-2.08 Uses soldering and brazing equipment

- soldering and brazing equipment, its maintenance soldering and brazing equipment and supplies
- safe work practices and procedures pertaining to the use of soldering and brazing equipment

A-2.09 Uses measuring and layout equipment

- measuring and layout equipment, their applications, maintenance and procedures for use

A-2.11 Uses stationary and mobile work platforms

- stationary and mobile work platforms, their applications, limitations and procedures for use
- safe work practices and procedures pertaining to stationary and mobile work platforms
- regulatory requirements pertaining to stationary and mobile work platforms

A-2.12 Uses hoisting, rigging and positioning equipment

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

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Math **18 hours**

- uses basic mathematics
- uses basic algebra
- uses metric units

RSOS topics covered in this section of training:

No Specific Task in RSOS

There are no Level One topics from the RSOS that are taught in context.

For details regarding the In Context Topics, see page 35

Level Two — 8 weeks — 240 hours

Print Reading — 14 hours

- use trade-related documentation
- interpret drawings
- perform basic design and field modifications
- develop patterns using radial line layout methods.

RSOS topics covered in this section of training:

A-3 Organizes Work

A-3.01 Uses trade-related documentation

- trade-related documentation and their application
- procedures used to prepare trade-related documentation
- procedures used to produce material take-off lists
- procedures used to prepare safety-related documentation

A-3.02 Interprets drawings

- drawings and specifications, and their applications
- the procedures used to interpret and extract information from drawings

A-3.04 Performs basic design and field modifications

- inspection procedures
- procedures used to take field measurements
- performing field modifications
- basic pattern development and layout
- duct systems and their associated design principles

Trade Theory — 40 hours

- describe HVAC system categories and components including package units, built-up systems and terminal units
- describe the components and subsystems within a material handling systems
- identify the tools, equipment, and manpower to install HVAC and architectural systems and components
- explain how to prepare for ductwork installations
- describe the characteristics of anchors and hangers used to install ductwork
- discuss the characteristics of fire and smoke dampers
- interpret the SMACNA duct fabrication standards to determine gauge, transverse joint spacing and reinforcement for a given section of ductwork
- interpret information related to chimneys and vents
- discuss appliance venting theories for various types of HVAC appliances
- discuss types of chimneys and related applications
- discuss certifications, licenses, and bonding related to appliance installations
- interpret National Building Codes related to chimneys and venting of appliances
- interpret Saskatchewan Codes of Practice related to chimneys and venting appliances
- interpret manufacturer installation methods for a given appliance
- design a new and retro-fitted chimney installation to meet applicable codes and standards
- explain the process of demolition for renovations
- explain field measuring fundamentals
- discuss installation of insulation and cladding
- discuss different forms of matter
- describe heat energy and heat transfer Solve problems involving simple machines
- interprets plans and specifications

RSOS topics covered in this section of training:

C-9 Installation Site (prepares)

C-9.01 Performs on-site measurements

- procedure to perform on-site measurements and the associated tools and equipment
- calculations required to measure a work area
- drawing interpretation of trade standards and specifications pertaining to installation of hangers, braces and brackets

C-9.02 Performs demolitions for renovations

- dismantling materials and equipment and the associated tools and equipment
- safe work practices and procedures related to the dismantling and removal of materials and equipment
- regulations and specifications pertaining to the disposal of waste materials

C-9.03 Installs penetrations and sleeves

- procedures used to cut penetrations and their associated tools and equipment
- procedures used to install sleeves

C-9.04 Installs supports and bases

- procedures used to install supports and bases and associated tools and equipment
- drawing interpretation
- trade standards and regulations pertaining to supports and bases

C-9.05 Installs hangers, cables, braces and brackets

- used to install materials and associated tools and equipment
- drawing interpretation
- trade standards and specifications pertaining to hangers, cables, braces and brackets

C-10 Chimney, Breeching, Venting (installs, connects)

C-10.01 Installs chimney

- of installation procedures for chimneys and the associated tools and equipment
- drawing interpretation safe work practices and procedures related to the installation of chimneys
- regulatory requirements pertaining to the installation of chimneys

C-10.02 Installs and connects chimneys, breeching and venting to exhaust appliances and mechanical equipment

- installation procedures for connecting appliances and mechanical equipment to chimneys and breeching and the associated tools and equipment
- drawing interpretation
- regulatory requirements pertaining to connecting appliances and mechanical equipment to chimneys and breeching
- safe work practices and procedures related to connecting appliances and mechanical equipment to breeching
- safe work practices and procedures related to connecting appliance and mechanical equipment to chimneys and breeching

C-10.03 Installs high efficiency appliances and mechanical equipment

- installation procedures for high efficiency appliances and mechanical equipment and the associated tools and equipment
- drawing interpretation
- regulatory requirements pertaining to installing high efficiency appliances and mechanical equipment
- safe work practices and procedures related to connecting appliances and mechanical equipment to breeching

C-11 Air Handling System Components (installs)

C-11.01 Installs air handling equipment

- installation procedures for air handling equipment and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing air handling equipment
- basic concepts of electricity

C-11.04 Installs fire and fire/smoke dampers

- installation procedures for fire and fire/smoke dampers and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing fire and fire/smoke dampers
- regulatory requirements pertaining to the installation of fire and fire/smoke dampers

C-11.08 Installs system component accessories

- installation procedures for system component accessories, and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing system component accessories

D-16-Installs Exterior Components

D-16.01 Prepares surface

- preparing surfaces for the installation of exterior components and the associated tools and equipment

D-16.02 Fastens exterior components

- fastening exterior components and the associated tools and equipment

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Pattern Drafting Theory — 8 hours

- identify characteristics of basic layout of sheet metal fittings
- identify characteristics of parallel line layout of sheet metal fittings
- identify characteristics of radial line layout of sheet metal fittings
- identify characteristics of triangulation layout of sheet metal fittings
- identify isometric, oblique, and perspective drawings

Pattern Drafting Practical — 44 hours

- develop patterns using basic layout methods
- develop patterns using parallel line layout methods
- develop patterns using radial line layout methods
- identify characteristics of triangulation layout methods
- prepare scaled and freehand isometric and oblique drawings

RSOS topics covered in this section of training:

B-5 Performs pattern development

B-5.02 Develops patterns using parallel line method

- parallel line development for round duct fittings, its applications and associated calculations
- procedures used to develop and fabricate round duct fittings using parallel line development
- of parallel line development for architectural applications and its associated calculations
- procedures used to develop patterns for advanced or complex fittings for architectural applications using parallel
- line development

B-5.03 Develops patterns using radial line method

- radial line development for right cones, its applications and associated calculations
- procedures used to develop patterns for fittings based on right cones using radial line development
- radial line development for oblique fittings and components and its associated calculations
- procedures used to develop patterns for oblique fittings and components using radial line development

B-5.04 Develops patterns using triangulation method

- triangulation method from plan view, its applications and associated calculations
- procedures used to develop patterns for fittings using triangulation method from plan view
- triangulation method from elevation, its applications and associated calculations

- procedures used to develop patterns for advanced or complex fittings using triangulation method from elevation

Welding — 8 hours

- recognize hazards related to welding and cutting processes
- select personal protective equipment
- use gas tungsten arc welding (GTAW) equipment

RSOS topics covered in this section of training:

A-2 Tools and Equipment

A-2.02 Uses shop tools and equipment
- shop tools and equipment, their applications, maintenance and procedures for use
- inspection procedures and criteria

A-2.03 Uses gas metal arc welding (GMAW) equipment
- GMAW equipment, its applications, maintenance and procedures for use
- safe work practices and procedures pertaining to the use of GMAW equipment

A-2.06 Uses shielded metal arc welding (SMAW) equipment
- SMAW equipment, its applications, maintenance and procedures for use
- procedures used to weld using the SMAW process
- safe work practices and procedures pertaining to the use of SMAW equipment

A-2.08 Uses soldering and brazing equipment
- soldering and brazing equipment, its maintenance and procedures for use
- safe work practices and procedures pertaining to the use of soldering and brazing equipment
- procedures used to solder and braze materials

A-2.10 Uses testing and inspection devices
- testing and inspection devices, their applications, maintenance and procedures for use

Bench and Shop Work Theory — 8 hours

- demonstrate safe operation of powered shop equipment
- set up powered machinery to perform basic operations
- examine gas tungsten arc welding (GTAW) operations

Bench and Shop Work Practical — 80 hours

- operate a power press brake to form various types of metal to specific shapes
- operate the notching and punching stations on an iron worker
- tap holes in metal components for the specified machine screw
- use a power rolls machine to roll heavy gage sheet metal to various diameters
- fabricate components from pictorial drawing using the appropriate powered equipment
- assembles ductwork fittings and flexible connectors
- fabricate ducts, duct accessories, and fittings using basic layout
- fabricate fittings using parallel line layout
- fabricate fittings using radial line layout
- Fabricate fittings using triangulation layout
- use soldering and brazing equipment
- assembles ductwork, fittings, and flexible connectors
- fabricate exterior architectural sheet metal components
- demonstrate on-site measuring
- install appliances and venting
- install decking, hangers, and supporting components
- install air handling equipment
- install duct accessories
- demonstrate the process for sealing exposed joints and seams on ductwork

RSOS topics covered in this section of training:

B-6 Air/Material handling components (fabricates)

B-6.02 Forms ductwork, fittings and flexible connectors

- procedures used to form ductwork, fittings and components
- safe work practices pertaining to forming ductwork, fittings and components
- metallurgic principles

B-6.04 Assembles ductwork, fittings and flexible connectors

- procedures used to assemble ductwork, fittings
- welding equipment, its application, maintenance and procedure for use
- safe work practices and procedures pertaining to the assembly of ductwork, fittings and components
- industry standards pertaining to the assembly of ductwork, fittings and components

B-7 Flashing, roofing, sheeting, and cladding (fabricates)

B-7.01 Cuts metal for flashing, roofing, sheeting and cladding

- procedures used to cut metal for flashing, roofing, sheeting and cladding
- safe work practices and procedures pertaining to cutting metal for flashing, roofing, sheeting and cladding
- calculations required to measure material for cutting

B-7.02 Forms flashing, roofing, sheeting and cladding

- procedures for forming flashing, roofing, sheeting and cladding
- safe work practices and procedures pertaining to forming flashing, roofing, sheeting and cladding

D-15 Metal Roofing and Cladding Systems

D-15.01 Lays out roof and walls

- procedures for laying out metal roofing and walls, and the associated tools and equipment
- safe work practices and procedures pertaining to laying out metal roofing and walls
- drawing interpretation
- trade standards pertaining to metal roofing and walls

D-15.02 Installs insulation, isolation material and building envelope components

- procedures for installing insulation, isolation materials and building envelop components and the associat4ed tools and equipment
- safe work practices and procedures pertaining to installing insulation, isolation materials and building envelope components
- drawing interpretation
- regulatory requirements pertaining to insulation, isolation materials and building envelope components

D-15.03 Installs roofing and cladding system components

- procedures for installing roofing and cladding/siding components, and the associated tools and equipment

D-15.04 Seals exposed joints

- procedures for sealing exposed joints, and the associated tools and equipment

D-15.05 Installs decking

- procedures for installing decking, and the associated tools and equipment
- safe work practices and procedures pertaining to installing decking
- drawing interpretation

Scheduled Maintenance & Repair — 24 hours

- define terminology associated with the servicing of system components
- use tools and equipment associated with the servicing of system components
- identify hazards and safe work practices pertaining to service work
- preform calculations of system performances

- use tools and equipment associated with airflow in ductwork
- describe the conditions that create airflow in ductwork

RSOS topics covered in this section of training:

No Specific Task in RSOS

Trade Mathematics **14 hours**

- use basic algebra to solve problems
- solve Complex problems
- apply the basic trigonometric functions to solve problems

RSOS topics covered in this section of training:

No Specific Task in RSOS

The Level Two topics from the RSOS that are taught in context are:

- Safety Related Functions, and
- Communication

For details regarding the In Context Topics, see page 35

Level Three — 7 weeks — 240 hours

Trade Theory — 56 hours

- compare HVAC systems and components
- examine the properties of air
- examine ventilation
- analyze air flow in ductwork
- categorize fans used in HVAC systems
- analyze HVAC duct systems
- examine the characteristics of heat
- examine the characteristics of cooling systems
- examine duct design characteristics
- compare duct sizing methods
- describe field measuring principles
- analyze hoisting and rigging operations
- examine HVAC equipment and installations
- discuss automatic control systems
- discuss sign work
- discuss properties of various materials
- solve problems involving simple machines
- examine specialty sheet metal products

RSOS topics covered in this section of training:

D-Installs roofing and specialty products

D-17.01 Installs stainless steel specialty products

- stainless steel specialty products and their applications
- of safe work practices and procedures pertaining to installing stainless steel specialty products
- regulatory requirements pertaining to stainless steel specialty products
- drawing interpretation
- metals and their properties, characteristics and applications
- metallurgic principles

D-17.02 Installs non-stainless steel specialty products

- non-stainless steel specialty products and their applications
- safe work practices and procedures pertaining to installing non-stainless steel specialty products
- regulatory requirements pertaining to non-stainless steel specialty products
- drawing interpretation

D-17.03 Installs marine products (Not Common Core)

- marine products and their applications
- safe work practices and procedures pertaining to installing marine products
- regulatory requirements pertaining to marine products
- drawing interpretation

Welding — 12 hours

- select protective equipment
- recognize hazards related to welding and cutting processes
- use gas tungsten arc welding (GTAW) operations
- use Shielded Metal Arc Welding (SMAW) procedures

RSOS topics covered in this section of training:

A-2 Uses and maintains tools and equipment

A-2.02 Uses shop tools and equipment

- shop tools and equipment, their applications, maintenance and procedures for use

- inspection procedures and criteria

A-2.03 Uses gas metal arc welding (GMAW) equipment
- GMAW equipment, its applications, maintenance and procedures for use
- safe work practices and procedures pertaining to the use of GMAW equipment

A-2.05 Uses gas tungsten arc welding (GTAW) equipment
- GTAW equipment, its applications, maintenance and procedures for use
- the procedures used to weld using the GTAW process
- safe work practices and procedures pertaining to the use of GTAW equipment

A-2.10 Uses testing and inspection devices
- testing and inspection devices, their applications, maintenance and procedures for use

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Pattern Drafting Theory **8 hours**
- identify Characteristics of basic layout of sheet metal fittings
- identify characteristics of parallel line layout of sheet metal fittings
- identify characteristics of radial line layout of sheet metal fittings
- identify characteristics of triangulation layout of sheet metal fittings
- identify characteristics of a combined layout method for sheet

Pattern Drafting Practical **40 hours**
- develop patterns using basic layout methods
- develop patterns using parallel line layout method
- develop patterns using radial line layout method
- develop patterns using triangulation layout method
- develop patterns using combined layout methods

RSOS topics covered in this section of training:

B-5 Performs pattern development

B-5.02 Develops patterns using parallel line method
- parallel line development for round duct fittings, its applications and associated calculations
- the procedures used to develop and fabricate round duct fittings using parallel line development
- parallel line development for architectural applications and its associated calculations
- the procedures used to develop patterns for advanced or complex fittings for architectural applications using parallel line development

B-5.03 Develops patterns using radial line method
- of radial line development for right cones, its applications and associated calculations
- the procedures used to develop patterns for fittings based on right cones using radial line development
- radial line development for oblique fittings and components and its associated calculations
- the procedures used to develop patterns for oblique fittings and components using radial line development

B-5.04 Develops patterns using triangulation method
- triangulation method from plan view, its applications and associated calculations
- the procedures used to develop patterns for fittings using triangulation method from plan view
- of triangulation method from elevation, its applications and associated calculations
- the procedures used to develop patterns for advanced or complex fittings using triangulation method from elevation

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Print Reading — 18 hours

- interpret information from plans and specifications
- interpret information from shop drawings
- examine plans and specifications
- develop shop drawings for given specifications
- perform a take-off from a shop drawing

RSOS topics covered in this section of training:

B-5 Performs pattern development

B-5.02 Develops patterns using parallel line method

- parallel line development for round duct fittings, its applications and associated calculations
- the procedures used to develop and fabricate round duct fittings using parallel line development
- parallel line development for architectural applications and its associated calculations
- the procedures used to develop patterns for advanced or complex fittings for architectural applications using parallel line development

B-5.03 Develops patterns using radial line method

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

B-5.04 Develops patterns using triangulation method

- triangulation method from plan view, its applications and associated calculations
- the procedures used to develop patterns for fittings using triangulation method from plan view
- of triangulation method from elevation, its applications and associated calculations
- the procedures used to develop patterns for advanced or complex fittings using triangulation method from elevation

Bench and Shop Work Theory — 10 hours

- recognize hazards related to the use of powered fabrication equipment
- discuss the operational characteristics of powered fabrication equipment
- examine the operational characteristics of a power press brake
- examine Gas Tungsten Arc Welding (GTAW) operation
- examine Shielded Metal Arc Welding (SMAW) operation

Bench and Shop Work Practical — 68 hours

- demonstrate safe operation of powered shop equipment
- fabricate metal parts using heavy gage fabrication equipment
- fabricate ducts, duct accessories, and fittings using basic layout
- fabricate fittings using parallel line layout
- fabricate fittings using radial line layout
- fabricate fittings using triangulation line layout
- fabricate fittings using combined layout methods
- fabricate specialty sheet metal products
- fabricate specialty sheet metal products using stainless steel
- install air handling system equipment and accessories
- install air handling plenums
- install coils and terminal boxes

RSOS topics covered in this section of training:

B- 6 Fabricates sheet metal components for air and material handling systems

B-6.02 Forms ductwork, fittings and components
- the procedures used to form ductwork, fittings and components
- safe work practices pertaining to forming ductwork, fittings and components
- metallurgic principles

B-6.03 Insulates ductwork, fittings and components
- the procedures used to insulate ductwork, fittings and components
- safe work practices and procedures pertaining to insulating ductwork, fittings and components
- metals and their properties, characteristics and applications
- standards pertaining to insulating ductwork, fittings and components

B-8.01 Cuts material for specialty products
- specialty products and their applications
- industry standards pertaining to specialty products
- the procedures used to cut material for specialty products
- safe work practices and procedures pertaining to cutting material for specialty products
- calculations required to measure material for cutting
- materials and their properties, characteristics and applications
- metallurgic principles

B-8.02 Forms specialty products
- the procedures used to form specialty products
- safe work practices and procedures pertaining to forming specialty products
- drawing interpretation
- considerations pertaining to forming specialty products

B-8.03 Assembles specialty products
- the procedures used to assemble specialty products
- safe work practices and procedures pertaining to the assembly of specialty products
- considerations pertaining to the assembly of specialty products

B-8.04 Finishes specialty products
- the procedures used to finish specialty products
- the procedures used to interpret and extract information from drawings
- safe work practices and procedures pertaining to finishing specialty products
- inspection procedures
- considerations pertaining to finishing specialty products

D-Installs roofing and specialty products

D-17.01 Installs stainless steel specialty products
- stainless steel specialty products and their applications
- of safe work practices and procedures pertaining to installing stainless steel specialty products
- regulatory requirements pertaining to stainless steel specialty products
- drawing interpretation
- metals and their properties, characteristics and applications
- metallurgic principles

D-17.02 Installs non-stainless steel specialty products
- non-stainless steel specialty products and their applications
- safe work practices and procedures pertaining to installing non-stainless steel specialty products
- regulatory requirements pertaining to non-stainless steel specialty products
- drawing interpretation

D-17.03 Installs marine products (Not Common Core)
- marine products and their applications
- safe work practices and procedures pertaining to installing marine products
- regulatory requirements pertaining to marine products
- drawing interpretation

Scheduled Maintenance and Repair **14 hours**

- performs maintenance inspections
- service components service
- diagnoses system faults
- repairs worn or faulty system components
- use testing and inspection tools and equipment

RSOS topics covered in this section of training:

No Specific Task in RSOS

Trade Mathematics (exceeds) **14 hours**

- basic mathematics and algebra
- performing calculations involving trade applications
- application of basic trigonometry to solve trade problems

RSOS topics covered in this section of training:

No Specific Task in RSOS

The Level Three topics from the RSOS that are taught in context are:

A-1 Safety Related Functions
A-4 Uses Communication and mentoring techniques
A-3 Organizes work
C-9 Prepares Installation Site
C-10 Installs and connects chimneys, breeching and venting to exhaust appliances and mechanical equipment

For details regarding the In Context Topics, see page 35

Level Four — 8 weeks — 240 hours

Bench and Shop Work Theory — 8 hours

- discuss shop safety
- calculate bend allowance using empirical formula
- discuss the operational characteristics of powered fabrication equipment

Bench and Shop Work Practical — 80 hours

- fabricate complex fittings using the triangulation method
- fabricate complex fittings using the parallel line method
- fabricate complex fittings using the radial line method
- use a combination of drafting methods to fabricate various fittings
- calculate bend allowance using the empirical method and form the part
- fabricate dampers and louvers
- install insulation, lagging, cladding, and flashing
- install material handling components and equipment
- install air handling components and equipment

RSOS topics covered in this section of training:

B-6 Air/Material handling components (fabricates)

B-6.02 Forms ductwork, fittings and flexible connectors

- procedures used to form ductwork, fittings and components
- safe work practices pertaining to forming ductwork, fittings and components
- metallurgic principles

B-6.04 Assembles ductwork, fittings and flexible connectors

- procedures used to assemble ductwork, fittings
- welding equipment, its application, maintenance and procedure for use
- safe work practices and procedures pertaining to the assembly of ductwork, fittings and components
- industry standards pertaining to the assembly of ductwork, fittings and components

B-6.05 Fabricates dampers

- the procedures used to fabricate dampers
- safe work practices and procedures pertaining to the fabrication of dampers
- calculations related to dampers

C-11 Air Handling System Components (installs)

C-11.01 Installs air handling equipment

- installation procedures for air handling equipment and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing air handling equipment
- basic concepts of electricity

C-11.08 Installs system component accessories

- installation procedures for system component accessories, and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing system component accessories

C-12 Installs pneumatic and gravity material handling system components

C-12.01 Installs pneumatic and gravity material handling system components

- installation procedures for pneumatic and gravity material handling system components, and the associated tools and equipment
- drawings and job specifications
- drawings and job specifications regulatory requirements pertaining to pneumatic and gravity material handling system components

- regulatory requirements pertaining to pneumatic and gravity material handling system components

C-12.02 Installs mechanized material handling system components

- installation procedures for mechanized material handling system components, and the associated tools and equipment
- drawings and specifications
- safe work practices and procedures related to installing mechanized material handling system components
- regulatory requirements pertaining to mechanized material handling system components

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Communication — 8 hours

- application of job-related interpersonal and oral communications
- principles of customer service
- preparation of workplace documents

RSOS topics covered in this section of training:

A-4 Uses communication and mentoring techniques

A-4.02 Uses mentoring techniques

- trade terminology
- effective communication practices

Pattern Drafting Theory — 8 hours

- performing calculations related to change ogee offsets
- performing calculations related to drop cheek elbows
- calculation of the cut size of round elbows
- calculation of panel lengths for a rectangular transition from a single view
- draft complex fittings using the triangulation method
- draft complex fittings using the parallel line method
- draft complex fittings using the radial line method
- use a combination of drafting methods to draw various fittings

Pattern Drafting Practical — 30 hours

- draft complex fittings using the triangulation method
- draft complex fittings using the parallel line method
- draft complex fittings using the radial line method
- use a combination of layout methods to fabricate various fittings
- uses computer technology for pattern development

RSOS topics covered in this section of training:

B-5 Uses computer technology for pattern development

B-5.05 Uses computer technology for pattern development

- computer technology used for pattern development and layout drawing interpretation
- basic pattern development and layout

Print Reading — 18 hours

- describe the importance of prints and specifications in the construction industry
- interpret information found in prints and specifications
- produce a shop print for a given blow pipe system
- perform a take-off from a shop print

RSOS topics covered in this section of training:

B-5 Uses computer technology for pattern development
B-5.05 Uses computer technology for pattern development
- computer technology used for pattern development and layout drawing interpretation
- basic pattern development and layout

Trade Theory — 56 hours

- analyzing industrial sheet metal
- comparison of industrial material handling systems
- blowpipe systems
- industrial specialties related to sheet metal work
- duct leakage testing
- testing, adjusting and balancing work
- commissioning a building
- examination of indoor air quality
- comparison of filtration and air cleaning equipment
- special ventilation needs
- commercial refrigeration systems
- how automatic controls function in HVAC systems
- fabrication and installation procedures related to boiler breeching
- planning and running jobs
- application of job-related interpersonal and oral communications
- principles of customer service
- preparation of workplace documents
- basic mathematics and algebra
- performing calculations involving trade applications
- application of basic trigonometry to solve trade problems

RSOS topics covered in this section of training:

C-11 Air Handling System Components (installs)
C-11.01 Installs air handling equipment
- installation procedures for air handling equipment and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing air handling equipment
- basic concepts of electricity

C-11.08 Installs system component accessories
- installation procedures for system component accessories, and the associated tools and equipment
- drawing interpretation
- safe work practices and procedures related to installing system component accessories

C-12 Installs pneumatic and gravity material handling system components
C-12.01 Installs pneumatic and gravity material handling system components
- installation procedures for pneumatic and gravity material handling system components, and the associated tools and equipment
- drawings and job specifications
- drawings and job specifications regulatory requirements pertaining to pneumatic and gravity material handling system components
- regulatory requirements pertaining to pneumatic and gravity material handling system components

C-12.02 Installs mechanized material handling system components
- installation procedures for mechanized material handling system components, and the associated tools and equipment

- drawings and specifications
- safe work practices and procedures related to installing mechanized material handling system components
- regulatory requirements pertaining to mechanized material handling system components

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Scheduled Maintenance and Repair **18 hours**

- review the operation of a standing pilot appliance
- identify electrical components used in modern appliances
- describe the sequence of operation for various appliances
- perform leak tests of a duct system
- perform testing adjusting and balancing of a duct system
- perform commissioning of air and material handling systems
- measure voltage, current, and resistance to confirm the operation of electrical controls found in an appliance

RSOS topics covered in this section of training:

- No Specific Task in RSOS

Mathematics **14 hours**

- basic mathematics and algebra
- performing calculations involving trade applications
- application of basic trigonometry to solve trade problems

RSOS topics covered in this section of training:

- No Specific Task in RSOS

The Level Four topics from the RSOS that are taught in context are:

A-1 Performs Safety Related Functions
A-2 Uses and maintains tools and equipment
A-3 Organizes Work
B-8 Fabricates specialty products
C-9 Installation Site (prepares)
C-10 Chimney, Breeching, Venting (installs, connects)
D-Installs roofing and specialty products

For details regarding the In Context Topics, see page 35

In Context Topics

In context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in context topics are accomplished in other topics in that level.

The Level Four topics from the RSOS that are taught in context are:

A-1 Performs Safety Related Functions

A-1.01 Uses personal protective equipment (PPE) and safety equipment
- PPE and safety equipment, their applications, maintenance, storage and procedures for use
- regulatory requirements pertaining to PPE and safety equipment

A-1.02 Maintains safe work environment
- safe work practices and procedures
- regulatory requirements pertaining to safety
- inspection procedures

A-1.03 Performs lock-out and tag-out procedures
- regulations, applications and procedures for locking out and tagging out

A-2 Uses and maintains tools and equipment

A-2.01 Uses hand and portable power tools
- hand and portable power tools, their applications, maintenance and procedures for use

A-2.02 Uses shop tools and equipment
- shop tools and equipment, their applications, maintenance and procedures for use
- inspection procedures and criteria

A-2.03 Uses gas metal arc welding (GMAW) equipment
- GMAW equipment, its applications, maintenance and procedures for use
- safe work practices and procedures pertaining to the use of GMAW equipment

A-2.04 Uses resistance spot welding equipment
- resistance spot welding equipment, consumables, accessories and procedures for use
- procedures used to weld using resistance spot welding equipment
- safe work practices and procedures pertaining to the use of resistance spot welding equipment

A-2.07 Uses oxy-fuel and plasma arc cutting equipment
- oxy-fuel and plasma arc cutting equipment and accessories
- oxy-fuel and plasma arc cutting procedure
- safety practices and procedures related to oxy- fuel and plasma arc cutting

A-2.08 Uses soldering and brazing equipment
- soldering and brazing equipment, its maintenance soldering and brazing equipment and supplies
- safe work practices and procedures pertaining to the use of soldering and brazing equipment

A-2.09 Uses measuring and layout equipment
- measuring and layout equipment, their applications, maintenance and procedures for use

A-2.11 Uses stationary and mobile work platforms
- stationary and mobile work platforms, their applications, limitations and procedures for use
- safe work practices and procedures pertaining to stationary and mobile work platforms
- regulatory requirements pertaining to stationary and mobile work platforms

A-2.12 Uses hoisting, rigging and positioning equipment
- hoisting, rigging and positioning equipment, their applications, limitations and procedures for use
- basic hoisting, rigging and positioning techniques
- safe work practices and procedures pertaining to hoisting, rigging and positioning
- regulatory requirements pertaining to hoisting, rigging and positioning
- inspection, maintenance and storage procedures for hoisting, rigging and positioning equipment4.01 Uses communication techniques

A-3 Organizes Work

A-3.01 Organizes project tasks and procedures

- trade-related documentation and their application
- procedures used to prepare trade-related documentation
- procedures used to produce material take-off lists
- procedures used to prepare safety-related documentation

A-3.02 Organizes materials and equipment for project

- type, properties and handling requirements of materials and equipment
- safe handling practices for materials and equipment
- procedures used to plan and organize jobs3.03 Organizes materials and equipment for project

A-3.03 Organizes materials and equipment for project

- prepares work site
- performs job hazard assessment
- determines location and layout of equipment and systems

B-8 Fabricates specialty products

B-8.01Cuts material for specialty products

- specialty products and their applications
- industry standards pertaining to specialty products
- the procedures used to cut material for specialty products
- safe work practices and procedures pertaining to cutting material for specialty products
- calculations required to measure material for cutting
- materials and their properties, characteristics and applications

B-8.02 Forms specialty products

- the procedures used to form specialty products
- safe work practices and procedures pertaining to forming specialty products
- drawing interpretation
- considerations pertaining to forming specialty products

B-8.03 Assembles specialty products

- the procedures used to assemble specialty products
- safe work practices and procedures pertaining to the assembly of specialty products
- considerations pertaining to the assembly of specialty products

B-8.04 Finishes specialty products

- the procedures used to finish specialty products
- the procedures used to interpret and extract information from drawings
- safe work practices and procedures pertaining to finishing specialty products
- inspection procedures
- considerations pertaining to finishing specialty products

C-9 Installation Site (prepares)

C-9.01 Performs on-site measurements

- procedure to perform on-site measurements and the associated tools and equipment
- calculations required to measure a work area
- drawing interpretation of trade standards and specifications pertaining to installation of hangers, braces and brackets

C-9.02 Performs demolitions for renovations

- dismantling materials and equipment and the associated tools and equipment
- safe work practices and procedures related to the dismantling and removal of materials and equipment
- regulations and specifications pertaining to the disposal of waste materials

C-9.03 Installs penetrations and sleeves

- procedures used to cut penetrations and their associated tools and equipment
- procedures used to install sleeves

C-9.04 Installs supports and bases

- procedures used to install supports and bases and associated tools and equipment

- drawing interpretation
- trade standards and regulations pertaining to supports and bases

C-9.05 Installs hangers, cables, braces and brackets
- used to install materials and associated tools and equipment
- drawing interpretation
- trade standards and specifications pertaining to hangers, cables, braces and brackets

C-10 Chimney, Breeching, Venting (installs, connects)

C-10.01 Installs chimney
- of installation procedures for chimneys and the associated tools and equipment
- drawing interpretation safe work practices and procedures related to the installation of chimneys
- regulatory requirements pertaining to the installation of chimneys

C-10.02 Installs and connects chimneys, breeching and venting to exhaust appliances and mechanical equipment
- installation procedures for connecting appliances and mechanical equipment to chimneys and breeching and the associated tools and equipment
- drawing interpretation
- regulatory requirements pertaining to connecting appliances and mechanical equipment to chimneys and breeching
- safe work practices and procedures related to connecting appliances and mechanical equipment to breeching
- safe work practices and procedures related to connecting appliance and mechanical equipment to chimneys and breeching

C-10.03 Installs high efficiency appliances and mechanical equipment
- installation procedures for high efficiency appliances and mechanical equipment and the associated tools and equipment
- drawing interpretation
- regulatory requirements pertaining to installing high efficiency appliances and mechanical equipment
- safe work practices and procedures related to connecting appliances and mechanical equipment to breeching
- Specialty products (installs)

D-Installs roofing and specialty products

D-17.01 Installs stainless steel specialty products
- stainless steel specialty products and their applications
- of safe work practices and procedures pertaining to installing stainless steel specialty products
- regulatory requirements pertaining to stainless steel specialty products
- drawing interpretation
- metals and their properties, characteristics and applications
- metallurgic principles

D-17.02 Installs non-stainless steel specialty products
- non-stainless steel specialty products and their applications
- safe work practices and procedures pertaining to installing non-stainless steel specialty products
- regulatory requirements pertaining to non-stainless steel specialty products
- drawing interpretation

D-17.03 Installs marine products (Not Common Core)
- marine products and their applications
- safe work practices and procedures pertaining to installing marine products
- regulatory requirements pertaining to marine products
- drawing interpretation

APPENDIX A: POST HARMONIZATION TRAINING PROFILE CHART

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

Implementation for harmonization will take place progressively. Level one to be implemented in 2018/2019, level two 2019/2020, level three 2021/2022, and level four in 2022/2023.

SATCC Level One	Transcript Code	Hours	Pan-Canadian Harmonized Level One
Trade Theory	SHME 100	59	Safety Related Drawings
			Organizes Work
			Communication
Pattern Drafting	DRFT 100 – Theory	10	Pattern Development
	DRFT 101 – Practical	47	
Welding and Cutting	WELD 139	12	Tools and Equipment
Bench and Shop Work Theory	BESK 102 – Theory	14	Air/Material Handling Components (fabricates)
	BESK 103 – Practical	80	Air/Material Handling Components (installs)
Mathematics	MATH 198	18	*Exceed
		240	

SATCC Level Two	Transcript Code	Hours	Pan-Canadian Harmonized Level Two
In context learning			Safety Related Functions (In-Context)
			Communications (In-Context)
Print Reading	PRNT 204	14	Organizes Work
Trade Theory	SHME 200	40	Chimney Breeching Venting (installs, Connects)
			Exterior Components (installs)
			Air Handling System components (installs)
			Installation Site (prepares)
Pattern Drafting	DRFT 203 – Theory	8	Pattern Development
	DRFT 204 – Practical	44	
Welding	WELD 208	8	Tools and Equipment
Bench and Shop Work	BESK 200 – Theory	8	Air/Material Handling Components (fabricates)
	BESK 201 – Practical	80	Flashing, Roofing, Sheeting and Cladding (fabricates) Metal Roofing and Cladding Systems
Scheduled Maintenance and Repair	MAIN 204	24	Scheduled Maintenance and Repair
Mathematics	MATH 293	14	**Exceed*
		240	

SATCC Level Three	Transcript Code	Hours	Pan-Canadian Harmonized Level Three
In-context learning			Safety Related Functions (In-Context)
			Installation Site (prepares) (In-Context)
			Organizes Work (In-Context)
			Communications (In-Context)
			Chimney Breeching Venting (installs, Connects) (In-Context)
Welding	WELD 303	12	Tools and Equipment
Pattern Drafting	DRFT 300 – Theory	8	Pattern Development
	DRFT 301– Practical	40	
Print Reading	PRNT 303	18	
Trade Theory	SHME 381	56	Specialty Products (installs)
Bench and Shop Work	BESK 300 – Theory	10	Air/Material Handling Components (fabricates)
	BESK 301 – Practical	68	Specialty Products (fabricates)
			Air Handling System Components (installs)
Scheduled Maintenance & Repair	MAIN 300	14	Scheduled Maintenance
			Repair
Mathematics	MATH 381	14	**Exceed*
		240	

SATCC Level Four	Transcript Code	Hours	Pan-Canadian Harmonized Level Four
In-context learning			Safety Related Functions (In-Context)
			Installation Site (prepares) (In-Context)
			Organizes Work (In-Context)
			Communication (In-Context)
			Specialty Products (fabricates) (In-Context)
			Specialty Products (installs) (In-Context)
			Chimney Breeching Venting (installs, Connects) (In-Context)
			Tools and Equipment (In-Context)
Scheduled Maintenance & Repair	MAIN 400	18	Scheduled Maintenance
			Repair
Communication	COMM 480	8	Mentoring
Pattern Drafting	DRFT 400 – Theory	8	Pattern Development
	DRFT 401 – Practical	30	
Print Reading	PRNT 401	18	
Trade Theory	SMHE 481 – Theory	56	Exterior Components (installs)
			Air Handling System Components (installs)
Bench and Shop Work	BESK 400 – Theory	8	Air/Material Handling Components (fabricates)
			Air/Material Handling Components (installs)
	BESK 401 – Practical	80	Material Handling System Components (installs)
			Thermal Insulation, Lagging, Cladding and Flashing
			Leak Testing, Air Balancing, Commissioning
Mathematics	MATH 481	14	**Exceed*
		240	

**Exceed Topics*

Throughout this guide to course content there are topics which exceed the minimum scope of work as set out in the Sheet Metal Worker RSOS. Industry in Saskatchewan has deemed certain topics to fall within the scope of work of the Sheet Metal Worker Trade in Saskatchewan and therefore require technical training to cover these topics.