

Apprenticeship and Industry Training

Apprenticeship Curriculum Guide

Refrigeration and Air Conditioning Mechanic



Apprenticeship
and Industry
Training

Alberta 

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Description of the Trade

Refrigeration and air conditioning mechanics install, maintain, repair and overhaul industrial, commercial and residential refrigeration and air conditioning systems and their component parts.

A journeyperson Refrigeration and air conditioning mechanic is an individual who may be able to:

- work from drawings or verbal instructions to mount or place system components,
- assemble and install refrigeration or air conditioning systems and components,
- install and calibrate related controls (including wiring), and
- start up systems, test lines to detect leaks, and record the readings taken to ensure that the system is functioning satisfactorily.

Apprenticeship Education Entrance Requirements



Apprenticeship education entrance requirements will **NOT** prevent an individual from registering into an apprentice education program as an apprentice, however they will restrict that individual's ability to register for the in-classroom training portion of the training until those requirements have satisfied the education entrance requirement for that trade. The minimum education entrance requirements for the Refrigeration and air conditioning mechanic are:

- English 30-2, Math 30-3, and Physics 20 or Chemistry 20
- OR a pass mark in all five Canadian General Educational Development (GED) tests or Canadian Adult Education Credential tests
- OR an Apprenticeship and Industry Training entrance examination.

To increase an individual's chances of success in classroom instruction for the Refrigeration and air conditioning mechanic Apprenticeship Education Program, successful completion of English 30-2, Math 30-3, Physics 20 OR Chemistry 20 are recommended.

What to Expect

Apprenticeship is a training program that combines on-the-job and in-classroom training for a specific profession designated as a trade.

It may be a new form or model of learning to some individuals, however, has been the cornerstone to large portions of Alberta's industry training and economy for almost a century.

In the process of progressing through an apprenticeship education program, the learner experiences both the theoretical and practical components of their chosen discipline and will be assessed in both the classroom and working environments.

The following flow chart presents a visual representation of what a learner can expect while progressing through the Refrigeration and air conditioning mechanic program.

Apprentice Pathway to Certification

Apply

Register (Pre-Apprenticeship)

- Choose a program.
- Meet the apprenticeship eligibility requirements.
- Complete the application and include any Prior learning assessments



Learn

On-the-job

Refrigeration and air conditioning mechanic Period 1

- 1560 hours

Refrigeration and air conditioning mechanic Period 3

- 1560 hours

Refrigeration and air conditioning mechanic Period 2

- 1560 hours

Refrigeration and air conditioning mechanic Period 4

- 1560 hours

Apprentices must have an Apprenticeship Education Agreement with a sponsor to earn on-the-job hours.

Classroom Instruction

Refrigeration and air conditioning mechanic Period 1

- 240 hours

Refrigeration and air conditioning mechanic Period 3

- 240 hours

Refrigeration and air conditioning mechanic Period 2

- 240 hours

Refrigeration and air conditioning mechanic Period 4

- 240 hours

Apprentices must meet minimum education requirements prior to entrance in classroom instruction.

Competence-based Assessments

Each period, apprentices are assessed:

- on-the-job (by mentors)
- in the classroom (by instructors)
- through period exams (by Apprenticeship and Industry Training)

Earn

Certification

- Post Secondary Education Credential
- Journeyperson Certificate



Core Competences

The foundation of an apprenticeship education program is defined by its core competences. These competences are what the training will focus on as the learner progresses through the Refrigeration and air conditioning mechanic Apprenticeship Education Program.

A core competence is an observable skill that is demonstrated by the learner. Competences are identified by industry subject matter experts and cover the job-related tasks and activities that a refrigeration and air conditioning mechanic will be required to perform in the course of their employment.

Determining Success

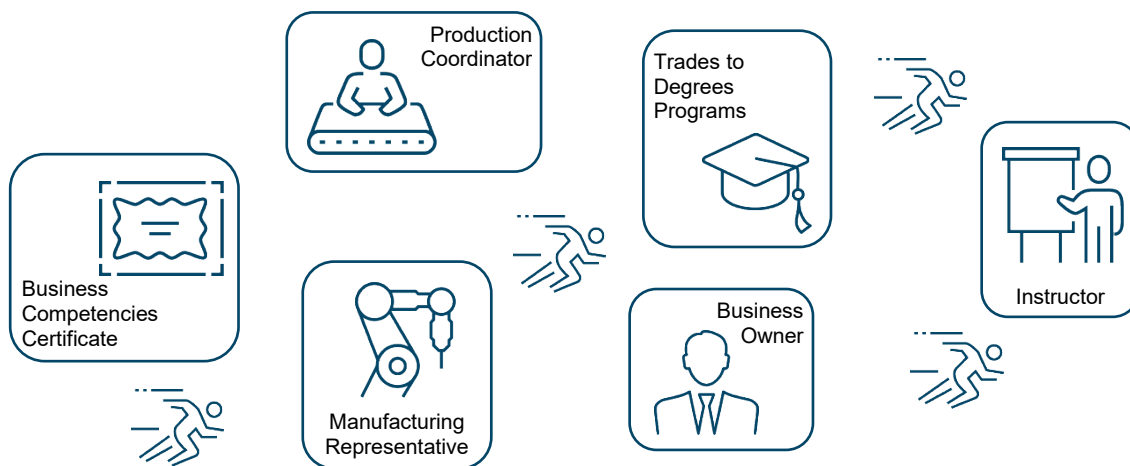
Grades for the theory component of technical training are calculated and based on a cumulative weighted average. To complete a period of technical training successfully, an apprentice must achieve a minimum cumulative weighted average of 65% across all sections in the technical training component of their apprenticeship education program with no grades below 50% in any one section.

Lab and shop components are calculated as a cumulative weighted average requiring a minimum of 65% with a minimum grade of 65% in each section.

Thriving

Successful completion of the Refrigeration and air conditioning mechanic Apprenticeship Education Program is an accomplishment that should be celebrated and can continue to be a successful provider and career choice for a lifetime.

It can also become a useful lever that opens doors leading to future career choice enhancers and/or create alternate professions pathways. This may include some of the following:



Defined Learning

Core competence (Major category)

The section introduction paragraph outlines the intent of the skill set listed below and how it connects to other skill sets such as competency groups and competency levels in the case of a multi-period group (i.e. Electrical I, Electrical II).

The major category is the grouping of work-related tasks that combine to form an identifiable portion of the trade.

Competence statement

This statement is a core competence as identified by industry. It is followed by the **weighting**, which provides and supports a guideline for instructional focus and assessment structure.



NOTE: Competence Statements will be identified by this symbol.

Weighting %

Each competence is assigned a weighting (in percent) by industry to reflect the amount of available time that is dedicated to it, on average, in the learning environment. This percentage is then converted to hours based on the total hours available for the entire training period. All percentages will total 100%.

Example: Core Competence

Foundational Skill, Job Responsibilities and Procedures	27%
Tools, Equipment, and Instruments	9%
Drawing and Specifications	10%
Rigging: Hoisting, Lifting and Load-Moving	28%
Cutting and Fabrication	26%
TOTAL	100%

Supporting competence

A supporting competence is a skill that supports the learning of the competence statement. This competence is a teachable skill that can be assessed to measure the abilities and progress of the learner (see Taxonomy).

It also has an assigned weighting (in percent) that will total 100%, however is derived based on the assigned core competence percentage.

Example: Supporting Competence (Drawing and Specifications) - 10%

Interpret drawings	22% (of 10%)
Interpret specifications.	22% (of 10%)
Layout projects using drawings and/or specifications	56% (of 10%)
TOTAL	100% of 10%

Taxonomy

Taxonomies are a cognitive framework of learning behaviors organized hierarchically in categories: knowledge, comprehension, application, analysis, evaluation, and synthesis. Taxonomy is used as a tool to identify and create learning objectives that define and measure the learning experience for all stakeholders involved.

For the purposes of Alberta's apprenticeship education programs, **supporting competences** are classified into three of these categories; Taxonomy I – **Know it**, Taxonomy II – **Do it** and Taxonomy III – **Solve it**.

These categories identify the type of skill set that will be applied to be successful.

Some supporting competences have multiple taxonomies that will require the training to address different skill sets.



NOTE: A Taxonomy verb list is also attached in the appendix to demonstrate the level and/or complexity of a given taxonomy.

- Taxonomy I competences focus on recollection of facts, definitions, and principles.
- Taxonomy II competences are a procedural application of knowledge (i.e. reference to a step-by-step process).
- Taxonomy III competences deal with critical thinking and problem solving (i.e. diagnosis and analysis).

Course Content Overview



The term ***“In Context”*** indicates that the supporting competence will become integrated learning and/or utilized as a component of the competence statement. It will **not** have an assigned weighting and will **not** be assessed as an examination item.

PERIOD ONE COURSE CONTENT

CORE COMPETENCE ONE: Foundational Skills, Job Responsibilities, and Procedures

Competence Statement:	Supporting Competences:		
Apply foundational skills essential to convey and receive critical training and workplace information.	⇒	A Apply Safety Legislation, Regulations, and Industry Policy in the Trades	B Interpret Codes
			C Select, Use and Maintain Tools and Instruments
	⇒	D Interpret Drawings and Schematics	E Demonstrate Numeracy
			F Demonstrate Communication Skills
	⇒	G Demonstrate Literacy and Digital Literacy	
		<i>In Context</i>	<i>In Context</i>

CORE COMPETENCE TWO: Air Handling

Competence Statement:	Supporting Competences:		
Demonstrate knowledge, understanding and proficiency of air properties, air flow design, air handling systems, accessories and filtration.	⇒	A Calculate Air Properties and Air Flow Design	B Describe Air Handling Systems and Accessories
			C Analyze Air Filtration

CORE COMPETENCE THREE: Refrigeration and Mechanical Cooling

Competence Statement:		Supporting Competences:		
Demonstrate knowledge, understanding and proficiency in refrigeration principles, the vapour compression cycle, gas laws, pressure enthalpy, valve designs, valve functions, refrigerant and oil handling.	⇒	A	B	C
		Describe Refrigeration Principles	Describe Vapor Compression Cycle	Apply Enthalpy and Gas Laws
	⇒	D	E	
		Identify Valve Design and Functions	Demonstrate Refrigerant and Oil Handling	

CORE COMPETENCE FOUR: Controls and Electrical Systems

Competence Statement:		Supporting Competences:		
Demonstrate knowledge, understanding and proficiency in electrical safety, theory, controls, components and design.	⇒	A	B	C
		Use Electrical Safety Equipment, Connections, and Meters	Demonstrate Knowledge on Current, Voltage, and Resistance	Apply Knowledge of Circuits
	⇒	D	E	F
		Describe Methods of Producing Electromotive Force and Magnetism	Demonstrate Fundamental Knowledge of Alternating Current	Demonstrate Knowledge on Control Systems and Components

CORE COMPETENCE FIVE: Heating and Fuel Systems

Competence Statement:		Supporting Competences:		
Demonstrate knowledge, understanding and proficiency in fuel gas properties, regulations, storage, distribution, components and systems.	⇒	A	B	C
		Describe Distribution and Storage of Fuel Gas	Apply Knowledge of the Properties of Gas	Apply Principles of Combustion
	⇒	D		
		Describe Pilot and Pilot Burners		

PERIOD TWO COURSE CONTENT

CORE COMPETENCE ONE: Foundational Skills, Job Responsibilities, and Procedures

Competence Statement:	Supporting Competences:		
Apply foundational skills essential to convey and receive critical training and workplace information.	⇒	A Apply Safety Legislation, Regulations, and Industry Policy in the Trades <i>In Context</i>	B Interpret Codes <i>In Context</i>
		C Select, Use, and Maintain Tools and Instruments <i>In Context</i>	
	⇒	D Interpret Drawings and Schematics <i>In Context</i>	E Demonstrate Numeracy <i>In Context</i>
		F Demonstrate Communication Skills <i>In Context</i>	
	⇒	G Demonstrate Literacy and Digital Literacy <i>In Context</i>	

CORE COMPETENCE TWO: Air Handling

Competence Statement:	Supporting Competences:		
Demonstrate knowledge, understanding and proficiency of air properties, air flow design, air handling systems, accessories and filtration.	⇒	A Calculate Air Properties and Air Flow Design <i>In Context</i>	B Describe Air Handling Systems and Accessories <i>In Context</i>
		C Analyze Air Filtration <i>In Context</i>	

CORE COMPETENCE THREE: Refrigeration and Mechanical Cooling

Competence Statement:	Supporting Competences:		
Demonstrate knowledge, understanding and proficiency in refrigeration principles, the vapour compression cycle, gas laws, pressure enthalpy, valve designs, valve functions, refrigerant and oil handling.	⇒	A Describe Refrigeration Principles <i>In Context</i>	B Install and Service Refrigeration and Mechanical Cooling Systems <i>In Context</i>
		C Demonstrate Knowledge of Components in Refrigeration and Mechanical Cooling Systems <i>In Context</i>	
	⇒	D Perform Refrigerant Changeover on Refrigeration and Mechanical Cooling Systems <i>In Context</i>	

CORE COMPETENCE FOUR: Controls and Electrical Systems

Competence Statement:	Supporting Competences:		
Demonstrate knowledge, understanding and proficiency in electrical safety, theory, controls, components and design.	A	B	C
	Connect and Analyze Motors	Connect Transformers	Describe Class 1 and Class 2 Circuits
	D	E	F
	Describe Three-Phase Fundamentals	Troubleshoot Electrical System Faults	Demonstrate Knowledge of Control Systems and Components

CORE COMPETENCE FIVE: Heating and Fuel Systems

Competence Statement:	Supporting Competences:		
Demonstrate knowledge, understanding and proficiency in fuel gas properties, regulations, storage, distribution, components and systems.	A	B	C
	Describe Distribution and Storage of Fuel Gas	Apply Knowledge on the Properties of Gas	Apply Principles of Combustion
	<i>In Context</i>	<i>In Context</i>	<i>In Context</i>
	D	E	F
	Describe Flues, Draft Hoods, and Vent Connections	Install and Service Pressure Regulators	Troubleshoot Basic Heating and Cooling Control Circuit of an HVAC unit
	G		
	Calculate and Adjust Gas Consumption on Burners up to 400 MBH		

PERIOD THREE COURSE CONTENT

CORE COMPETENCE ONE: Foundational Skills, Job Responsibilities, and Procedures

Competence Statement:	Supporting Competences:		
Apply foundational skills essential to convey and receive critical training and workplace information.		A	B
	⇒	Apply Safety Legislation, Regulations, and Industry Policy in the Trades <i>In Context</i>	Interpret Codes <i>In Context</i>
		C	
		Select, Use, and Maintain Tools and Instruments <i>In Context</i>	
	⇒	D	E
		Interpret Drawings and Schematics <i>In Context</i>	Demonstrate Numeracy <i>In Context</i>
		F	
		Demonstrate Communication Skills <i>In Context</i>	
	⇒	G	
		Demonstrate Literacy and Digital Literacy <i>In Context</i>	

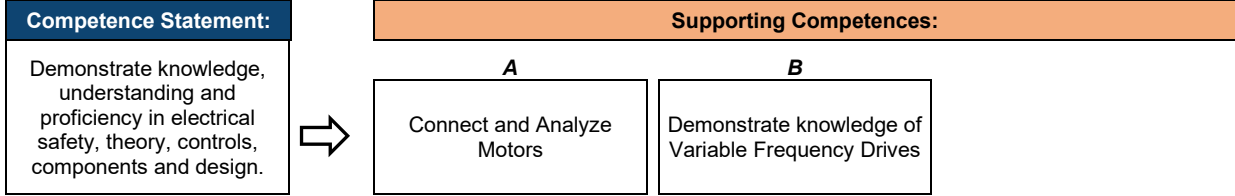
CORE COMPETENCE TWO: Air Handling

Competence Statement:	Supporting Competences:		
Demonstrate knowledge, understanding and proficiency of air properties, air flow design, air handling systems, accessories and filtration.		A	B
	⇒	Calculate Air Properties and Air Flow Design <i>In Context</i>	Describe Air Handling Systems and Accessories <i>In Context</i>
		C	
		Analyze Air Filtration <i>In Context</i>	
	⇒	D	E
		Describe Make-up Air Systems	Use Air Instruments for System Balancing
		F	
		Calculate HVAC Load Requirements	

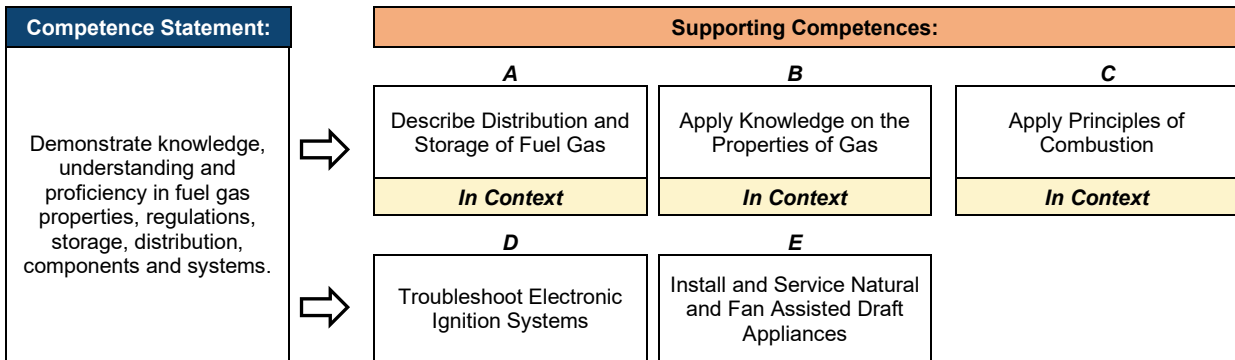
CORE COMPETENCE THREE: Refrigeration and Mechanical Cooling

Competence Statement:	Supporting Competences:		
Demonstrate knowledge, understanding and proficiency in refrigeration principles, the vapour compression cycle, gas laws, pressure enthalpy, valve designs, valve functions, refrigerant and oil handling.		A	B
	⇒	Describe Refrigeration Principles <i>In Context</i>	Demonstrate Knowledge on RAC systems
		C	
		Describe Ice Machine Operations	
	⇒	D	E
		Troubleshoot HVAC/R Systems	Demonstrate Knowledge on Defrost Methods, Circuits, and Controls
		F	
		Design and Install HVAC/R Piping System	
	⇒	G	
		Calculate Refrigeration and Air Conditioning Load Requirements	

CORE COMPETENCE FOUR: Controls and Electrical Systems



CORE COMPETENCE FIVE: Heating and Fuel Systems



PERIOD FOUR COURSE CONTENT

CORE COMPETENCE ONE: Foundational Skills, Job Responsibilities, and Procedures

Competence Statement:		Supporting Competences:		
Apply foundational skills essential to convey and receive critical training and workplace information.	⇒	A Apply Safety Legislation, Regulations, and Industry Policy in the Trades	B Interpret Codes	C Select, Use, and Maintain Tools and Instruments <i>In Context</i>
	⇒	D Interpret Drawings and Schematics	E Demonstrate Numeracy <i>In Context</i>	F Demonstrate Communication Skills <i>In Context</i>
	⇒	G Demonstrate Literacy and Digital Literacy <i>In Context</i>		

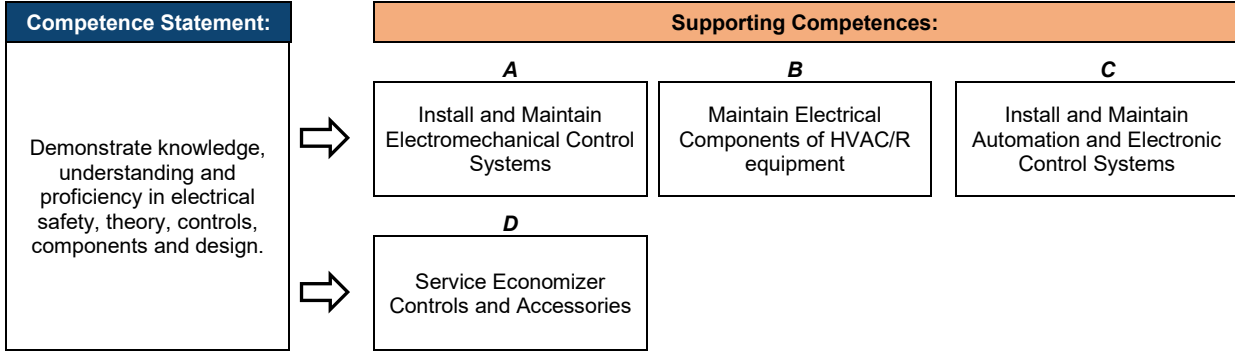
CORE COMPETENCE TWO: Air Handling

Competence Statement:		Supporting Competences:		
Demonstrate knowledge, understanding and proficiency of air properties, air flow design, air handling systems, accessories and filtration.	➡	A	B	C
		Calculate Air Properties and Air Flow Design	Describe Air Handling Systems and Accessories	Analyze Air Filtration
	<i>In Context</i>	<i>In Context</i>	<i>In Context</i>	
	➡	D	E	F
		Service HVAC and Make-up Air systems	Install of HVAC/R Systems	Troubleshoot Make-Up Air Systems
	➡	G	H	
Troubleshoot HVAC/R Systems		Describe New Environmental Technology		

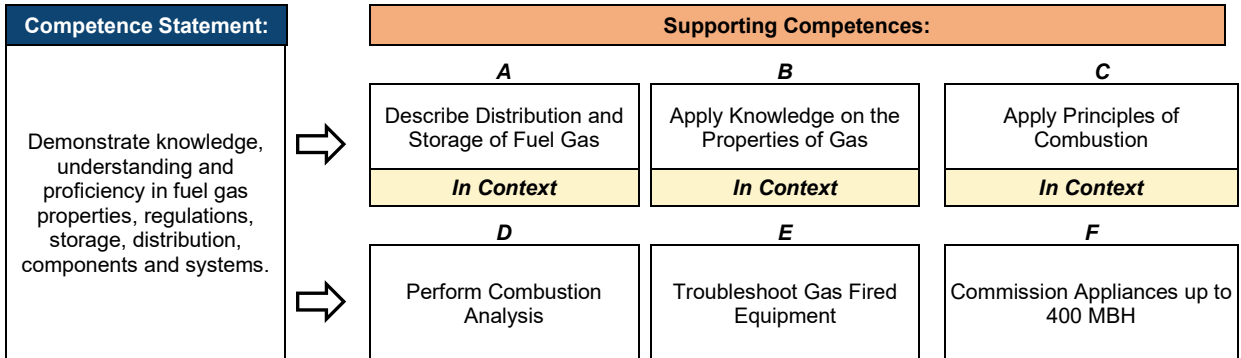
CORE COMPETENCE THREE: Refrigeration and Mechanical Cooling

Competence Statement: Demonstrate knowledge, understanding and proficiency in refrigeration principles, the vapour compression cycle, gas laws, pressure enthalpy, valve designs, valve functions, refrigerant and oil handling.	 	Supporting Competences:		
		A Describe Refrigeration Principles <i>In Context</i>	B Demonstrate Knowledge of Ultra Low Compression Systems	C Service Industrial Refrigeration Systems
		D Service a Chiller System	E Service Multiplex Systems	F Demonstrate Knowledge of Circulating Pumps

CORE COMPETENCE FOUR: Controls and Electrical Systems



CORE COMPETENCE FIVE: Heating and Fuel Systems



Period One Course Content

(8 weeks – 240 hours)

Period One Core Competences	Weighting
Foundational Skills, Job Responsibilities, and Procedures	28%
Air Handling	5%
Refrigeration and Mechanical Cooling	25%
Controls and Electrical Systems	27%
Heating and Fuel Systems	15%

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures Weighting – 28%



The outcomes for this supporting competence include applying safety regulations and industry standards, using tools and equipment, and understanding codes and drawings. It also involves recognizing hazards, completing training, and managing an apprenticeship.



Apply foundational skills essential to convey and receive critical training and workplace information.

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1A. Apply Safety Legislation, Regulations & Industry Policy in the Trades	I, II	31%
1B. Interpret Codes	I, II	15%
1C. Select, Use, and Maintain Tools and Instruments	I, II	48%
1D. Interpret Drawings and Schematics	I, II	6%
1E. Demonstrate Numeracy		In Context

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1F. Demonstrate Communication Skills		In Context
1G. Demonstrate Literacy and Digital Literacy		In Context

Core Competence 2: Air Handling

Weighting – 5%



The outcomes for this supporting competence include mastering air flow design, maintaining air handling systems and accessories, and analyzing air filtration efficiencies. It also involves installing and aligning fans, belts, and mechanical drives, ensuring optimal system performance and air quality.



Demonstrate knowledge, understanding and proficiency of air properties, air flow design, air handling systems, accessories and filtration.

Core Competence 2: Air Handling

Supporting Competence	Taxonomy	Weighting
2A. Calculate Air Properties and Air Flow Design	I, II, III	34%
2B. Describe Air Handling Systems and Accessories	I, II	33%
2C. Analyze Air Filtration	I, II, III	33%

Core Competence 3: Refrigeration and Mechanical Cooling

Weighting – 25%



The outcomes for this supporting competence include understanding refrigeration principles, describing the vapour compression cycle, applying gas laws and pressure enthalpy charts, identifying valve designs and functions, and demonstrating refrigerant and oil handling. It also involves performing calculations, converting temperatures and pressures, and maintaining refrigeration systems for optimal performance.



Demonstrate knowledge, understanding and proficiency in refrigeration principles, the vapour compression cycle, gas laws, pressure enthalpy, valve designs, valve functions, refrigerant and oil handling.

Core Competence 3: Refrigeration and Mechanical Cooling

Supporting Competence	Taxonomy	Weighting
3A. Describe Refrigeration Principles	I, II	23%
3B. Describe the Vapour Compression Cycle	I, II	18%
3C. Describe Gas Laws and Pressure Enthalpy	I, II	33%
3D. Identify Valve Designs and Functions	I, II	7%
3E. Demonstrate Refrigerant and Oil Handling	I, II	19%

Core Competence 4: Controls and Electrical Systems**Weighting – 27%**

The outcomes for this supporting competence include using electrical safety equipment, understanding current, voltage, and resistance, applying circuit knowledge, describing EMF and magnetism, demonstrating knowledge of alternating current, and maintaining HVAC/R control systems for optimal performance.



Demonstrate knowledge, understanding and proficiency in electrical safety, theory, controls, components and design.

Core Competence 4: Controls and Electrical Systems

Supporting Competence	Taxonomy	Weighting
4A. Use Electrical Safety Equipment, Connections, and Meters	I, II	12%
4B. Demonstrate knowledge of Current, Voltage, and Resistance	I, II, III	9%
4C. Apply Knowledge of Circuits	I, II, III	22%
4D. Describe Methods of Producing Electromotive Force (EMF) and Magnetism	I, II	12%
4E. Demonstrate Fundamental Knowledge of Alternating Current	I, II	9%
4F. Demonstrate Knowledge on Control Systems and Components	I, II	36%

Core Competence 5: Heating and Fuel Systems

Weighting – 15%



The outcomes for this supporting competence include describing the distribution and storage of natural and propane gas, understanding fuel gas properties, calculating pressures, and explaining combustion principles. It also involves adhering to regulations, performing calculations, and ensuring safe practices with fuel gases and gas-fired equipment.



Demonstrate knowledge, understanding and proficiency in fuel gas properties, regulations, storage, distribution, components and systems.

Core Competence 5: Heating and Fuel Systems

Supporting Competence	Taxonomy	Weighting
5A. Describe Distribution and Storage of Fuel Gas	I, II, III	49%
5B. Apply Knowledge on the Properties of Fuel Gas	I, II, III	29%
5C. Apply Principles of Combustion	I	6%
5D. Describe Pilot and Pilot Burners	I, II	16%

Period Two Course Content

(8 weeks – 240 hours)

Period Two Core Competences	Weighting
Foundational Skills, Job Responsibilities, and Procedures	1%
Air Handling	N/A
Refrigeration and Mechanical Cooling	52%
Controls and Electrical Systems	25%
Heating and Fuel Systems	22%

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures Weighting – 1%



The outcomes for this supporting competence include understanding the application of the Canadian Electrical Code (CEC) in relation to the safe installation and maintenance of HVAC/R equipment and identifying those responsible for electrical installations.



Apply foundational skills essential to convey and receive critical training and workplace information.

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1A. Apply Safety Legislation, Regulations & Industry Policy in the Trades		In Context
1B. Interpret Codes	II	100%
1C. Select, Use, and Maintain Tools and Instruments		In Context
1D. Interpret Drawings and Schematics		In Context

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1E. Demonstrate Numeracy		In Context
1F. Demonstrate Communication Skills		In Context
1G. Demonstrate Literacy and Digital Literacy		In Context

Core Competence 2: Air Handling

Weighting – 0%



The outcomes for this supporting competence include mastering air flow design, maintaining air handling systems and accessories, and analyzing air filtration efficiencies. It also involves installing and aligning fans, belts, and mechanical drives, ensuring optimal system performance and air quality.



Demonstrate knowledge, understanding and proficiency of air properties, air flow design, air handling systems, accessories and filtration.

Core Competence 2: Air Handling

Supporting Competence	Taxonomy	Weighting
2A. Calculate Air Properties and Air Flow Design		In Context
2B. Describe Air Handling Systems and Accessories		In Context
2C. Analyze Air Filtration		In Context

Core Competence 3: Refrigeration and Mechanical Cooling

Weighting – 52%



The outcomes for this supporting competence include installing, commissioning, and troubleshooting refrigeration and mechanical cooling systems, identifying and operating system components, and performing refrigerant changeovers. It also involves preparing schematics, performing start-ups, and ensuring optimal system functionality and safety.



Demonstrate knowledge, understanding and proficiency in refrigeration principles, the vapour compression cycle, gas laws, pressure enthalpy, valve designs, valve functions, refrigerant and oil handling.

Core Competence 3: Refrigeration and Mechanical Cooling

Supporting Competence	Taxonomy	Weighting
3A. Describe Refrigeration Principles		In Context
3B. Install and Service Refrigeration and Mechanical Cooling Systems	I, II, III	49%
3C. Demonstrate Knowledge of Components in Refrigeration and Mechanical Cooling Systems.	I, II	45%
3D. Perform Refrigerant Changeover on Refrigeration and Mechanical Cooling Systems.	I, II	6%

Core Competence 4: Controls and Electrical Systems

Weighting – 25%



The outcomes for this supporting competence include connecting and analyzing motors, compressors, and transformers, understanding three-phase electrical systems, troubleshooting electrical faults, and demonstrating knowledge of control system, circuits and components.



Demonstrate knowledge, understanding and proficiency in electrical safety, theory, controls, components and design.

Core Competence 4: Controls and Electrical Systems

Supporting Competence	Taxonomy	Weighting
4A. Connect and Analyze Motors	I, II, III	39%
4B. Connect Transformers	I, II, III	7%
4C. Describe Class 1 and Class 2 Circuits	I	3%
4D. Describe Three-Phase Fundamentals	I, II	10%
4E. Troubleshooting Electrical Systems Faults	I, II, III	15%
4F. Demonstrate Knowledge of Control Systems and Components	I, II	26%

Core Competence 5: Heating and Fuel Systems

Weighting – 22%



The outcomes for this supporting competence include servicing draft hoods, vent connectors, pressure regulators, orifices, pilots, pilot burners, and propane storage systems, and troubleshooting HVAC control circuits.



Demonstrate knowledge, understanding and proficiency in fuel gas properties, regulations, storage, distribution, components and systems.

Core Competence 5: Heating and Fuel Systems

Supporting Competence	Taxonomy	Weighting
5A. Describe Distribution and Storage of Fuel Gas		In Context
5B. Apply Knowledge on the Properties of Gas		In Context
5C. Apply Principles of Combustion		In Context
5D. Describe Flues, Draft Hoods, and Vent Connections	I, II	11%
5E. Install and Service Pressure Regulators and Orifices	I, II	28%
5F. Troubleshoot Basic Heating and Cooling Control Circuits of an HVAC Unit.	I, II, III	35%
5G. Demonstrate Knowledge on Burners up to 400 MBH Adjustments and Calculate Gas Consumption	I, II	26%

Period Three Course Content

(8 weeks – 240 hours)

Period Three Core Competences	Weighting
Foundational Skills, Job Responsibilities, and Procedures	2%
Air Handling	9%
Refrigeration and Mechanical Cooling	51%
Controls and Electrical Systems	8%
Heating and Fuel Systems	30%

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures Weighting – 2%



The outcomes for this supporting competence include applying the B52 Mechanical Refrigeration Code and the Canadian Code of Practice to ensure safe and compliant installation and maintenance of refrigeration and air conditioning equipment in Alberta and interpreting electrical diagrams for HVAC systems.



Apply foundational skills essential to convey and receive critical training and workplace information.

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1A. Apply Safety Legislation, Regulations & Industry Policy in the Trades		In Context
1B. Interpret Codes	I, II	40%
1C. Select, Use, and Maintain Tools and Instruments		In Context
1D. Interpret Drawings and Schematics	I, II	60%
1E. Demonstrate Numeracy		In Context

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1F. Demonstrate Communication Skills		In Context
1G. Demonstrate Literacy and Digital Literacy		In Context

Core Competence 2: Air Handling**Weighting – 9%**

The outcomes for this supporting competence include calculating air properties and air flow design, servicing make-up air units, using air instruments for system balancing, and calculating HVAC load requirements. It also involves understanding advanced air flow calculations, psychrometric charts, and troubleshooting techniques for HVAC systems.



Demonstrate knowledge, understanding and proficiency of air properties, air flow design, air handling systems, accessories and filtration.

Core Competence 2: Air Handling

Supporting Competence	Taxonomy	Weighting
2A. Calculate Air Properties and Air Flow Design	I, II	28%
2B. Describe Air Handling Systems and Accessories		In Context
2C. Analyze Air Filtration		In Context
2D. Describe Make-Up Air Systems	I, II	27%
2E. Use Air Instruments for System Balancing	I, II	18%
2F. Calculate HVAC Load requirements	I, II, III	27%

Core Competence 3: Refrigeration and Mechanical Cooling

Weighting – 51%



The outcomes for this supporting competence include demonstrating knowledge of air conditioning and industrial refrigeration systems, installing and maintaining ice machines, troubleshooting HVAC/R systems, understanding defrost methods, designing and installing HVAC/R piping systems, and calculating load requirements for refrigeration and air conditioning systems.



Demonstrate knowledge, understanding and proficiency in refrigeration principles, the vapour compression cycle, gas laws, pressure enthalpy, valve designs, valve functions, refrigerant and oil handling.

Core Competence 3: Refrigeration and Mechanical Cooling

Supporting Competence	Taxonomy	Weighting
3A. Describe Refrigeration Principles		In Context
3B. Demonstrate Knowledge on RAC Systems	I, II	29%
3C. Describe Ice Machine Operations	I, II	2%
3D. Troubleshoot HVAC/R Systems	I, II, III	18%
3E. Demonstrate Knowledge of Defrost methods, Circuits and Controls	I, II, III	7%
3F. Design and Install HVAC/R Piping System	I, II, III	24%
3G. Calculate Refrigeration and Air Conditioning Load Requirements.	I, II	20%

Core Competence 4: Controls and Electrical Systems

Weighting – 8%



The outcomes for this supporting competence include installing, analyzing, and troubleshooting three-phase motors and variable frequency drives (VFDs), understanding motor connections, protection, and characteristics, and programming VFDs for optimal performance.



Demonstrate knowledge, understanding and proficiency in electrical safety, theory, controls, components and design.

Core Competence 4: Controls and Electrical Systems

Supporting Competence	Taxonomy	Weighting
4A. Connect and Analyze Motors	I, II, III	70%
4B. Demonstrate Knowledge of Variable Frequency Drives (VFD)	I, II, III	30%

Core Competence 5: Heating and Fuel Systems**Weighting – 30%**

The outcomes for this supporting competence include troubleshooting electronic ignition systems, installing and servicing natural and fan-assisted draft appliances, venting systems, air supply systems, gas appliances, and gas-fired boilers. It also involves understanding regulations, performing installations, and ensuring safe and efficient operation of HVAC systems.



Demonstrate knowledge, understanding and proficiency in fuel gas properties, regulations, storage, distribution, components and systems.

Core Competence 5: Heating and Fuel Systems

Supporting Competence	Taxonomy	Weighting
5A. Describe Distribution and Storage of Fuel Gas		In Context
5B. Apply Knowledge on the Properties of Gas		In Context
5C. Apply Principles of Combustion		In Context
5D. Troubleshoot Electronic ignition Systems	I, II	11%
5E. Install and Service Natural and Fan Assisted Draft Appliances	I, II, III	89%

Period Four Course Content

(8 weeks – 240 hours)

Period Four Core Competences	Weighting
Foundational Skills, Job Responsibilities, and Procedures	10%
Air Handling	28%
Refrigeration and Mechanical Cooling	28%
Controls and Electrical Systems	21%
Heating and Fuel Systems	13%

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures Weighting – 10%



The outcomes for this supporting competence include using Red Seal products to challenge an interprovincial examination, applying the B52 Mechanical Refrigeration Code and the Canadian Code of Practice for HVAC/R piping systems, and demonstrating knowledge of HVAC/R drawings and schematic diagrams.



Apply foundational skills essential to convey and receive critical training and workplace information.

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1A. Apply Safety Legislation, Regulations & Industry Policy in the Trades	I	8%
1B. Interpret Codes	I, II	17%
1C. Select, Use, and Maintain Tools and Instruments		In Context
1D. Interpret Drawings and Schematics	I, II	75%

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1E. Demonstrate Numeracy		In Context
1F. Demonstrate Communication Skills		In Context
1G. Demonstrate Literacy and Digital Literacy		In Context

Core Competence 2: Air Handling**Weighting – 28%**

The outcomes for this supporting competence include installing, maintaining and servicing complex HVAC systems and make-up air systems. It involves understanding components, control methods, maintenance procedures, and systematic troubleshooting approaches and applications of new technology.



Demonstrate knowledge, understanding and proficiency of air properties, air flow design, air handling systems, accessories and filtration.

Core Competence 2: Air Handling

Supporting Competence	Taxonomy	Weighting
2A. Calculate Air Properties and Air Flow Design		In Context
2B. Describe Air Handling Systems and Accessories		In Context
2C. Analyze Air Filtration		In Context
2D. Service HVAC and Make-Up Air Systems	I, II	52%
2E. Install of HVAC/R Systems	I, II	12%
2F. Troubleshoot Make-Up Air Systems.	I, II, III	14%
2G. Troubleshoot Complex HVAC Systems.	I, II, III	18%
2H. Describe New Environmental Technology	I, II	4%

Core Competence 3: Refrigeration and Mechanical Cooling

Weighting – 28%



The outcomes for this supporting competence include servicing ultra-low temperature systems, industrial refrigeration systems, chiller systems, multiplex systems, and circulating pumps. It involves understanding components, refrigerants, troubleshooting techniques, and performing installations and analyses for optimal system performance.



Demonstrate knowledge, understanding and proficiency in refrigeration principles, the vapour compression cycle, gas laws, pressure enthalpy, valve designs, valve functions, refrigerant and oil handling.

Core Competence 3: Refrigeration and Mechanical Cooling

Supporting Competence	Taxonomy	Weighting
3A. Describe Refrigeration Principles		In Context
3B. Demonstrate Knowledge on Ultra Low Compression Systems.	I, II	13%
3C. Service Industrial Refrigeration Systems	I, II, III	30%
3D. Service Chiller Systems	I, II	21%
3E. Service Multiplex Systems	I, II, III	24%
3F. Demonstrate Knowledge on Circulating Pumps	I, II	12%

Core Competence 4: Controls and Electrical Systems

Weighting – 21%



The outcomes for this supporting competence include installing, maintaining, and troubleshooting electromechanical, automation, electronic control systems, and economizer controls, as well as maintaining electrical components of HVAC/R equipment.



Demonstrate knowledge, understanding and proficiency in electrical safety, theory, controls, components and design.

Core Competence 4: Controls and Electrical Systems

Supporting Competence	Taxonomy	Weighting
4A. Install and Maintain Electromechanical Control Systems.	I, II	24%
4B. Maintain Electrical Components of HVAC/R equipment	I, II, III	20%
4C. Install and Maintain Automation and Electronic Control Systems.	I, II	30%
4D. Service Economizer Controls and Accessories	I, II	26%

Core Competence 5: Heating and Fuel Systems**Weighting – 13%**

The outcomes for this supporting competence include performing combustion analysis, troubleshooting gas-fired equipment, and commissioning appliances up to 400 MBH. It involves understanding combustion procedures, safety concerns, systematic troubleshooting approaches, appliance setup and verification.



Demonstrate knowledge, understanding and proficiency in fuel gas properties, regulations, storage, distribution, components and systems.

Core Competence 5: Heating and Fuel Systems

Supporting Competence	Taxonomy	Weighting
5A. Describe Distribution and Storage of Fuel Gas		In Context
5B. Apply Knowledge on the Properties of Gas		In Context
5C. Apply Principles of Combustion		In Context
5D. Perform Combustion Analysis	I, II	27%
5E. Troubleshoot Gas Fired Equipment	I, II	33%
5F. Commission Appliances up to 400 MBH	I, II	40%

Taxonomy Verb List

This is a list of common verbs used to demonstrate the level and/or complexity of a given taxonomy. It is only intended as a guide and is not meant to exclude additional verbs.

Taxonomy I (*Recall It*)

Verbs	
Convert	Define
Describe	Explain
Identify	List
Recognize	State

Taxonomy II (*Do It*)

Verbs	
Apply	Connect
Demonstrate	Draw
Extract	Locate
Maintain	Perform
Select	Splice
Tap	Terminate
Use	

Taxonomy III (*Solve It*)

Verbs	
Analyze	Calculate
Create	Determine
Develop	Interpret
Program	Solve
Troubleshoot	Verify



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