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EXCELLENCE
RED SEAL · SCEAU ROUGE

National Occupational Analysis

Sheet Metal Worker

2015

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Sheet Metal Worker

2015

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FOREWORD

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this National Occupational Analysis as the national standard for the occupation of Sheet Metal Worker.

Background

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to cooperate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. Employment and Social Development Canada (ESDC) sponsors a program, under the guidance of the CCDA, to develop a series of NOAs.

The NOAs have the following objectives:

- to describe and group the tasks performed by skilled workers;
- to identify which tasks are performed in every province and territory;
- to develop instruments for use in the preparation of Interprovincial Red Seal Examinations and curricula for training leading to the certification of skilled workers;
- to facilitate the mobility of apprentices and skilled workers in Canada; and,
- to supply employers, employees, associations, industries, training institutions and governments with analyses of occupations.

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This analysis was prepared by the Labour Market Integration Directorate of ESDC. The coordinating, facilitating and processing of this analysis were undertaken by employees of the NOA development team of the Trades and Apprenticeship Division. The host jurisdiction of Ontario also participated in the development of this NOA.

Comments or questions about National Occupational Analyses may be forwarded to:

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STRUCTURE OF ANALYSIS

To facilitate understanding of the occupation, the work performed by tradespersons is divided into the following categories:

Blocks	the largest division within the analysis that is comprised of a distinct set of trade activities
Tasks	distinct actions that describe the activities within a block
Sub-Tasks	distinct actions that describe the activities within a task
Key Competencies	activities that a person should be able to do in order to be called 'competent' in the trade

The analysis also provides the following information:

Trends	changes identified that impact or will impact the trade including work practices, technological advances, and new materials and equipment
Related Components	a list of products, items, materials and other elements relevant to the block
Tools and Equipment	categories of tools and equipment used to perform all tasks in the block; these tools and equipment are listed in Appendix A
Context	information to clarify the intent and meaning of tasks
Required Knowledge	the elements of knowledge that an individual must acquire to adequately perform a task

The appendices located at the end of the analysis are described as follows:

Appendix A — Tools and Equipment	a non-exhaustive list of tools and equipment used in this trade
Appendix B — Glossary	definitions or explanations of selected technical terms used in the analysis
Appendix C — Acronyms	a list of acronyms used in the analysis with their full name
Appendix D — Block and Task Weighting	the block and task percentages submitted by each jurisdiction, and the national averages of these percentages; these national averages determine the number of questions for each block and task in the Interprovincial exam
Appendix E — Pie Chart	a graph which depicts the national percentages of exam questions assigned to blocks
Appendix F — Task Profile Chart	a chart which outlines graphically the blocks, tasks and sub-tasks of this analysis

DEVELOPMENT AND VALIDATION OF ANALYSIS

Development of Analysis

A draft analysis is developed by a committee of industry experts in the field led by a team of facilitators from Human Resources and Skills Development Canada. This draft analysis breaks down all the tasks performed in the occupation and describes the knowledge and abilities required for a tradesperson to demonstrate competence in the trade.

Draft Review

The National Occupational Analysis (NOA) development team then forwards a copy of the analysis and its translation to provincial and territorial authorities for a review of its content and structure. Their recommendations are assessed and incorporated into the analysis.

Validation and Weighting

The analysis is sent to all provinces and territories for validation and weighting. Participating jurisdictions consult with industry to validate and weight the document, examining the blocks, tasks and sub-tasks of the analysis as follows:

BLOCKS	Each jurisdiction assigns a percentage of questions to each block for an examination that would cover the entire trade.
TASKS	Each jurisdiction assigns a percentage of exam questions to each task within a block.
SUB-TASKS	Each jurisdiction indicates, with a YES or NO, whether or not each sub-task is performed by skilled workers within the occupation in its jurisdiction.

The results of this exercise are submitted to the NOA development team who then analyzes the data and incorporates it into the document. The NOA provides the individual jurisdictional validation results as well as the national averages of all responses. The national averages for block and task weighting guide the Interprovincial Red Seal Examination plan for the trade.

This method for the validation of the NOA also identifies common core sub-tasks across Canada for the occupation. If at least 70% of the responding jurisdictions perform a sub-task, it shall be considered common core. Interprovincial Red Seal Examinations are based on the common core sub-tasks identified through this validation process.

Definitions for Validation and Weighting

YES	sub-task performed by qualified workers in the occupation in a specific jurisdiction
NO	sub-task not performed by qualified workers in the occupation in a specific jurisdiction
NV	analysis Not Validated by a province/territory
ND	trade Not Designated in a province/territory
NOT COMMON CORE (NCC)	sub-task, task or block performed by less than 70% of responding jurisdictions; these will not be tested by the Interprovincial Red Seal Examination for the trade
NATIONAL AVERAGE %	average percentage of questions assigned to each block and task in Interprovincial Red Seal Examination for the trade

Provincial/Territorial Abbreviations

NL	Newfoundland and Labrador
NS	Nova Scotia
PE	Prince Edward Island
NB	New Brunswick
QC	Quebec
ON	Ontario
MB	Manitoba
SK	Saskatchewan
AB	Alberta
BC	British Columbia
NT	Northwest Territories
YT	Yukon Territory
NU	Nunavut

ANALYSIS

SAFETY

Safe working procedures and conditions, accident prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and work environments can be created by controlling the variables and behaviours that may contribute to accidents or injury.

It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe and accident-free work environment.

It is imperative to apply and be familiar with the Occupational Health and Safety (OH&S) Acts and Workplace Hazardous Materials Information System (WHMIS) regulations. As well, it is essential to determine workplace hazards and take measures to protect oneself, co-workers, the public and the environment.

Safety education is an integral part of training in all jurisdictions. As safety is an imperative part of all trades, it is assumed and therefore it is not included as a qualifier of any activities. However, the technical safety tasks and sub-tasks specific to the trade are included in this analysis.

SCOPE OF THE SHEET METAL WORKER TRADE

"Sheet metal worker" is this trade's official Red Seal occupational title approved by the CCDA. This analysis covers tasks performed by sheet metal workers whose occupational title has been identified by provinces and territories of Canada under the following names:

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
Sheet Metal Worker	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Tinsmith					✓								

Sheet metal workers design, fabricate, assemble, install and repair sheet metal products. Design work covers primarily residential HVAC systems, as commercial and industrial systems are normally engineered by others. In fabrication work, sheet metal workers lay out and measure pieces to specifications. They use tools such as power shears, press brakes, drill presses and computerized cutting 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, aluminium, copper, brass, nickel, tin plate and other alloys. Some may also work with fibreglass, ceramics, plastics and other metal substitutes.

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, shop manufacture, or servicing and maintenance of installed equipment and systems. Those who work in installation may specialize in heating, ventilation and air conditioning (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, and air conditioning and heating 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.

There may be overlaps with other trades such as ironworkers, boilermakers, refrigeration and air conditioning mechanics, insulators, gasfitters, oil burner mechanics, roofers, carpenters and welders. Experienced sheet metal workers may become specialists in design and layout, estimators, supervisors or business owners.

OCCUPATIONAL OBSERVATIONS

Much of the equipment used by sheet metal workers has remained the same. However, some have become computer-controlled and motorized to minimize human error and improve efficiency.

Workplaces have become safer because of an increase in training and legislated safety practices and procedures. There is a greater awareness of the importance of job safety. For example, practices such as safety committees and weekly safety meetings are well-established.

Clients are more inclined to promote the use of environmentally friendly products and processes in their buildings. Environmental considerations are modifying building methods to reduce energy use and taking advantage of alternate energy sources. For instance, "green roofs" are becoming more common. Plastic and new alloys are being used for venting and will continue to become more prevalent with the continued effort to increase fuel efficiency in all gas burning appliances. Leadership in Energy and Environmental Design (LEED) projects are becoming more prevalent in this trade which have led to the use of different products such as solar panels/walls and reflective surfaces, and different building processes. For instance, these standards impact the removal and recycling of construction materials, collection and control of dust and limiting of solvents and other chemicals. Also, environmental upgrading and maintenance on existing systems is a developing trend in the trade.

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.

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

The application of these skills may be described throughout this document within the competency statements which support each subtask of the trade. 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.

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, 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. They may explain the fabrication, construction, installation and repair procedures to customers as well.

Numeracy
Numeracy skills are very 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, air flows, capacities and air pressures. 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 Skills
Sheet metal workers solve problems in situations where work may be delayed due to equipment breakdowns and shortages in materials. They may suggest modifications to project designs to correct flaws. They need the ability to think spatially and visualize in three dimensions.

Working with Others
Sheet metal workers coordinate job tasks and share tools, workspace and equipment with small 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) software in their work. They may also use computers to perform word processing and electronic communication devices to communicate with others or perform Internet research to stay current about industry-related topics. 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 tools and to access electronic data.

Continuous Learning
Sheet metal workers are required to stay current with new product developments, codes and standards including safety, as well as changes in installation and production processes.

Trends

Computers are being used more for organizing work and communications. There is a greater variety of cordless power tools which have the capability of replacing tools with cords without the hazards and inconveniences. There is more electronic documentation which is less expensive and faster than paper-based documentation. There is a greater awareness of, and regard for, health and safety and improved personal protective equipment (PPE).

Related Components

All components apply.

Tools and Equipment

See Appendix A.

Task 1 Performs safety-related functions.

Context

Sheet metal workers are responsible for ensuring the safety of themselves and others in the work environment. They must follow company and jurisdictional regulations.

It is critical that sheet metal workers be constantly aware of their surroundings and the hazards they may encounter.

Required Knowledge

K 1	health and safety acts and codes
K 2	government regulations such as Transportation of Dangerous Goods (TDG) regulations, WHMIS and OH&S
K 3	construction codes and regulations
K 4	company safety policies and procedures
K 5	good housekeeping practices
K 6	types of PPE and safety equipment and their operation
K 7	training requirements for PPE and safety equipment
K 8	location of PPE and safety equipment
K 9	types of stationary and mobile platforms such as scaffolds, hydraulic lifts and manlifts

K 10	training requirements for mobile work platforms such as hydraulic lifts and manlifts
K 11	types, operations and limitations of hoisting and rigging equipment such as cranes, material lifts and chain blocks
K 12	rigging equipment components such as shackles, slings and chokers
K 13	hand signals for hoisting
K 14	applications of hoisting and rigging equipment
K 15	training requirements for hoisting and rigging equipment

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Sub-task

A-1.01 Maintains safe work environment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-1.01.01	perform preliminary site inspection to identify potential hazards
A-1.01.02	report and correct hazards
A-1.01.03	install temporary safety protection such as barriers to cover hazardous openings, guard rails and signage
A-1.01.04	hold daily or weekly toolbox meetings
A-1.01.05	perform work area housekeeping by sweeping, removing debris and storing materials, tools and equipment
A-1.01.06	follow safety practices for using tools and equipment according to manufacturers' specifications
A-1.01.07	store unnecessary tools and equipment away from immediate work space

Sub-task

A-1.02 Uses personal protective equipment (PPE) and safety equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-1.02.01	identify site hazards and regulations requiring the use of PPE and safety equipment
A-1.02.02	select PPE and safety equipment appropriate for individual tasks and situations
A-1.02.03	maintain and store PPE and safety equipment
A-1.02.04	apply local, provincial and national safety regulations such as WHMIS and OH&S
A-1.02.05	identify PPE damage such as excessively worn boots, worn harnesses and cracked safety glasses
A-1.02.06	recognize Canadian Standards Association (CSA)-approved PPE and applicable safety equipment such as fire extinguishers, welding screens and barricades
A-1.02.07	ensure proper fit of PPE such as respirators, fall arrest harnesses and welding face shields
A-1.02.08	report and replace damaged, expired or faulty PPE and safety equipment

Sub-task

A-1.03 Performs lock-out/tag-out procedures.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-1.03.01	coordinate lock-out and tag-out requirements with appropriate authorities and other trades
A-1.03.02	identify circuit for lock-out and tag-out, and recognize other equipment that may present a hazard
A-1.03.03	select approved device to ensure proper lock-out and tag-out
A-1.03.04	isolate hazardous energies such as electricity, steam and fuel sources, and de-energize and lock-out equipment

A-1.03.05	test system for zero potential using voltage-rated equipment
A-1.03.06	verify proper lock-out and tag-out

Sub-task

A-1.04 Uses stationary and mobile work platforms.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-1.04.01	select stationary and mobile work platforms for the job taking into consideration size, site conditions and task being performed
A-1.04.02	inspect stationary and mobile work platforms for damage and missing components, and tag and remove from service if required
A-1.04.03	identify hazards such as power lines and excess loads when erecting stationary and mobile work platforms
A-1.04.04	secure ladders and work platforms
A-1.04.05	erect, level and dismantle scaffolding according to jurisdictional regulations
A-1.04.06	use equipment within operating limitations as indicated on manufacturers' tags and in compliance with OH&S regulations
A-1.04.07	document safe work procedures and maintenance according to jurisdictional regulations

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Sub-task

A-1.05 Uses hoisting and rigging equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-1.05.01	inspect hoisting and rigging equipment before and after use
A-1.05.02	select rigging equipment such as shackles, tag lines, spreader bars and chain blocks according to task, and load size and capacities
A-1.05.03	recognize worn, damaged or defective hoisting and rigging equipment, and remove from service
A-1.05.04	lubricate hoisting equipment such as chain blocks and pulleys
A-1.05.05	locate centre of gravity of load

A-1.05.06	secure load to rigging using techniques such as choking, and using shackles and lifting lugs
A-1.05.07	communicate with personnel involved in lift using methods such as hand signals and two-way radios
A-1.05.08	store hoisting and rigging equipment in secure, clean and dry environment
A-1.05.09	restrict access to lift area to prevent injury and damage using items such as signs, barricades and danger/caution tape

Task 2 Uses and maintains tools and equipment.

Context This task describes the maintenance of tools and equipment that are used throughout this NOA to perform tasks of the sheet metal worker trade. It also describes the use of tools and equipment used for welding, cutting, soldering and brazing activities.

Required Knowledge

K 1	types, operations and limitations of hand and portable power tools
K 2	types, operations and limitations of shop tools and equipment
K 3	types, operations and limitations of welding, cutting, soldering and brazing equipment
K 4	types of testing and inspection devices
K 5	types, operations and limitations of measuring and layout equipment
K 6	materials to be welded such as black iron, stainless steel, aluminium and other alloys
K 7	welding consumable materials such as filler rods, electrodes and inert gas
K 8	welding principles, considerations and manufacturers' operating instructions
K 9	licensing and training requirements for welding and cutting
K 10	ventilation requirements for welding and cutting
K 11	materials to be soldered or brazed such as copper, brass, galvanized and stainless steel
K 12	soldering/brazing gases such as propane, oxygen and natural gas
K 13	manufacturers' operating instructions for soldering/brazing equipment
K 14	alloys and fluxes
K 15	hot work procedures and required PPE

Sub-task

A-2.01 Maintains hand and portable power tools.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-2.01.01	organize and store hand and portable power tools in a clean and dry environment to avoid damage
A-2.01.02	clean and lubricate hand and portable power tools such as wrenches, snips, and unishears to prevent corrosion and to promote ease of operation and longevity
A-2.01.03	recognize worn, damaged and defective hand and portable power tools, and tag and remove from service if necessary
A-2.01.04	recognize hazards of using portable power tools
A-2.01.05	charge batteries according to manufacturers' specifications to avoid damage to battery

Sub-task

A-2.02 Maintains shop tools and equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-2.02.01	clean and lubricate shop tools and equipment such as brakes, lock formers and roll formers to prevent corrosion and to grease drive mechanisms for ease of operation and longevity
A-2.02.02	recognize worn, damaged and defective shop tools and equipment, and tag and lock out power supply until repair is complete
A-2.02.03	recognize hazards of use of shop tools and equipment by interpreting warning and caution labels as well as manufacturers' specifications
A-2.02.04	recognize shop tool and equipment capacities, limitations and operational parameters according to manufacturers' specifications

Sub-task

A-2.03 Uses welding, cutting, soldering and brazing equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-2.03.01	recognize worn, damaged and defective welding, cutting, soldering and brazing equipment, and tag and remove from service if necessary
A-2.03.02	replace worn and defective consumable equipment such as tips, cups, nozzles and electrodes
A-2.03.03	set voltage and timing, and clean and reshape tips of spot welding equipment to ensure a good contact and performance
A-2.03.04	clean and re-tin soldering equipment
A-2.03.05	store welding, cutting, soldering and brazing equipment and supplies to avoid damage or injury
A-2.03.06	check and clean torch tips on brazing equipment
A-2.03.07	recognize hazards of use when welding, cutting, soldering and brazing
A-2.03.08	select and set up welding, cutting, soldering and brazing equipment according to job requirements
A-2.03.09	match and identify alloys to specific components to be welded
A-2.03.10	ensure work area is ventilated and PPE is used according to hot work procedures
A-2.03.11	select welding consumables according to specific components to be welded
A-2.03.12	protect surrounding equipment and flammable materials while welding and grinding
A-2.03.13	perform tack welding when assembling specific components to be welded
A-2.03.14	perform visual inspections and identify welding faults

Sub-task

A-2.04 Maintains measuring and layout equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-2.04.01	clean and lubricate measuring and layout equipment to avoid corrosion
A-2.04.02	store measuring and layout equipment to keep organized and avoid damage
A-2.04.03	sharpen layout equipment such as trammel points, scratch awls and dividers
A-2.04.04	verify accuracy of measuring devices such as squares and scribers

Sub-task

A-2.05 Maintains testing and inspection devices.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-2.05.01	store testing and inspection devices to keep organized and avoid damage
A-2.05.02	recognize defective testing and inspection devices, and tag and remove from service
A-2.05.03	follow manufacturers' recommendations for regular calibration of testing and inspection devices
A-2.05.04	check service records prior to use to ensure effective operation

Task 3 Organizes work.

Context In order to organize their work, sheet metal workers must be able to use documents and drawings, plan their project tasks, and obtain and organize required materials. A well-organized job reduces costs, minimizes mistakes and ensures a productive and safe workplace.

Required Knowledge

K 1	documentation such as specifications, codes, standards, manuals, work orders, packing slips, addenda, change orders and site instructions
K 2	safety documentation such as material safety data sheets (MSDS) and WHMIS symbols
K 3	site-specific documentation such as permits and signage
K 4	drawings such as plans, specifications, shop drawings and sketches
K 5	symbols on drawings
K 6	sequence of construction and fabrication operations
K 7	inventory requirements
K 8	basic design principles of systems such as HVAC, material handling and roofing, and their applications
K 9	fabrication and installation methods
K 10	system commissioning procedures
K 11	LEED requirements
K 12	properties of metals (metallurgy) and other materials

Sub-task

A-3.01 Uses trade-related documentation.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-3.01.01	fill out documents such as time cards, as-builts, work orders, change orders, invoices and requests for information (RFI)
A-3.01.02	complete accident/incident and safety inspection reports
A-3.01.03	record maintenance, repairs and recommendations for follow-up action
A-3.01.04	sketch and dimension components to be fabricated and assembled

A-3.01.05	complete material take-off lists (tear sheets) with information such as material and equipment to be used and number of components to be fabricated, based on specifications
A-3.01.06	review maintenance records and safety documentation
A-3.01.07	locate information in reference materials such as Sheet Metal Air Conditioning National Association (SMACNA), local and national construction codes
A-3.01.08	complete deficiency reports for quality control

Sub-task

A-3.02 Interprets drawings.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-3.02.01	locate information on drawings such as dimensions, legends, schedules and details
A-3.02.02	interpret sizing of actual dimensions based on scale readings
A-3.02.03	check drawings for dimensioning and conflicting information
A-3.02.04	visualize finished product by analyzing information on drawings
A-3.02.05	cross-reference information on drawings with specifications

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Sub-task

A-3.03 Organizes materials and equipment for project.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-3.03.01	label materials by transferring information from drawings to fittings to ensure correct fabrication, assembly, shipping and installation
A-3.03.02	maintain inventory of materials such as consumables, fasteners, sheets and sealants
A-3.03.03	estimate time and material requirements
A-3.03.04	manage job site materials according to construction schedule

Sub-task

A-3.04 Performs basic design and field modifications.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

A-3.04.01	perform preliminary site inspection to identify potential conflicts or design modifications
A-3.04.02	use site measurements to modify design for installation as required
A-3.04.03	design and/or modify sheet metal systems, materials and routing while maintaining industry codes and standards
A-3.04.04	identify design conflicts and suggest/implement field modifications
A-3.04.05	sketch modifications to accommodate changes in construction and installation requirements

Trends Computerized systems such as Computer-Aided Design (CAD) and Computer Numerical Controlled (CNC) software and equipment are becoming common place for determining specifications, material ordering, design and cutting. These systems are taking emphasis away from traditional fabrication and layout methods.

Related Components (including, but not limited to) Metal and specialty materials; screws, nuts, bolts, washers, pop rivets, solid rivets and other hardware such as hinges, quadrants and locks; consumable welding products; insulation; lagging; pins; strapping gaskets; caulking; adhesives; sealants and paint.

Tools and Equipment See Appendix A.

Task 4 Performs pattern development.

Context Pattern development is the starting point of fabrication and one of the most important steps. Sheet metal workers develop a pattern by hand or computer using one or more of the four methods of layout to build a finished product. They need to be able to identify which method to use.

Required Knowledge

K 1	mathematical formulas
K 2	orthographic and isometric diagrams
K 3	types of layout tools such as trammel points, dividers, squares, circumference rules, markers and scratch awls
K 4	triangulation method and its applications such as square-to-round, transitions and sweep offsets
K 5	radial line method and its applications such as cones and round reducers
K 6	parallel line method and its applications such as round elbows, tees and take-offs
K 7	simple layout and its applications such as square and round duct, countertops and pans
K 8	joints such as flanges, standing seams, slip and drive, and pre-engineered duct connectors

K 9	seams such as button lock, Pittsburgh lock and groove seams
K 10	seam and material thickness allowances
K 11	information to write on piece such as break lines, kink lines, bend up/down and pattern in/out
K 12	labelling practices for CAD and CNC including plasma tables
K 13	software used to assist in the design and development of patterns

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Sub-task

B-4.01 Develops patterns using triangulation method.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-4.01.01	visualize finished product in three dimensions
B-4.01.02	develop views required for fitting such as plan view and elevation view
B-4.01.03	find true lengths by using the two known points
B-4.01.04	lay out flat pattern and allow for transverse joint and longitudinal seam allowances according to specifications
B-4.01.05	connect points to finish pattern using layout tools
B-4.01.06	mark braking lines and braking diagrams on pattern for future forming

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Sub-task

B-4.02 Develops patterns using radial line method.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-4.02.01	visualize finished product in three dimensions
B-4.02.02	develop views required for fitting such as plan view and elevation view
B-4.02.03	find common apex using layout tools and mathematical formulas
B-4.02.04	calculate circumference stretch-out
B-4.02.05	divide stretch-out lengths into equal parts, spaced according to required accuracy, and corresponding to developed plan and elevation views

B-4.02.06	transfer points from plan and elevation views to pattern, and add allowances for seams and edges
B-4.02.07	connect points to finish pattern using layout tools
B-4.02.08	mark braking lines and braking diagrams on pattern for future forming

---

Sub-task

B-4.03 Develops patterns using parallel line method.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-4.03.01	visualize finished product in three dimensions
B-4.03.02	develop views required for fitting such as plan view and elevation view
B-4.03.03	divide plan and elevation into equal parts to achieve required accuracy
B-4.03.04	calculate stretch-out
B-4.03.05	divide stretch-out lengths into equal parts, spaced according to required accuracy, and corresponding to developed plan and elevation views
B-4.03.06	connect points to finish pattern and add allowances for seams and edges
B-4.03.07	mark braking lines and braking diagrams on pattern for future forming

---

Sub-task

B-4.04 Develops patterns using simple and straight line layout.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-4.04.01	visualize finished product in three dimensions
B-4.04.02	determine cut size of blank piece while allowing for seams and edges and to minimize waste
B-4.04.03	mark and notch material to identify seams and bend marks
B-4.04.04	mark braking lines and braking diagrams on pattern for future forming

Sub-task

B-4.05 Uses computer technology for pattern development.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-4.05.01	visualize finished product in three dimensions
B-4.05.02	select required product to be developed from computer database
B-4.05.03	input dimensions into computer based on type and size of finished product
B-4.05.04	select all joint and seam information from computer database based on finished product requirements
B-4.05.05	label blank pieces with forming information such as layout of pieces, braking lines and seam allowances

Task 5 Fabricates sheet metal components for air and material handling systems.

Context Fabrication of air and material handling systems is the process of producing finished ductwork or fittings from a flat pattern or sheet using various tools.

Required Knowledge

K 1	components such as ductwork, fittings, flexible connectors, hanger systems, supports and bases
K 2	properties of materials such as stainless steel, galvanized steel and aluminium
K 3	building standards such as LEED
K 4	thickness of materials such as insulation, gaskets and metal sheets
K 5	bend allowances and notching
K 6	joint and seam allowances
K 7	forming techniques such as bending and rolling
K 8	reinforcing techniques such as cross-braking, beading and stiffeners
K 9	types of insulation such as rigid or flexible
K 10	properties of insulation such as fibrous or non-fibrous, and acoustic or thermal

K 11	pin placement
K 12	fittings to assemble such as square-to-round, elbow and offset
K 13	assembly techniques such as welding, spot welding and the use of Pittsburgh locks
K 14	joints such as standing seams, slip and drives, and pre-engineered duct connectors
K 15	hardware and fasteners such as solid rivets, pop rivets, screws, rods, nuts and bolts
K 16	types of dampers such as opposed blade, parallel blade and butterfly
K 17	types and properties of flexible connectors
K 18	materials used for hanger systems such as brackets, saddles, channels, threaded rods, angle iron, flat bar and beam clamps
K 19	load bearing capacity and specifications
K 20	equipment supports and bases such as curbs and stands
K 21	types, size and weight of air and material handling units
K 22	epoxies and sealants

Sub-task

B-5.01 Cuts ductwork, fittings and flexible connectors.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-5.01.01	select and use tools such as snips, shears, grinders, hack saws, cut-off saws and marking tools
B-5.01.02	verify measurements for seam allowances and duct length
B-5.01.03	create cut list based on drawing to minimize waste
B-5.01.04	cut blanks according to cut list
B-5.01.05	scribe allowances for horizontal and longitudinal seams
B-5.01.06	notch pieces based on seam allowances and pattern
B-5.01.07	mark braking lines and braking diagrams on pieces for future forming

Sub-task

B-5.02 Forms ductwork, fittings and flexible connectors.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-5.02.01	examine braking diagrams to establish order of operations
B-5.02.02	cross brake pieces as required to strengthen piece and eliminate vibration and noise
B-5.02.03	select and use forming tools such as brakes, roll formers, rolls and stakes
B-5.02.04	form longitudinal seams according to braking diagram or scribes
B-5.02.05	form transverse seams according to braking diagram or scribes

Sub-task

B-5.03 Insulates ductwork and fittings.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-5.03.01	select insulation thicknesses, properties and types according to specifications
B-5.03.02	select fastening method such as adhesives and pins
B-5.03.03	select and use tools and equipment such as knives, tape measure, straight edge and pin spotter
B-5.03.04	measure and cut insulation according to type and thickness
B-5.03.05	seal cut edges of insulation according to specifications
B-5.03.06	apply insulation using selected fastening method
B-5.03.07	apply perforated metal according to specifications using methods such as spot welding and using mechanical fasteners

Sub-task

B-5.04 Assembles ductwork, fittings and flexible connectors.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-5.04.01	select and use tools and equipment such as hammers, setting tools and screwdrivers
B-5.04.02	use welding equipment for assembly if required
B-5.04.03	select and use fasteners such as pop rivets and spot welds
B-5.04.04	select and use epoxies and sealants
B-5.04.05	refer to labels and diagrams for order of assembly and orientation of pieces
B-5.04.06	align pieces and fasten according to locks and seams
B-5.04.07	install or form transverse joints as required
B-5.04.08	fasten overlapping sections of flexible connectors using methods such as stapling and gluing

Sub-task

B-5.05 Fabricates dampers.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-5.05.01	determine damper type required according to specifications
B-5.05.02	measure and size damper according to application
B-5.05.03	select and use tools and equipment such as drills, snips and screwdrivers
B-5.05.04	select hardware required for damper such as quadrant arms, linkages and ball joints according to specifications
B-5.05.05	cut and form damper blades and body
B-5.05.06	assemble blades, hardware and body according to damper type
B-5.05.07	verify damper operation to ensure correct orientation and blade movement

Sub-task

B-5.06 Fabricates hanger systems, supports and bases.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-5.06.01	determine size and weight of equipment and materials to be supported according to specifications
B-5.06.02	select materials and components based on isolation and seismic restraint requirements according to specifications
B-5.06.03	select hangers for height, size and run of air or material handling systems according to insulation requirements, specifications and industry standards
B-5.06.04	determine required number of hangers for specified length of air or material handling systems and spacing of hangers according to codes and specifications
B-5.06.05	select and use tools and equipment such as tape measures, welding equipment, drills, snips, abrasive cut-off saws and hack saws
B-5.06.06	determine location according to plans and specifications for required installation
B-5.06.07	perform layout for hanger systems, supports and bases
B-5.06.08	pre-drill holes for mounting hanger systems, supports and bases as required
B-5.06.09	assemble components of hanger systems, supports and bases according to specifications and plans

Task 6 Fabricates flashing, roofing, sheeting and cladding.

Context Flashing, roofing, sheeting and cladding are fabricated to provide protection and aesthetics to structures. Fabrication of flashing, roofing (and roofing drainage systems), sheeting and cladding is the process of producing finished products from a flat pattern or sheet using a variety of tools.

Required Knowledge

K 1	types of seams such as standing, batten and lap
K 2	joints such as S-joints, lap joints and standing joints

K 3	types of materials such as copper, galvanized steel , pre-finished material, composite materials and aluminium
K 4	expansion and contraction properties of materials
K 5	types of flashing, roofing, sheeting and cladding
K 6	bend allowances
K 7	sealing and joining methods such as caulking and soldering
K 8	drainage requirements
K 9	environmental impact from weather conditions such as rain, snow and ice
K 10	LEED standards and green roofing technologies

Sub-task

B-6.01 Cuts metal for flashing, roofing, sheeting and cladding.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-6.01.01	select and use tools and equipment such as tape measures, snips and shears
B-6.01.02	select seam type according to strength, aesthetics, type of material being used and specifications
B-6.01.03	calculate and measure material, taking into account factors such as expansion, contraction, seams and bend allowances
B-6.01.04	calculate size of area to be covered to determine material required and to minimize waste
B-6.01.05	shear material to gross blank size (stretch-out)
B-6.01.06	notch material according to selected seams
B-6.01.07	mark brake lines and diagrams

Sub-task

B-6.02 Forms flashing, roofing, sheeting and cladding.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-6.02.01	select and use tools and equipment such as brakes, rolls and stakes
B-6.02.02	plan and follow order of operations for forming material
B-6.02.03	mark braking lines and diagrams on pieces
B-6.02.04	bend or roll material according to brake lines and diagrams
B-6.02.05	select sealing and joining methods such as caulking and soldering

Task 7 Fabricates specialty products.

Context This is the process of producing finished specialty products from designs. Specialty products may include kitchen equipment, medical facility products, food processing equipment, pharmaceutical laboratory products, decorative accessories and plastic products.

Required Knowledge

K 1	types and thickness of materials such as stainless steel, copper, plastic, composite materials and aluminium
K 2	bend and seam allowances
K 3	types of finishes such as brushed, mirrored and dull
K 4	specialty products such as canopies, sinks and polyvinyl chloride (PVC) fittings
K 5	specialty product applications such as food preparation, corrosive environments and medical environments
K 6	pattern development and basic specialty product design
K 7	forming techniques such as bending, rolling and heat forming
K 8	assembly techniques such as welding, spot welding and gluing
K 9	fasteners such as solid rivets, pop rivets, bolts and screws
K 10	handling procedures of materials such as stainless steel, copper, plastic, composite materials and aluminum

Sub-task

B-7.01 Cuts material for specialty products.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-7.01.01	select materials and fabrication methods according to specifications
B-7.01.02	select and use tools and equipment for cutting specific material such as plastic, PVC-coated and stainless steel
B-7.01.03	calculate and measure material, taking into account factors such as expansion, contraction, seams and bend allowances
B-7.01.04	shear or saw material according to manufacturers' specifications
B-7.01.05	notch material according to selected seams
B-7.01.06	mark brake lines and diagrams

Sub-task

B-7.02 Forms specialty products.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-7.02.01	select and use tools and equipment for forming specific material such as plastic, PVC-coated and stainless steel
B-7.02.02	use specialized procedures for forming specialty products such as pre-heating material for bending and annealing to relieve stress
B-7.02.03	plan and follow order of operations for forming materials
B-7.02.04	bend or roll material according to brake lines and diagrams

Sub-task

B-7.03 Assembles specialty products.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-7.03.01	select and use tools and equipment such as welding equipment, soldering irons and drills
B-7.03.02	select and use fasteners according to material and specifications
B-7.03.03	assemble product components according to plans and specifications

Sub-task

B-7.04 Finishes specialty products.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

B-7.04.01	select and use tools and equipment such as buffers, grinders, files and chemical compounds
B-7.04.02	finish product using methods such as grinding, filing and buffing to achieve surface finish according to specifications
B-7.04.03	perform quality control for conditions such as sharp edges and overall appearance
B-7.04.04	select and use sealants according to specifications

BLOCK C AIR AND MATERIAL HANDLING SYSTEM INSTALLATION

Trends

There continues to be a strong push by industry and governments towards installing energy efficient equipment and practicing green construction methods. Sealants and glues are required to be low volatile organic compound (VOC).

High efficient appliances and mechanical equipment are being vented with plastic piping.

Related Components (including, but not limited to)

Chimney, breeching, venting, barometric relief damper, louvers, grilles, diffusers, registers, fire dampers, splitter dampers, backdraft dampers, motorized dampers, volume dampers, smoke dampers, filter racks, duct heaters, coils, furnaces, rooftop units, power venters, power exhausters, draft inducers, air conditioners, exhaust fans, humidifiers, unit heaters, heat recovery ventilators, energy recovery ventilators, mixing boxes, variable air volume boxes, filter banks, drain pans, burglar bars, air valves, air lock, scrubbers, silencers, flexible duct, test ports, access doors, temporary caps, acoustic plenums, acoustic insulation, thermal insulation, lagging, cladding, hoppers, hoods, bins, cyclones, bag houses, conveyor skirting, hangers, braces, mounting brackets, threaded rod, cable hangers, channel, round rod, beam clamps, concrete shields, threaded concrete anchors, concrete inserts, nails, pins, screws, rivets, tape, glue, nuts, bolts.

Tools and Equipment

See Appendix A.

Task 8 Prepares installation site.

Context

Sheet metal workers need to confirm field measurements and prepare the site prior to installation of equipment to ensure safe, smooth and efficient installation. Measurements need to be made ahead of time to allow time for construction of ductwork and equipment.

Required Knowledge

K 1 code, regulations and manufacturers' specifications for requirements such as clearances, weight and spacing

K 2 building materials

K 3	hazardous materials such as asbestos, mould and noxious gases
K 4	material to be recycled or reclaimed
K 5	dimension and weight of units and materials
K 6	orientation and location of units and materials
K 7	plans and specifications
K 8	updated documentation
K 9	hangers, braces and brackets and their installation methods
K 10	supports and bases and their installation methods

Sub-task

C-8.01 Performs on-site measurements.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-8.01.01	select and use tools and equipment such as laser levels, tape measures and scale rulers
C-8.01.02	measure and verify work area dimensions and compare to plans and specifications for discrepancies
C-8.01.03	identify obstructions and problems to be resolved
C-8.01.04	verify location and size of penetrations are according to plans and specifications to ensure proper fit
C-8.01.05	identify and sleeve locations for duct fitting penetrations
C-8.01.06	mark penetrations to be cut according to plans and specifications
C-8.01.07	determine position of hangers, braces and brackets according to codes, regulations and specifications

Sub-task

C-8.02 Performs demolitions for renovations.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-8.02.01	prepare removal plan for material and equipment considering factors such as containment of particles and hazardous materials
C-8.02.02	place barricades according to job site requirements to isolate demolition site
C-8.02.03	select and use tools and equipment such as grinders, hammers and saws
C-8.02.04	identify materials and equipment to be removed according to plans and demolition drawings
C-8.02.05	dismantle and remove materials and equipment
C-8.02.06	recycle or dispose of waste materials and equipment according to job site requirements

Sub-task

C-8.03 Cuts penetrations.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-8.03.01	select and use tools and equipment such as hole saws, snips and reciprocating saws according to material to be cut
C-8.03.02	identify obstructions and hidden hazards in surrounding area such as electrical and structural members for safety and architectural reasons
C-8.03.03	put measures in place to isolate cutting area before beginning to cut to prevent injury or damage to equipment or property
C-8.03.04	perform cut according to markings

Sub-task

C-8.04 Installs supports and bases.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-8.04.01	select and use tools and equipment such as tape measures, hammer drills and drills
C-8.04.02	verify that shop drawings are approved and reflect equipment on site or to be installed
C-8.04.03	determine anchor positions using shop drawings and specifications
C-8.04.04	select and use anchors and fasteners to support load
C-8.04.05	install isolators to isolate system from vibration
C-8.04.06	install seismic restraints as required according to specifications, local codes and regulations

Sub-task

C-8.05 Installs hangers, cables, braces and brackets.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-8.05.01	select and use tools and equipment such as tape measures, hammer drills and chop saws
C-8.05.02	verify that shop drawings are approved and reflect materials and equipment on site or to be installed
C-8.05.03	determine anchor positions using shop drawings and specifications
C-8.05.04	select materials such as anchors, braces, cables, brackets, and inserts to be used according to specifications
C-8.05.05	measure and cut material to fabricate hangers, cables, braces and brackets
C-8.05.06	secure anchors and fasteners to support load according to specifications
C-8.05.07	install seismic restraints as required according to specifications, local codes and regulations

Task 9 — Installs and connects chimneys, breeching and venting to exhaust appliances and mechanical equipment.

Context

Chimneys are the vertical section used to vent gases, smoke and other products of combustion to the atmosphere. Breeching is the horizontal section of venting that connects one or more appliances or mechanical equipment to the chimney. Proper installation methods are important to ensure indoor and outdoor air quality and safety. Additional certification may be required by some jurisdictions to install products.

Required Knowledge

K 1	code and manufacturers' specifications for requirements such as clearances, weight, spacing and seismic upgrading
K 2	types of chimneys
K 3	building materials
K 4	construction codes and regulations
K 5	sealants
K 6	sheet metal materials used for chimneys, breeching and venting
K 7	appliances such as furnaces, stoves and incinerators
K 8	mechanical equipment and components such as boilers, generators, piping and pressure vessels
K 9	barometric relief dampers
K 10	thermal expansion and contraction of material
K 11	effect of environmental conditions on material and installation
K 12	high efficiency furnace venting such as 636 rated composites, glues and primers
K 13	requirements of combustion and relief air

Sub-task

C-9.01 Installs chimney.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-9.01.01	select and use tools and equipment such as drills, saws and levels
C-9.01.02	plan location of chimney to minimize interference and conflicts while ensuring the most direct path and according to local codes
C-9.01.03	select chimney components according to codes, local authorities and specifications
C-9.01.04	assemble and fasten sections according to specifications and manufacturers' instructions
C-9.01.05	flash and seal roof penetration to weatherproof
C-9.01.06	install clean-out at base of chimney for removal of debris
C-9.01.07	seal chimney according to specifications

Sub-task

C-9.02 Connects single appliance or mechanical equipment to chimney.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-9.02.01	select and use tools and equipment such as snips, drills, levels and tape measures
C-9.02.02	identify type of appliance or mechanical equipment and select venting materials to be used to connect to chimney
C-9.02.03	identify type of expansion joint required for appliance or mechanical equipment according to specifications
C-9.02.04	plan location of breeching for single appliance or mechanical equipment to minimize offsets while maintaining grade and clearance from combustibles
C-9.02.05	install and secure vibration isolation and/or expansion joint between the appliance or mechanical equipment and the chimney to allow for expansion and contraction
C-9.02.06	seal chimney to appliance or mechanical equipment according to specifications, codes and local authorities

Sub-task

C-9.03 Installs breeching.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-9.03.01	select and use tools and equipment such as drills, saws and levels
C-9.03.02	plan location of breeching to minimize offsets while maintaining grade and clearance from combustibles
C-9.03.03	select breeching size, thickness and material according to codes, local authorities and specifications
C-9.03.04	assemble and fasten sections according to specifications
C-9.03.05	seal breeching according to specifications

Sub-task

C-9.04 Connects appliances and mechanical equipment to breeching.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-9.04.01	select and use tools and equipment such as snips, drills, levels and tape measures
C-9.04.02	identify type of appliances and mechanical equipment and select venting materials to be used to connect to breeching
C-9.04.03	identify type of expansion joint required for appliances and mechanical equipment according to specifications
C-9.04.04	install and secure vibration isolation and/or expansion joint between the appliances and mechanical equipment and breeching to allow for expansion and contraction
C-9.04.05	seal breeching to appliances and mechanical equipment according to specifications, code and local authorities
C-9.04.06	sequence connections to breeching according to code

Sub-task

C-9.05 Installs high efficiency appliances and mechanical equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-9.05.01	select and use tools and equipment such as drills, saws and levels
C-9.05.02	plan location of venting to minimize offsets while maintaining grade
C-9.05.03	select venting size and material according to codes, local authorities, specifications and manufacturers' specifications
C-9.05.04	assemble and fasten sections according to codes, local authorities and specifications
C-9.05.05	install exterior vent termination according to codes, local authorities' requirements and manufacturers' specifications
C-9.05.06	seal and weatherproof exterior vent termination

Task 10 Installs air handling system components.

Context Sheet metal workers install air handling systems to ensure comfort, air quality and efficiency. There are many components manufactured to be installed in air handling systems. They can be used for climate control, humidity control, indoor air quality, security and fire prevention.

Required Knowledge

K 1	air handlers such as furnaces, fans, rooftop units, built-up systems and air conditioners
K 2	the effect of environmental conditions on material and installation
K 3	types of dampers and their applications such as volume, smoke, fire, motorized and backdraft
K 4	construction codes and regulations
K 5	duct systems such as supply, return, exhaust and fresh air
K 6	codes and manufacturers' specifications for requirements such as clearances, weight and spacing
K 7	requirements for fire damper sleeves such as gauge and angled
K 8	types and applications of registers, grilles, diffusers and louvers
K 9	HVAC systems

K 10	types of coils such as electric, hydronic and direct expansion
K 11	refrigeration principles
K 12	heat recovery ventilator applications such as improving air quality and efficiency of building envelope
K 13	types of filters such as viscous impingement, electronic polarized filter media, pleated and high efficiency particulate air (HEPA)
K 14	accessories such as humidifiers, silencers, air valves, variable air volume boxes, mixing boxes, filter banks, drain pans, burglar bars, access doors, flexible ducts, acoustic plenums and unit heaters
K 15	energy recovery ventilators
K 16	types of material for sealing such as oil-based, solvent-based, water-based, tapes and caulking
K 17	types of fusible links and their applications

Sub-task

C-10.01 Installs air handlers, heat recovery ventilators (HRVs) and energy recovery ventilators (ERVs).

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-10.01.01	select and use tools and equipment such as impact drills, snips, hammers, and rigging, hoisting and lifting equipment
C-10.01.02	assemble air handler, HRV or ERV components according to manufacturers' specifications
C-10.01.03	place and secure air handler, HRV or ERV to base/structure according to manufacturers' specifications, drawings and building lines
C-10.01.04	install isolators according to manufacturers' specifications
C-10.01.05	install flexible connections according to manufacturers' specifications
C-10.01.06	verify that shipping brackets are removed prior to unit start-up
C-10.01.07	check tightness and alignment of pulleys and belts
C-10.01.08	attach condensate drain according to manufacturers' specifications
C-10.01.09	balance HRV or ERV according to manufacturers' specifications

Sub-task

C-10.02 Installs sheet metal ducts and fittings.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-10.02.01	select and use tools and equipment such as grinders, hammers, snips and screwdrivers
C-10.02.02	assemble ductwork, fittings and components according to labelling and tagging
C-10.02.03	select and lay out fittings and components according to sequence to be installed
C-10.02.04	connect and seal transverse joints to ensure integrity according to specifications and industry standards such as SMACNA and American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
C-10.02.05	secure ducts to support system according to specifications and industry standards
C-10.02.06	align ductwork with building lines to ensure uniformity and aesthetics
C-10.02.07	install seismic restraints according to specifications, local codes and regulations

Sub-task

C-10.03 Installs dampers.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-10.03.01	select and use tools and equipment such as snips, hammers and cordless drills
C-10.03.02	select dampers according to requirements such as size and use
C-10.03.03	determine damper positions according to air direction and shaft access
C-10.03.04	prepare ductwork by using processes such as installing retaining brackets and slotting ductwork to receive dampers
C-10.03.05	prepare sectional dampers using methods such as bolting sections together and adding stiffeners to damper frames and brackets to damper blades to allow blades to move in unison, as required

C-10.03.06	verify that dampers are true and square
C-10.03.07	secure dampers and control mechanisms using fasteners such as screws, rivets and bolts
C-10.03.08	mark or slot shafts to identify blade direction
C-10.03.09	cycle dampers to ensure free movement of parts
C-10.03.10	set dampers as required for application

Sub-task

C-10.04 Installs fire dampers.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-10.04.01	select and use tools and equipment such as hammers, hacksaws and cordless drills
C-10.04.02	select fire dampers with fusible links according to requirements such as size and application
C-10.04.03	select and prepare sleeves according to requirements for installation of fire dampers, local code and manufacturers' specifications
C-10.04.04	prepare sectional fire dampers using methods such as bolting sections together and adding stiffeners to the fire damper frames, as required
C-10.04.05	secure fire dampers using fasteners and angles ensuring tight fit to wall and around fire damper sleeves
C-10.04.06	verify that fire dampers are true and square
C-10.04.07	test fire dampers to ensure free movement of parts
C-10.04.08	install access door on ductwork for easy access to perform tests and visual inspections and to reset fire dampers
C-10.04.09	install breakaway joints according to jurisdictional regulations

Sub-task

C-10.05 Installs registers, grilles, diffusers and louvers.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-10.05.01	select and use tools and equipment such as drills, screwdrivers, levels and snips
C-10.05.02	select registers, grilles, diffusers and louvers according to requirements and drawings
C-10.05.03	connect registers, grilles, diffusers and louvers to ductwork using methods such as flex connections and placing in ceiling grid, taking directional considerations into account
C-10.05.04	align registers, grilles, diffusers and louvers with building line for aesthetic reasons
C-10.05.05	assemble register, grille, diffuser and louver components, when required
C-10.05.06	install access doors according to requirements and specifications

Sub-task

C-10.06 Installs terminal boxes.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-10.06.01	select and use tools and equipment such as cordless drills, snips, screwdrivers and hammers
C-10.06.02	determine terminal box position according to air flow direction marked on box, and access to connections and shafts
C-10.06.03	install access doors on ductwork for testing and cleaning purposes according to specifications, plans and documents
C-10.06.04	secure and seal terminal boxes to ductwork, plenums or units using mechanical fasteners such as S-cleats, drive cleats and screwed joints
C-10.06.05	determine duct straight length requirements prior to connection to main ductwork for optimal operation according to manufacturers' specifications

Sub-task

C-10.07 Installs coils.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-10.07.01	select and use tools and equipment such as cordless drills, snips, screwdrivers and hammers
C-10.07.02	determine coil position according to air flow direction marked on coil, access to connections and for easy removal
C-10.07.03	install access doors on ductwork for testing and cleaning purposes according to specifications and plans
C-10.07.04	secure and seal coils to ductwork, plenums or units using methods such as installing channels and using mechanical fasteners

Sub-task

C-10.08 Installs system component accessories.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-10.08.01	select and use tools and equipment such as screwdrivers, drills and hammers
C-10.08.02	determine installation requirements for component accessories such as fans, air balancing test ports, security bars, humidifiers, spark arrestors, air filtration systems and access doors according to specifications, plans and drawings
C-10.08.03	determine location of accessories according to factors such as accessibility, specifications and manufacturers' recommendations
C-10.08.04	secure accessories using mechanical fasteners

Task 11 Installs material handling system components.

Context Material handling system components may be installed for safety, cleanliness and cost-saving. These components may have specific applications such as dust collection, product separation and conveyance, and handling grease laden air and hazardous materials.

Required Knowledge

K 1	types of fans such as vane axial, centrifugal and backward inclined
K 2	types of material handling systems such as gravity, pneumatic and mechanical
K 3	gravity handling systems such as garbage and laundry chutes
K 4	pneumatic handling systems such as shop dust collector and shop vehicle exhaust system
K 5	mechanical handling systems such as chutes and slides
K 6	system design principles and air flow
K 7	construction codes and regulations such as National Fire Prevention Association (NFPA) 69
K 8	collection devices such as hoppers, hoods and bins
K 9	separating devices such as cyclones, bag houses and scrubbers
K 10	the effect of environmental conditions on material and installation
K 11	installation techniques

Sub-task

C-11.01 Installs pneumatic and gravity material handling system components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-11.01.01	select and use tools and equipment such as grinders, hammers and screwdrivers
C-11.01.02	assemble ductwork, fittings and components according to labelling, tagging, plans and specifications
C-11.01.03	complete joints using methods such as welding and bolting according to specifications to limit protrusions

C-11.01.04 secure ducts and components according to specifications to support system

C-11.01.05 select and install fittings and components to ensure a smooth passage of materials through systems by minimizing angle and direction changes

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Sub-task

C-11.02 Installs mechanical material handling system components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-11.02.01 select and use tools and equipment such as welding equipment, impact drills and grinders

C-11.02.02 assemble chutes and slides, fittings and components according to labelling, tagging, plans and specifications

C-11.02.03 complete joints using methods such as welding and bolting according to specifications to limit obstructions

C-11.02.04 secure chutes, slides and components to supports or hanging systems according to specifications

C-11.02.05 select and install fittings and components to ensure a smooth passage of materials through systems by minimizing angle and direction changes

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Sub-task

C-11.03 Installs collection and separating devices.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-11.03.01 select and use tools and equipment such as drills, hammers and wrenches

C-11.03.02 determine location of device according to specifications or requirements

C-11.03.03 select devices for particles to be conveyed

C-11.03.04 assemble components of device according to requirements

C-11.03.05 place and secure device using methods such as mechanical fasteners, welding and installing brackets

C-11.03.06 connect components such as ductwork and bag house to device

Task 12 Applies thermal insulation, lagging, cladding and flashing.

Context Sheet metal workers apply insulation, lagging, cladding and flashing to prevent condensation, limit operating costs, increase the efficiency of equipment through the conservation of energy, and protect insulation and ductwork from damage due to environmental exposure.

Required Knowledge

K 1	types of insulation such as thermal and fire-rated and their application
K 2	types of cladding material such as aluminium, stainless steel and galvanised steel
K 3	types of lagging material such as aluminium, stainless steel and canvas
K 4	types of flashings such as cap flashing, curb and step flashing
K 5	building materials and types of weather-proofing materials
K 6	cladding components such as end caps, straps and preformed elbows
K 7	cladding requirements
K 8	the effect of environmental conditions on materials and installation
K 9	types of materials for sealing such as oil-based, solvent-based, water-based, tapes and caulking
K 10	measurement and layout techniques
K 11	installation and securing techniques

Sub-task

C-12.01 Applies thermal insulation to components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-12.01.01	select and use tools and equipment such as knives, end cutters and pin spotters
C-12.01.02	select insulation according to specifications and codes
C-12.01.03	identify location to be insulated according to specifications and codes
C-12.01.04	measure, lay out and cut insulation pieces

C-12.01.05	secure insulation by applying fasteners and components such as pins, z-bars and glue, and finish with insulation washers
C-12.01.06	complete vapour barrier according to specifications

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Sub-task

C-12.02 Applies lagging and cladding to components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-12.02.01	select and use tools and equipment such as snips, grinders, banding tools, tape measures and trammel points
C-12.02.02	select material according to plans and specifications
C-12.02.03	measure, lay out and cut material to fit
C-12.02.04	overlap seams to shed moisture
C-12.02.05	secure and seal material using methods such as banding, and applying screws, sealants and adhesives

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Sub-task

C-12.03 Applies flashing to components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-12.03.01	select and use tools and equipment such as drills, snips and folding pliers
C-12.03.02	select material according to plans, specifications or requirements
C-12.03.03	measure and modify flashing to fit on-site conditions
C-12.03.04	overlap seams in order to shed moisture
C-12.03.05	secure and seal material using fasteners such as screws, sealants and adhesives to ensure a weather-tight seal

Task 13 Performs leak testing, air balancing and commissioning.

Context Sheet metal workers perform leak testing. They perform testing, adjusting and balancing (TAB) to ensure that the system operates efficiently at its specified performance level. Sheet metal workers also participate in the commissioning of building systems.

Required Knowledge

K 1	types of leak tests such as smoke, dye, pressure, fluid, visual and audible
K 2	test procedures
K 3	charts for leak tests
K 4	air balancing instruments and techniques
K 5	HVAC and material handling systems
K 6	damper locations
K 7	thermal overload
K 8	pressure requirements
K 9	litres per second (L/S) and cubic feet per minute (CFM) measurements
K 10	documentation requirements such as balancing and commission reports and leak test results
K 11	sealing methods
K 12	application of fan laws and associated calculations
K 13	pulley alignment and adjustment
K 14	belt length calculation and sizing
K 15	LEED standards

Sub-task

C-13.01 Performs leak tests.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
no	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-13.01.01	select and use tools and equipment such as testing equipment, snips and drills
C-13.01.02	cap all branches using materials such as end caps, polyethylene and duct tape
C-13.01.03	determine system capacity and allowable leakage rate according to plans and specifications

C-13.01.04	pressurize ductwork to predetermined pressure by attaching blower to duct
C-13.01.05	identify and mark leaking areas when leakage is higher than allowable leakage rate
C-13.01.06	reseal leaking areas and retest when sealant has cured
C-13.01.07	document successful test results

Sub-task

C-13.02 Performs testing, adjusting and balancing (TAB).

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
no	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-13.02.01	select and use tools and testing equipment such as velometers, flow hoods and drills
C-13.02.02	verify that dampers are open and that filters and coils are clean
C-13.02.03	perform duct traverse including creating test ports by drilling holes in ductwork, to determine volume and velocity of system
C-13.02.04	adjust equipment such as motor pulley to achieve required air flow at the unit
C-13.02.05	perform calculations to determine air flow and compare to design specifications
C-13.02.06	test and adjust main, zone and branch ducts for proper air flow
C-13.02.07	test and adjust each individual outlet for proper air flow
C-13.02.08	retest and adjust as required until overall desired results are achieved
C-13.02.09	document balancing results

Sub-task

C-13.03 Participates in the commissioning of building systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
no	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

C-13.03.01	meet with commissioning agent throughout project to verify work completed so far
C-13.03.02	provide documentation such as equipment shop drawings, as-built drawings and test results to commissioning agent
C-13.03.03	perform walk-around with commissioning agent identifying locations of equipment
C-13.03.04	provide assistance during commissioning, as required
C-13.03.05	address deficiencies cited on commissioning report
C-13.03.06	label equipment according to specifications for the purpose of identification, commissioning and maintenance

BLOCK D ROOFING AND SPECIALTY PRODUCT INSTALLATION

Trends

Pre-engineered wall paneling systems are becoming a popular building construction option. The pre-finished insulated panels permit maintenance-free, quick and efficient installation for feature walls or exterior shells. There is an increase in the use of architectural sheet metal products such as copper roofs in the residential, institutional, historical and commercial sectors.

Related Components (including, but not limited to)

Flashing, coping, gutters, downspouts, conductors, scuppers, fasteners, sealants, sheet and batten, closures, fascia, awnings, canopies, finials, insulation, waterproof membranes, isolation membranes, pre-formed and roll-formed decking, sheeting and roofing products, lagging, cladding, kitchen hoods, backsplashes, countertops, laboratory components, medical facility products, food processing products, guards, signage, brackets, cleaning compounds, abrasives.

Tools and Equipment

See Appendix A.

Task 14 Installs metal roofing and cladding systems.

Context

Sheet metal workers install metal roofing and cladding products to provide low maintenance, longevity of the building and protection from the elements. Metal roofs and cladding can also add to the aesthetics of the building.

Required Knowledge

K 1	types of roof structures such as pitched, tapered, domes and spires
K 2	roof construction features such as hips, ridges and valleys
K 3	access doors and roof hatches
K 4	roof and wall materials and characteristics
K 5	final appearance of roof and wall
K 6	types of insulation such as fibreglass, styrofoam and fibreboard
K 7	types of waterproof membranes such as mastic and plastic

K 8	isolation materials such as wood blocks, plastic, felt paper, rubber and mineral surface
K 9	air and vapour barriers
K 10	manufacturers' recommended installation methods for metal roofing and cladding systems
K 11	types of roof and wall panels such as standing seam, batten and snap lock
K 12	fasteners such as concealed and exposed clips, screws, washer nails and cleats
K 13	thermal expansion and contraction of material
K 14	effect of environmental conditions on material and installation
K 15	roofing components such as expansion joints, flashings and gutters
K 16	sealants such as caulking, solder and mastic
K 17	manufacturers' recommendations for application of sealants
K 18	locations requiring sealing
K 19	types of decking such as metal pan and Q-decking
K 20	material to be applied on decking such as roofing, concrete, wood and insulation
K 21	application methods for galvanized protective coating
K 22	properties of metals (metallurgy)

Sub-task

D-14.01 Lays out roof and walls.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

D-14.01.01	select and use tools such as transits, laser levels, framing square and chalk lines
D-14.01.02	check the building for things such as penetrations, status and square
D-14.01.03	establish reference lines
D-14.01.04	confirm site measurements referencing plans, specifications and documents
D-14.01.05	determine orientation of seams and joints taking into consideration the prevailing wind and according to building dimensions
D-14.01.06	determine desired overall appearance
D-14.01.07	prepare sheeting for installation procedures such as pre-drilling and hoisting

Sub-task

D-14.02 Installs insulation, isolation material and building envelope.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

D-14.02.01	select and use tools and equipment such as screwdrivers, paint brushes and hammer-staplers
D-14.02.02	apply building envelope such as felt paper, ice and water shield, and self-adhesive membrane to the building
D-14.02.03	select and use fasteners such as pin bolts, screws and powder-actuated fasteners
D-14.02.04	determine paneling system requirements according to manufacturers' specifications and engineered drawings
D-14.02.05	install panel mounting system such as z-bars, j-bars, clips and/or cleats
D-14.02.06	apply and fasten insulation to structure
D-14.02.07	apply isolation material such as neoprene, caulking and wood to structure according to specifications

Sub-task

D-14.03 Installs roofing and cladding system components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

D-14.03.01	select and use fasteners such as pre-engineered fasteners, screws, nails and bolts
D-14.03.02	select and use tools and equipment such as drills, seamers, framing square and laser levels
D-14.03.03	determine starting point to achieve finished appearance
D-14.03.04	install required flashing
D-14.03.05	cut, fit and fasten panels to the structure or mounting system following reference lines

D-14.03.06 install expansion joints

D-14.03.07 install coping, finish flashing, drainage and downspouts according to specifications

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Sub-task

D-14.04 Seals exposed joints.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

D-14.04.01 select and use tools and equipment such as caulking guns and soldering irons

D-14.04.02 select sealant such as caulking, solder and mastic

D-14.04.03 apply sealant according to manufacturers' specifications

D-14.04.04 apply joint or seam caps to secure seal and ensure watershed

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Sub-task

D-14.05 Installs decking.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

D-14.05.01 select and use tools and equipment such as welding equipment, abrasive cut-off saws and hand crimpers

D-14.05.02 determine material required such as metal pan and Q-decking

D-14.05.03 cut and fit decking

D-14.05.04 fasten decking using welding equipment, screws and dimple tools

D-14.05.05 frame out non-structural openings

D-14.05.06 finish exposed welds to prevent corrosion

Task 15 Installs exterior components.

Context Sheet metal workers install metal exterior components such as awnings, and signage for functional and aesthetic reasons.

Required Knowledge

K 1	types of exterior surfaces such as concrete, metal, stone, wood and composite
K 2	surface preparation such as cleaning, filling voids, grouting mortar lines and scoring surface for adherence
K 3	cleaning compounds and abrasives
K 4	exterior components such as awnings, finials, signage, decorative fascia and canopies
K 5	fasteners such as anchors, nail-ins, screws and adhesives
K 6	compatibility of fasteners and components
K 7	final appearance of components

Sub-task

D-15.01 Prepares surface.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

D-15.01.01	select and use tools and equipment such as grinders, putty knives and hammer drills
D-15.01.02	check alignment of the exterior surface for aesthetic purposes and for ease of installation
D-15.01.03	identify fastening points according to structural specifications
D-15.01.04	determine fastening system according to product material type and manufacturers' recommendations
D-15.01.05	clean installation area using scrapers, grinders, wire brushes and chemicals such as degreasers and acids according to material type
D-15.01.06	score surface for adherence according to material type
D-15.01.07	apply waterproofing membrane or flashing to ensure watertight construction

Sub-task

D-15.02 Fastens exterior components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

D-15.02.01	select and use tools and equipment such as drills, screwdrivers, impact drivers and hammers
D-15.02.02	select components to suit application and material type
D-15.02.03	modify components, as required
D-15.02.04	install fasteners such as anchors, nail-ins, screws and adhesives
D-15.02.05	seal joints by soldering or caulking to weatherproof the building

Task 16 Installs specialty products.

Context Sheet metal workers install specialty products in locations such as commercial kitchens, food processing plants, pharmaceutical laboratories, medical facilities and manufacturing plants. They also design and install stainless or non-stainless architectural products on or inside a variety of buildings.

Required Knowledge

K 1	kitchen preparation products such as sinks, hoods, backsplashes and countertops
K 2	pharmaceutical laboratory products such as tanks, conveyors and laboratory components
K 3	food processing products such as flumes, guards and chutes
K 4	medical facility products such as laundry chutes, counters and cupboards
K 5	codes and regulations
K 6	food grade caulking, solders and welding materials
K 7	non-stainless steel metals such as aluminium and copper
K 8	plastic products such as laboratory exhaust systems and sneeze shields
K 9	fasteners such as screws, pop rivets and bolts
K 10	types of finishes for architectural products

Sub-task

D-16.01 Installs stainless steel specialty products.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

D-16.01.01	select and use tools and equipment such as welding equipment, grinders and snips
D-16.01.02	install components according to codes, regulations and specifications
D-16.01.03	select and use fasteners and hangers according to application
D-16.01.04	isolate differing materials from each other to avoid electrolysis
D-16.01.05	assemble components according to plan
D-16.01.06	finish specialty product using sealants and coating such as food grade caulking, solders, welding materials and epoxy coating
D-16.01.07	finish products according to requirements such as sanitary and aesthetic

Sub-task

D-16.02 Installs non-stainless steel products.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

D-16.02.01	select and use tools and equipment such as welding equipment, grinders and snips
D-16.02.02	install components according to codes, regulations and specifications
D-16.02.03	select and use fasteners and hangers according to application
D-16.02.04	isolate differing materials from each other to avoid electrolysis
D-16.02.05	assemble components according to plan
D-16.02.06	finish specialty product using sealants and coating such as solders, welding materials and epoxy coatings
D-16.02.07	finish products according to requirements such as sanitary and aesthetic

Trends	There is an increase in the use of electronic equipment controls and sensors. This has increased the need for more training in electronic diagnosis.
Related Components (including, but not limited to)	Ductwork, furnaces, air conditioners, rooftop units, makeup air units, fans, dampers, belts, pulleys, bearings, blower wheels, electronic and mechanical controls, filters, vents, humidifiers, scrubbers, lubricants, roofs, walls.
Tools and Equipment	See Appendix A.

Task 17 Performs scheduled maintenance.

Context Sheet metal workers perform scheduled maintenance to minimize repair costs, increase longevity and enhance system performance.

Required Knowledge

K 1	components such as belts, pulleys, bearings, fan blades, filters and motors
K 2	normal operation and appearance of components
K 3	frequency of scheduled maintenance
K 4	sequence of equipment operation
K 5	codes and regulations

Sub-task

E-17.01 Performs maintenance inspections.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

E-17.01.01	obtain service schedule with a list of equipment and components to be inspected
E-17.01.02	refer to inspection checklist for itemisation of equipment components to be inspected
E-17.01.03	select and use tools and equipment such as multimeters, air testing equipment and nut drivers
E-17.01.04	perform required tests, surveys or readings such as amp draws, air readings and filter conditions
E-17.01.05	conduct sensory inspection to identify possible faults
E-17.01.06	record and report all findings on inspection checklist
E-17.01.07	keep record of inspection report on file

Sub-task

E-17.02 Services components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

E-17.02.01	refer to inspection checklist for parts
E-17.02.02	refer to manufacturers' specifications for normal operating conditions and specific accessories
E-17.02.03	select and use tools and equipment such as grease guns, Allen keys and adjustable wrenches
E-17.02.04	clean or replace filters
E-17.02.05	clean components using methods such as de-greasing, using compressed air and vacuuming
E-17.02.06	adjust pulleys and belts for required alignment and tension according to manufacturers' specifications
E-17.02.07	lubricate bearings according to manufacturers' specifications

E-17.02.08	re-check air and static pressures according to manufacturers' specifications
E-17.02.09	check amperage draw on direct drive components and compare to manufacturers' specifications

Task 18 Repairs faulty systems and components.

Context Sheet metal workers repair building systems and equipment such as heating, ventilation and air conditioning and conveyance systems to return them to normal operating conditions and specifications.

Required Knowledge

K 1	normal operation and appearance of components
K 2	diagnostic methods such as sensory inspections and use of testing devices
K 3	sequence for removing and replacing components such as ductwork, material handling components, filters, belts, pulleys and motors
K 4	patching methods such as welding, riveting and bonding
K 5	basic electrical

Sub-task

E-18.01 Diagnoses system faults.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

E-18.01.01	obtain information such as history of work done, deficiency report, maintenance records and, client feedback and observations to identify source of performance issues
E-18.01.02	select and use tools and equipment such as pitot tubes, multimeters and air testing equipment
E-18.01.03	perform required tests, surveys or readings such as amp draws, air readings and filter conditions
E-18.01.04	check performance accuracy of system against design requirements
E-18.01.05	conduct sensory inspections
E-18.01.06	locate and identify worn, faulty or missing components

E-18.01.07	troubleshoot system to identify potential source of problem
E-18.01.08	recommend course of action such as repair or replacement of components

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Sub-task

E-18.02 Repairs worn or faulty components.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	NV	NV	yes	yes	yes	yes	yes	NV	NV	NV

Key Competencies

E-18.02.01	select and use tools and equipment such as wrenches, hammers, drills and grinders
E-18.02.02	measure and fabricate sheet metal transition and components enabling connection to existing system
E-18.02.03	order components such as fan belts, motors and isolators
E-18.02.04	shut off utility services such as gas and electrical to the appliance
E-18.02.05	disassemble equipment and components in required sequence
E-18.02.06	replace or modify faulty or obsolete components
E-18.02.07	reassemble and tighten components
E-18.02.08	perform tests, surveys or readings such as amp draws, air readings and filter conditions to verify that system is operating according to specifications

APPENDICES

APPENDIX A TOOLS AND EQUIPMENT

Hand Tools

adjustable wrench
Allen hex keys
aviation snips R.H. and L.H.
ball peen hammer
banding tools
bulldog snips
bumping hammers
caulking gun
C-clamp
center punch
chalk line
chipping hammer
chisels
combination snip
divider
drift pin
duct puller/stretcher
files
groove seamer – hand groover
hacksaw
hand crimpers
hand dolly
hand notcher
hand seamer/folding pliers
hole punch
levels
locking pliers
magnets
mallett
marking pen
paint brush
pipe wrench
pliers
plumb bob
pop riveter
prick punch
rivet set
riveting hammer
scraper
scratch awl
screwdriver
scriber
setting hammer
side cutters
socket set
soldering coppers
straight edge
tap and die
trowels
wire and bolt cutters
wire brushes
wrenches

Portable Power Tools and Accessories

air compressor
angle drill
angle grinder
chainsaw
chop saw
circular saw
cordless drill
die grinder
double cutter
drill bits
electric drill
generator
hammer drill
hole saw
impact wrench
jigsaw
nibbler
spray gun
pneumatic hammer
polisher and buffer

portable band saw
portable plasma cutter
powder-actuated tool
pneumatic riveter
reciprocating saw
seamer
unishear

Shop Tools and Equipment

abrasive cut-off saw
angle iron roller
band iron bender
band saw
bar folder
box and pan brake
button lock machine
cleat folder
cleat machine
clinch lock machine
cold cut saw
cut to length line
dimpler
drill index
drill press
foot shear
grinder
hand brake
hydraulic press
ironworker
lever bench shear
magnetic brake
notcher
pattern
pin spotter
pipe-threader, cutter, reamer
Pittsburgh machine
power brake
power notcher
power press
power punch
power roll former
power sander or polisher
power shear
rivet press
riveting gun
rotary punch
slitter
snap-lock machine
spiral duct machine
transverse duct connectors/ transverse duct flange (TDC/TDF) machine

Rotary Machines

slip roll former
ring and circle shears
easy edger
combination beading and crimping machine
double seaming equipment
turning machines and attachments (such as elbow seaming, burring, beading, wiring, crimping)
van stone machine

Metal Forming Bench Stakes

anvil
beak horn
bench plate
blow horn
candle mould
common square
copper smith
creasing stake
double seaming
double seaming with heads
hatchet
hollow mandrel
solid mandrel
square

Welding, Brazing, Soldering and Cutting Equipment

AC power unit
AC/DC power unit
butane torch
electric soldering iron
gas metal arc welding (GMAW) equipment
oxy-fuel welding (OFW) equipment
shielded metal arc welding (SMAW) equipment
soldering furnace or pot
soldering coppers
spot welder
gas tungsten arc welding (GTAW) equipment
tiger torch

Layout and Drafting Equipment

beam compass
circumference rule
combination square
compass
divider
drafting arm
drafting pencil
drafting table
eraser shield
framing square
parallel bar
protractor
scale ruler
set square
stencil
template
trammel points
triangle
T-square

Measuring Tools

angle finder
angle rule
bench rule
caliper
laser level
micrometer
tape measure
transit level
vernier caliper

Ladders, Platforms, and Hoisting and Rigging Equipment

cable
chain blocks
chain hoist
chokers
come-along
fork lift
pulley (gin wheel)
hydraulic hoist
ladders
manlift
material lift
overhead crane
rope
scaffolds
scissor lift
shackles
slings
grip hoist

Testing Equipment

ammeter
amprobe
anemometer
calibrated flow hood
CO_2 tester
digital combustion analyzer
digital manometer
digital multimeter
digital scope
digital thermometer
duct thermometer
grommet or plug
high pressure duct tester
hygrometer
inclined manometer
magnehelic pressure gauge
mechanical tachometer
micro amp meter
CO tester
multimeter
O_2 tester
ohmmeter
pitot tube
pressure gauge
psychrometer
smoke tester
stack thermometer
stop watch
strobe tachometer
tachometer
U tube manometer
velometer
voltmeter

Computer Assisted Tools

computer hardware
digital camera
fax machine
hand held personal computer
laser cutter
numerical control/computer numerical control equipment (NC/CNC)
plasma cutter
printer/scanner
software packages
water jet cutter

Personal Protective Equipment and Safety Equipment

coveralls
eye protection
eye wash station
face shield
fall arrest equipment
fire extinguisher
first aid kit
fume exhaust system
gloves
hard hat
hearing protection
leather apron
reflective vest
respiratory protection
safety boots
welding screen
welding helmet
welding jacket

APPENDIX B GLOSSARY

acoustic insulation	material installed to reduce or transfer the intensity of sound
annealing	process by which metal is heated to relieve stress, changing the metal's strength and hardness
blank piece	piece of material cut to size prior to notching or marking
brake	manual or power equipment used to bend and form metal
breeching	the horizontal portion of a combustion venting system used for exhausting fumes and gases
building envelope	a barrier between the interior and exterior environment of the building that serves as an outer shell to protect the indoor environment from elements such as moisture
building insulation	material installed on buildings for comfort and energy efficiency
built-up system	a multi-section system that must be put together as per manufacturers' specifications
burglar bars	heavy steel bars installed to prevent access
cladding	a material that covers another material to provide a skin or a layer; it is intended to control infiltration of weather elements or for aesthetic purposes
coping (architectural)	material used as the capping of a wall
crimper	power or manual tool used to allow round or square sheet metal pipes that are the same size to be corrugated to fit together
damper	valve or plate that stops or regulates the flow of air or materials
flashing	thin continuous piece of sheet metal or other impervious material installed to prevent the passage of water into a structure from an angle or joint
isolator	components that minimize noise, sound and vibration transfer
lagging	provides protection for the insulation from damage; it also creates a true, flat and even surface for aesthetic purposes

parallel line method	method of pattern development based upon lines at an equal distance at all points
radial line method	method of conical pattern development where all points radiate from a common apex
seam/lock	any process of connecting two pieces or two ends of metal together
shear	equipment or a process of cutting sheet metal
stake	equipment used in forming material by hand; usually found in a sheet metal shop
stretch-out	overall length of material, not including locks and seams
thermal insulation	material used to reduce the rate of heat transfer
triangulation development	method of pattern development using right angle triangles and two known points to find a third unknown point

APPENDIX C ACRONYMS

ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
CAD	Computer-Aided Design
CFM	cubic feet per minute
CNC	Computer Numerical Controlled
CSA	Canadian Standards Association
GMAW	gas metal arc welding
GTAW	gas tungsten arc welding
HEPA	high efficiency particulate air
HRV	heat recovery ventilator
HVAC	heating, ventilation and air conditioning
LEED	Leadership in Energy and Environmental Design
L/S	litres per second
MSDS	Material Safety Data Sheet
NFPA	National Fire Prevention Association
OH&S	Occupational Health and Safety
PPE	Personal protective equipment
PVC	polyvinyl chloride
RFI	request for information
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMAW	shielded metal arc welding
TDC	transverse duct connectors
TDF	transverse duct flange
TDG	Transportation of Dangerous Goods
WHMIS	Workplace Hazardous Materials Information System

APPENDIX D BLOCK AND TASK WEIGHTING

BLOCK A COMMON OCCUPATIONAL SKILLS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	25	25	NV	NV	NV	16	24	25	15	20	NV	NV	NV	21%

Task 1 Performs safety-related functions.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	40	35	NV	NV	NV	30	30	20	30	30	NV	NV	NV	31%

Task 2 Uses and maintains tools and equipment.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	45	30	NV	NV	NV	10	30	35	50	35	NV	NV	NV	33%

Task 3 Organizes work.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	15	35	NV	NV	NV	60	40	45	20	35	NV	NV	NV	36%

BLOCK B FABRICATION

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	30	27	NV	NV	NV	30	33	35	30	30	NV	NV	NV	31%

Task 4 Performs pattern development.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	30	30	NV	NV	NV	50	60	60	30	20	NV	NV	NV	40%

Task 5 Fabricates sheet metal components for air and material handling systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	25	25	NV	NV	NV	30	20	20	45	40	NV	NV	NV	29%

Task 6 Fabricates flashing, roofing, sheeting and cladding.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	25	25	NV	NV	NV	10	10	10	15	20	NV	NV	NV	17%

Task 7 Fabricates specialty products.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	20	NV	NV	NV	10	10	10	10	20	NV	NV	NV	14%

BLOCK C AIR AND MATERIAL HANDLING SYSTEM INSTALLATION

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	25	20	NV	NV	NV	38	30	25	35	35	NV	NV	NV	30%

Task 8 Prepares installation site.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	20	NV	NV	NV	26	10	25	10	10	NV	NV	NV	17%

Task 9 Installs chimneys, breeching and venting.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	17	NV	NV	NV	16	10	10	15	10	NV	NV	NV	14%

Task 10 Installs air handling system components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	20	NV	NV	NV	40	35	25	30	40	NV	NV	NV	30%

Task 11 Installs material handling system components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	17	NV	NV	NV	10	35	15	25	30	NV	NV	NV	22%

Task 12 Installs thermal insulation, lagging, cladding and flashing.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	15	NV	NV	NV	4	5	10	12	5	NV	NV	NV	10%

Task 13 Performs testing, adjusting and balancing.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	0	11	NV	NV	NV	4	5	15	8	5	NV	NV	NV	7%

BLOCK D ROOFING AND SPECIALTY PRODUCT INSTALLATION

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	15	15	NV	NV	NV	10	7	5	5	10	NV	NV	NV	9%

Task 14 Installs metal roofing and cladding systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	30	35	NV	NV	NV	40	60	20	45	60	NV	NV	NV	42%

Task 15 Installs exterior components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	40	35	NV	NV	NV	40	20	30	35	20	NV	NV	NV	31%

Task 16 Installs specialty products.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	30	30	NV	NV	NV	20	20	50	20	20	NV	NV	NV	27%

BLOCK E MAINTENANCE AND REPAIR

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	5	13	NV	NV	NV	6	6	10	15	5	NV	NV	NV	9%

Task 17 Performs scheduled maintenance.

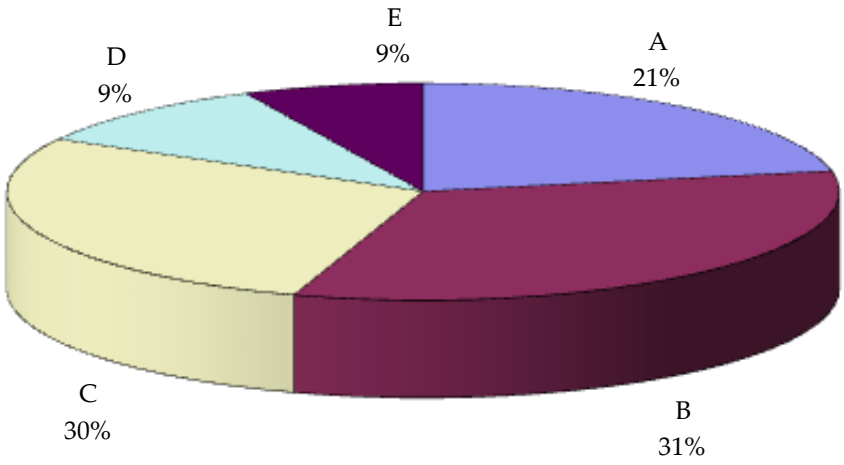
	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	50	45	NV	NV	NV	40	50	20	55	20	NV	NV	NV	40%

Task 18 Repairs faulty systems and components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	50	55	NV	NV	NV	60	50	80	45	80	NV	NV	NV	60%

APPENDIX E

PIE CHART*



TITLES OF BLOCKS

BLOCK A	Common Occupational Skills	BLOCK D	Roofing and Specialty Product Installation
BLOCK B	Fabrication	BLOCK E	Maintenance and Repair
BLOCK C	Air and Material Handling System Installation		

*Average percentage of the total number of questions on an interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada. Interprovincial examinations typically have from 100 to 150 multiple-choice questions.

APPENDIX F

TASK PROFILE CHART – Sheet Metal Worker

BLOCKS	TASKS	SUB-TASKS				
A – COMMON OCCUPATIONAL SKILLS	1. Performs safety-related functions.	1.01 Maintains safe work environment.	1.02 Uses personal protective equipment (PPE) and safety equipment.	1.03 Performs lock-out/tag-out procedures.	1.04 Uses stationary and mobile work platforms.	1.05 Uses hoisting and rigging equipment.
	2. Uses and maintains tools and equipment.	2.01 Maintains hand and portable power tools.	2.02 Maintains shop tools and equipment.	2.03 Uses welding, cutting, soldering and brazing equipment.	2.04 Maintains measuring and layout equipment.	2.05 Maintains testing and inspection devices.
	3. Organizes work.	3.01 Uses trade-related documentation.	3.02 Interprets drawings.	3.03 Organizes materials and equipment for project.	3.04 Performs basic design and field modifications.	
B – FABRICATION	4. Performs pattern development.	4.01 Develops patterns using triangulation method.	4.02 Develops patterns using radial line method.	4.03 Develops patterns using parallel line method.	4.04 Develops patterns using simple and straight line layout.	4.05 Uses computer technology for pattern development.
	5. Fabricates sheet metal components for air and material handling systems.	5.01 Cuts ductwork, fittings and flexible connectors.	5.02 Forms ductwork, fittings and flexible connectors.	5.03 Insulates ductwork and fittings.	5.04 Assembles ductwork, fittings and flexible connectors.	5.05 Fabricates dampers.
		5.06 Fabricates hanger systems, supports and bases.				
	6. Fabricates flashing, roofing, sheeting and cladding.	6.01 Cuts metal for flashing, roofing, sheeting and cladding.	6.02 Forms flashing, roofing, sheeting and cladding.			

	7. Fabricates specialty products.	7.01 Cuts material for specialty products.	7.02 Forms specialty products.	7.03 Assembles specialty products.	7.04 Finishes specialty products.	
C – AIR AND MATERIAL HANDLING SYSTEM INSTALLATION	8. Prepares installation site.	8.01 Performs on-site measurements.	8.02 Performs demolitions for renovations.	8.03 Cuts penetrations.	8.04 Installs supports and bases.	8.05 Installs hangers, cables, braces and brackets.
	9. Installs and connects chimneys, breeching and venting to exhaust appliances and mechanical equipment.	9.01 Installs chimney.	9.02 Connects single appliance or mechanical equipment to chimney.	9.03 Installs breeching.	9.04 Connects appliances and mechanical equipment to breeching.	9.05 Installs high efficiency appliances and mechanical equipment.
	10. Installs air handling system components.	10.01 Installs air handlers, heat recovery ventilators (HRVs) and energy recovery ventilators (ERVs)	10.02 Installs sheet metal ducts and fittings.	10.03 Installs dampers.	10.04 Installs fire dampers.	10.05 Installs registers, grilles, diffusers and louvers.
		10.06 Installs terminal boxes.	10.07 Installs coils.	10.08 Installs system component accessories.		
	11. Installs material handling system components.	11.01 Installs pneumatic and gravity material handling system components.	11.02 Installs mechanical material handling system components.	11.03 Installs collection and separating devices.		
	12. Applies thermal insulation, lagging, cladding and flashing.	12.01 Applies thermal insulation to components.	12.02 Applies lagging and cladding to components.	12.03 Applies flashing to components.		
	13. Performs leak testing, air balancing and commissioning.	13.01 Performs leak tests.	13.02 Performs testing, adjusting and balancing (TAB).	13.03 Participates in the commissioning of building systems.		

D – ROOFING AND SPECIALTY PRODUCT INSTALLATION	14. Installs metal roofing and cladding systems.	14.01 Lays out roof and walls.	14.02 Installs insulation, isolation material and building envelope.	14.03 Installs roofing and cladding system components.	14.04 Seals exposed joints.	14.05 Installs decking.
	15. Installs exterior components.	15.01 Prepares surface.	15.02 Fastens exterior components.			
	16. Installs specialty products.	16.01 Installs stainless steel specialty products.	16.02 Installs non-stainless steel products.			
E – MAINTENANCE AND REPAIR	17. Performs scheduled maintenance.	17.01 Performs maintenance inspections.	17.02 Services components.			
	18. Repairs faulty systems and components.	18.01 Diagnoses system faults.	18.02 Repairs worn or faulty components.			