



Refrigeration and Air Conditioning Mechanic On-the-Job Training Guide

2024

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Recognition:

To promote transparency and consistency, this document has been adapted from the 2019 Refrigeration and Air Conditioning Mechanic Red Seal Occupational Standard (Employment and Social Development Canada).

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



STRUCTURE OF THE ON-THE-JOB TRAINING GUIDE

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

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

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

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

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

On-the-Job and In-school Training Content for the Refrigeration and Air Conditioning Trade: a chart which outlines the topics of technical training with on-the-job examples for apprentices to achieve relevant experience at work.

TRAINING REQUIREMENTS FOR THE REFRIGERATION AND AIR CONDITIONING MECHANIC TRADE

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

Journeyman to apprentice ratio for this trade is: 1:2

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

The information contained in this document serves as a guide for employers and apprentices. Apprenticeship training is mutually beneficial to both employer and apprentice. The employer's investment in training apprentices results in skilled and certified workers. The document summarizes the tasks to be covered by the apprentice during their on-the-job portion of apprenticeship training. An apprentice spends approximately 85% of their apprenticeship term training on-the-job.

It is the employer's or journeyman's responsibility to supervise an apprentice's practical skills development until a satisfactory level of proficiency has been reached.

EMPLOYER TRAINING RESPONSIBILITY

- promote a safety-conscious workplace
- provide mentored, hands-on practice in the use of tools and equipment
- demonstrate procedures relevant to layout, forming, framing, exterior and interior finishing
- further the apprentice's ability to interpret technical drawings
- allow the apprentice to apply procedures used for estimating materials, costing projects and supervising personnel
- ensure that the apprentice can evaluate the end product
- where possible, expose the apprentice to new technology in the Carpenter trade

Employers should make every effort to expose their apprentices to work experience in as many areas of the trade as possible.

In the On-the-Job Training Guide, in-school instruction is listed first; on-the-job suggestions to help employers assist the apprentice to prepare for in-school training are listed next.

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

REFRIGERATION AND AIR CONDITIONING MECHANIC TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2019 Refrigeration and Air Conditioning Mechanic Red Seal Occupational Standard. Each sub-task details the corresponding essential skill and level of training where the content is covered. *

* Sub Tasks with numbers in the boxes is where the content will be delivered in training

A – Performs Common Occupational Skills

10%

A-1 Performs safety-related functions	A-1.01 Maintains safe work environment 1, In Context in 2, 3, 4	A-1.02 Performs lock-out, tag-out and isolation procedures 1, In Context in 2, 3, 4	A-1.03 Uses personal protective equipment (PPE) and safety equipment 1, In Context in 2, 3, 4		
A-2 Uses tools and equipment	A-2.01 Uses hand tools 1, In Context in 2, 3, 4	A-2.02 Uses portable and stationary power tools 1, In Context in 2, 3, 4	A-2.03 Uses brazing and soldering equipment 1, In Context in 2, 3, 4	A-2.04 Uses recovery and recycling tools and equipment 1, In Context in 2, 3, 4	A-2.05 Uses evacuation tools and equipment 1, In Context in 2, 3, 4
	A-2.06 Uses charging tools and equipment 1, In Context in 2, 3, 4	A-2.07 Uses diagnostic and measuring tools and equipment 1, In Context in 2, 3, 4	A-2.08 Uses access equipment 1, In Context in 2, 3, 4)	A-2.09 Uses rigging, hoisting and lifting equipment 1, In Context in 2, 3, 4	A-2.10 Uses digital technology 1, In Context in 2, 3, 4
A-3 Organizes work	A-3.01 Interprets drawings and specifications 2, 3, 4	A-3.02 Uses documentation and reference material 1, 2, 3, 4	A-3.03 Plans job tasks and procedures 1, 2, 3, 4		

A-4 Uses communication and mentoring techniques

A-4.01 Uses communication techniques

1, 4

A-4.02 Uses mentoring techniques

4

B – Performs Routine Trade Activities

15%

B-5 Performs work site preparation

B-5.01 Prepares work site

1

B-5.02 Handles materials and supplies

1

B-6 Performs trade activities

B-6.01 Performs brazing and soldering

1

B-6.02 Performs leak and pressure tests on system

1

B-6.03 Evacuates systems

1

B-6.04 Uses refrigerants, gases and oils

1, 2

B-6.05 Performs field wiring of systems

1, 2

B-6.06 Applies sealants and adhesives

1

C – Plans installation

14%

C-7 Plans installation of HVAC/R systems

C-7.01 Verifies HVAC/R system parameters and requirements

3, 4

C-7.02 Selects HVAC/R equipment, components and accessories

2, 3, 4

C-7.03 Determines placement of HVAC/R equipment, components and accessories

1, 2, 3, 4

C-7.04 Performs HVAC/R material take-off

2, 3, 4

C-8 Plans installation of control systems	C-8.01 Verifies control system parameters and requirements 3, 4	C-8.02 Selects control system components and accessories 2, 3, 4	C-8.03 Determines placement of control system components and accessories 1, 2, 3, 4	C-8.04 Performs control system material take-off 2, 3, 4	
C-9 Installs concrete, cement-based and epoxy products	C-9.01 Confirms system layout 3	C-9.02 Facilitates curing of concrete 2, 3	C-9.03 Places HVAC/R equipment, components and accessories 1, 3	C-9.04 Installs fasteners, brackets and hangers 1	C-9.05 Installs HVAC/R piping and tubing 1
	C-9.06 Applies HVAC/R holding charge 1				

D – Performs Installation

21%

D-9 Installs HVAC/R systems	D-9.01 Confirms system layout 1, 3	D-9.02 Assembles HVAC/R equipment, components and accessories 2, 3	D-9.03 Places HVAC/R equipment, components and accessories 1, 2, 3	D-9.04 Installs fasteners, brackets and hangers 1	D-9.05 Installs HVAC/R piping and tubing 1
	D-9.06 Applies HVAC/R holding charge 1				
D-10 Installs control systems	D-10.01 Places control system components 1, 2, 3	D-10.02 Connects control systems 1, 2, 3			

E – Performs Commissioning

17%

E-11 Commissions HVAC/R systems	E-11.01 Performs pre-start-up checks for HVAC/R systems 3, 4	E-11.02 Performs start-up of HVAC/R systems 3, 4	E-11.03 Completes HVAC/R system charge 3, 4	E-11.04 Sets up primary and secondary HVAC/R system components 3, 4
E-12 Commissions control systems	E-12.01 Performs start-up checks for control systems 3, 4	E-12.02 Verifies/sets operating parameters 3, 4		

F – Performs Maintenance and Service

23%

F-13 Maintains HVAC/R systems	F-13.01 Inspects HVAC/R systems 1, 2 In Context in 3, 4	F-13.02 Performs predictive and scheduled maintenance on HVAC/R systems 1, 2 In Context in 3, 4	F-13.03 Tests HVAC/R system components and accessories 1, 2 In Context in 3, 4	
F-14 Services HVAC/R systems	F-14.01 Troubleshoots HVAC/R systems 2, 3, 4	F-14.02 Repairs HVAC/R systems 2, 3, 4		
F-15 Maintains and services control systems	F-15.01 Performs maintenance and inspection on control systems 2, 3, 4	F-15.02 Troubleshoots control systems 2, 3, 4	F-15.03 Calibrates operating and safety controls 2, 3, 4	F-15.04 Repairs control systems 2, 3, 4

TRAINING PROFILE CHART

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

Level One	Transcript Code	Hours
Controls	CNTR 181	14
Electrical	ELEC 132	24
Graphics	GRPH 182	14
Mathematics	MATH 109	14
Components and Accessories	RFRG 102	14
Fundamentals of Refrigeration	RFRG 196	14
Basic Refrigeration Cycle	RFRG 198	14
Refrigerants	RFRG 199	14
Basic System Applications	SYST 180	24
Hand Skills and Service Techniques	TOOL 105	24
Hand Tools	TOOL 133	18
Welding	WLDR 132	18
Safety	SFTY 108	18
HVAC Basics	RFRG 105	16
		240

Level Two	Transcript Code	Hours
Electricity and Electrical Applications	ELEC 204	20
Electricity	ELEC 207	18
Trade Mathematics	MATH 286	12
Intro to Commercial Applications	RFRG 201	22
Refrigeration Flow Controls and Accessories	RFRG 202	20
Drafting	GRPH 280	12
Motors and Motor Electrics	RFRG 204	20
Comprehensive Systems Analysis	RFRG 206	20
Commercial Applications	RFRG 207	36
Medium Temp Applications	RFRG 208	34
Control Systems	RFRG 209	26
		240

Level Three	Transcript Code	Hours
Electricity	ELEC 384	18
Graphics	GRPH 380	14
Mathematics	MATH 382	12
Systems and Service Management	RFRG 381	14
Piping and Line Sizing	RFRG 382	16
Capacity and Head Pressure	RFRG 383	16
Commercial Refrigeration Systems and Service	RFRG 384	18
HVAC Systems	RFRG 385	32
Practical Refrigeration Applications	RFRG 386	28
Practical HVAC Applications	RFRG 387	28
Control Systems Wiring	RFRG 388	30
Troubleshooting and Systems Analysis	RFRG 389	14
		240

Level Four	Transcript Code	Hours
Electrical	ELEC 482	18
Graphics	GRPH 480	12
Mathematics	MATH 480	12
Enthalpy and Psychrometrics	RFRG 481	32
Load Calculation and Equipment Selection	RFRG 482	25
Advanced Commercial and Industrial Systems	RFRG 483	32
HVAC Systems	RFRG 484	34
Refrigeration Service Application	RFRG 485	30
HVAC Service Applications	RFRG 486	15
Control Systems Applications	RFRG 487	30
		240

ON-THE-JOB AND IN-SCHOOL TRAINING

CONTENT FOR THE REFRIGERATION AND AIR CONDITIONING MECHANIC TRADE

This chart outlines on-the-job examples for apprentices to achieve relevant work experience to prepare for the topics of technical training. Topics of technical training are provided with the associated learning outcomes.

Level One	8 weeks	240 hours
Controls <ul style="list-style-type: none">• identify electrical controls• install basic cycling controls• set up basic circuits• adjust basic cycling controls <p>Mentors can assist the apprentice to prepare for this section of technical training by:</p> <ul style="list-style-type: none">• <i>explaining and demonstrating the installation of electrical controls</i>• <i>demonstrating the set up and adjustment of cycling controls</i>• <i>describing the function of electrical controls</i>		14 hours
Electrical <ul style="list-style-type: none">• describe an electrical circuit• explain electrical voltage• explain electrical current• explain electrical resistance• use a multimeter• perform electrical calculations using ohm's law• describe the operation of series electric circuits• describe the operation of parallel circuits <p>Mentors can assist the apprentice to prepare for this section of technical training by:</p> <ul style="list-style-type: none">• <i>demonstrating the use of a multimeter</i>• <i>explaining the operation of electrical circuits</i>• <i>explaining and demonstrate electrical calculations</i>		24 hours
Graphics <ul style="list-style-type: none">• draw a two-dimensional object• use engineering lettering• sketch orthographic views• use compass-circles, curves, arcs• use scales to reduce and enlarge drawings• use basic dimensioning• sketch isometric and oblique drawings• prepare sectional drawings• prepare detail working assembly drawings		14 hours

Mentors can assist the apprentice to prepare for this section of technical training by:

- *reviewing and explaining on-site prints and shop drawings, discussing what different symbols represent*
- *explaining and demonstrating how a scale ruler is used and interpreted*
- *demonstrating how on-site blueprints and hand-drawn isometric drawings are used for material take off*

Mathematics

14 hours

- use basic mathematics
- perform trade calculations

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the importance of mathematical calculations on the job*
- *demonstrating the use of mathematical calculations*

Components and Accessories

14 hours

- explain the function of a compressor
- compare metering devices
- explain the purpose and operation of an evaporator
- explain the purpose and operation of a condenser

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the different components of a compressor*
- *explaining the function and operation of evaporators, compressors, condensers and metering devices*

Fundamentals of Refrigeration

14 hours

- discuss trade terminology
- compare temperature and temperature measurement
- compare pressure and pressure measurement
- identify types of heat and heat transfer
- explain change of state of a substance
- compare types of latent heat

Mentors can assist the apprentice to prepare for this section of technical training by:

- *using proper trade terminology*
- *explaining temperature and pressure measurements*
- *explaining the concept of heat transfer*

Basic Refrigeration Cycle

14 hours

- sketch a basic cycle diagram
- describe refrigerant condition in each component
- explain the function of each system component
- solve refrigeration system problems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrate the function of refrigeration system components*
- *explaining refrigeration cycle diagrams*

Refrigerants**14 hours**

- select refrigerants
- apply refrigerant safety practices
- choose acceptable refrigerant service techniques

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the different kinds of refrigerants*
 - *demonstrating refrigerant servicing*
-

Basic System Applications**24 hours**

- assemble a refrigeration system
- perform startup procedures
- conduct system analysis
- demonstrate knowledge of effective communication practices

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating the assembly of refrigeration system equipment*
 - *explaining and demonstrating start-up procedures*
 - *explaining system analysis*
-

Hand Skills and Service Techniques**24 hours**

- identify copper tubing
- demonstrate hand skills used for installation procedures
- choose service techniques and equipment

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating and explaining service techniques to troubleshoot and repair HVAC/R equipment*
 - *explaining materials used for HVAC/R repair*
-

Welding**18 hours**

- describe the safe assembly, operation and maintenance of oxy-fuel system
- demonstrate the safe assembly, operation and maintenance when torch brazing
- demonstrate the safe assembly, operation and maintenance when oxy-fuel cutting on gauge metal and plate
- identify safety hazards

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrate the use of welding equipment*
 - *providing the opportunity for soldering and brazing*
-

Hand Tools**18 hours**

- select materials
- use hand tools
- use power tools
- identify safety issues
- perform measurements
- determine grinding wheel applications

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating the safe use and care of hand and power tools*
- *demonstrating the correct tools used for a particular job task*

Safety

18 hours

- discuss safe work practices
- discuss WHMIS
- demonstrate safe work practices
- demonstrate knowledge of access equipment applications, maintenance and procedures for proper use
- demonstrate knowledge of rigging, hoisting and lifting equipment applications, communication methods, maintenance and procedures for proper use

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating safe work practices*
- *explaining workplace hazards*
- *demonstrating access equipment use*
- *using hoisting and rigging equipment*
- *using crane hand signals*
- *demonstrating proper PPE use*

HVAC Basics

16 hours

- examine air properties
- compare air conditioning systems
- select HVAC controls
- interpret air flow problems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining different air conditioning systems*
 - *using HVAC controls*
 - *explaining HVAC air flow problems*
-

Level Two

8 weeks

240 hours

Electricity and Electrical Applications

16 hours

- identify electrical components
- interpret wiring diagrams
- design electrical circuits
- apply troubleshooting techniques

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining wiring diagrams*
 - *demonstrating electrical troubleshooting techniques*
-

Electrical

18 hours

- describe the differences between dc and ac electrical circuits
- perform circuit measurements
- describe reactance and phase shift
- describe the operation of various electrical switching circuits
- describe the operation of a transformer
- describe the operation of an electric relay
- describe the operation of various single phase electric motors and their operating characteristics

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the operation of electrical circuits*
 - *demonstrating electrical troubleshooting techniques*
-

Trade Mathematics

12 hours

- use metric and imperial units
- perform trade calculations

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the importance of mathematical calculations on the job*
 - *demonstrating the use of mathematical calculations*
-

Intro to Commercial Applications

20 hours

- compare temperature applications
- compare defrost methods
- design piping arrangements
- select refrigerant and oil conversion procedures
- identify dehydration and evacuation methods

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining temperature applications*
- *demonstrating defrost methods*
- *explaining and demonstrating piping arrangements*
- *demonstrating evacuation methods*

Refrigeration Flow Controls and Accessories

18 hours

- select refrigerant system accessories
- select refrigerant flow controls
- calibrate refrigerant flow controls

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the selection of refrigerants*
 - *explaining the selection of refrigerant flow controls*
 - *demonstrating calibration of refrigerant flow controls*
-

Drafting

12 hours

- orthographic views
- basic dimensioning
- views/sketch
- true lengths
- basic symbols/layout
- isometric and oblique

Mentors can assist the apprentice to prepare for this section of technical training by:

- *reviewing and explaining on-site prints and shop drawings, discussing what different symbols represent*
 - *explaining and demonstrating how a scale ruler is used and interpreted*
 - *demonstrating how on-site blueprints and hand-drawn isometric drawings are used for material take off*
-

Motors and Motors Electric

18 hours

- identify motor types
- identify motor starting devices
- identify motor protection devices
- identify motor tests

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining different kinds of motors*
 - *explaining motor starting devices*
 - *explaining motor protection devices*
 - *demonstrating motor tests*
-

Comprehensive System Analysis

16 hours

- manage system problems
- select system components and accessories
- select service procedure

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrate service procedures*
 - *explaining possible system problems in HVAC/R systems*
-

Commercial Applications

36 hours

- design a two-temperature commercial system
- assemble a two-temperature system
- install the electrical system
- perform system start-up
- commission system

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the operation of two-temperature commercial systems*
 - *demonstrating the assembly of a two-temperature system*
 - *explaining and demonstrating the startup and commissioning of systems*
-

Medium Temp Applications

34 hours

- construct refrigerated fixtures
- set up system controls
- manage system problems
- perform system start-up
- commission system

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the operation of single temperature commercial systems*
 - *demonstrating the assembly of a single temperature system*
 - *explaining and demonstrating the startup and commissioning of systems*
-

Control Systems

26 hours

- design electrical systems
- select troubleshooting procedures
- solve electrical problems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrate troubleshooting control systems*
 - *explaining and demonstrate troubleshooting electrical systems*
 - *explaining electrical control system layout*
-

Systems and Service Analysis

14 hours

- interpret system problems
- solve system problems
- choose system components, accessories and refrigerant flow controls
- select service procedure
- analyze basic control systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrating troubleshooting techniques*
 - *explaining service procedure*
-

Level Three

8 weeks

240 hours

Electricity

18 hours

- describe the theory of operation of a transformer
- explain three phase electrical power circuits
- describe the operation of three phase electric motors
- explain the operation of various motor control circuits
- describe the operation of various three phase motor starting circuits
- identify capacity control methods
- identify head pressure control methods
- determine electrical requirements
- design the electrical system
- wire electrical systems
- evaluate the electrical system

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrate three phase circuits and motors*
 - *identifying and explaining motor control circuits*
-

Graphics

14 hours

- identify types of specification documents
- identify views used on blueprints and drawings
- sketch an exploded isometric

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrate the use of blueprint documents*
 - *explaining the information found in specification documents*
 - *explaining and demonstrate the uses of isometric piping drawings*
-

Mathematics

12 hours

- use basic geometry and trigonometry
- perform trade calculations

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrating trade related mathematical calculations*
 - *explaining and demonstrating the use of charts to find numerical information*
-

Systems and Service Management

14 hours

- manage system problems
- select refrigerant components, accessories and flow controls
- select service techniques
- analyze control systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating and explain service techniques for various system problems*
 - *explaining the selection of refrigerant components and accessories*
 - *demonstrating the proper tools used for repairs*
-

Piping and Line Sizing

16 hours

- design piping arrangements
- select pipe size
- interpret the mechanical code

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating and supervise apprentices designing piping arrangements*
 - *demonstrating and explaining the selection of pipe sizes*
 - *explaining the mechanical code as it refers to actual on the job circumstances*
-

Capacity and Head Pressure

16 hours

- identify capacity control methods
- identify head pressure control methods

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining capacity control methods*
 - *explaining head pressure control methods*
-

Commercial Refrigeration Systems and Service

18 hours

- analyze refrigerant oil
- analyze compressor failure
- identify refrigeration flow problems
- select refrigerants and oils

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the properties of refrigerant oil*
 - *explaining reasons for compressor failure*
 - *demonstrating refrigerant flow problems*
 - *explaining and demonstrate the selection of refrigerants and oils*
-

HVAC Design and Applications

32 hours

- select gas components
- compare HVAC designs
- interpret HVAC control systems
- identify the basics of pneumatic controls

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the purpose of HVAC components*
 - *demonstrating troubleshooting HVAC control system problems*
 - *explaining how component problems can affect different parts of the HVAC system*
-

Practical Refrigeration Applications

28 hours

- examine ice machines
- examine reach-ins
- examine walk-in coolers
- examine display cases
- service refrigeration equipment

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining refrigerant equipment*
- *demonstrating the servicing of refrigerant equipment*

HVAC Applications

28 hours

- examine window air conditioners
- examine water cooler packages
- examine residential and commercial HVAC systems
- examine mechanical economizers
- service HVAC equipment

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the operation of common HVAC applications*
- *demonstrating the assembly of common HVAC applications*
- *explaining and demonstrating the startup and commissioning of systems*

Control System Wiring

30 hours

- determine electrical requirements
- wire electrical systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *identifying electrical requirements of different control systems*
- *explaining the design of electrical systems*
- *explaining and demonstrating wiring of different electrical systems*
- *explaining how to check that an electrical system is operating correctly*

Troubleshooting and System Analysis

14 hours

- manage system problems
- select system components and accessories
- select service procedures
- analyze control systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *identifying and explaining the selection of system components and accessories*
 - *demonstrating service procedures*
 - *evaluating control systems*
-

Level Four

8 weeks

240 hours

Electrical

18 hours

- describe the operation of a dc power supply circuit and components
- describe the basic operation of programmable logic controllers
- explain power factor and power factor correction

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrating the operation of DC power supply components*
 - *explaining and demonstrating the operation of programmable logic controllers*
 - *demonstrating power factor correction*
-

Graphics

12 hours

- interpret blueprint and manufacturer's drawings
- perform take off from the blueprint and specifications
- prepare labour and materials estimate

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrating the process of take off of material from the blueprint and specifications*
 - *explaining and demonstrating how to prepare labour and material estimates*
 - *providing the apprentice time to interpret blueprint and manufacturer's drawings*
-

Enthalpy and Psychrometrics

32 hours

- interpret a pressure enthalpy diagram
- plot a system on a pressure enthalpy diagram
- compare system performance
- interpret a psychrometric process
- analyze system performance

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining enthalpy diagrams*
 - *demonstrating how to compare system performances*
 - *explaining the psychrometric process*
-

Load Calculation and Equipment Selection

25 hours

- apply heat transfer calculations
- determine refrigeration heat loads
- select refrigeration equipment
- determine air conditioning heat loads
- select air conditioning equipment

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining and demonstrating heat transfer calculations in a practical setting*
 - *explaining how to determine refrigeration and air conditioning heat loads*
 - *discussing the selection of air conditioning equipment*
-

Advanced Commercial and Industrial Systems**32 hours**

- arrange system components
- design piping schematics
- analyze design variations

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining commercial and industrial system components*
 - *explaining the design of commercial and industrial piping systems*
-

HVAC Variations and Refrigeration Systems**34 hours**

- examine HVAC variations
- select air filters
- describe air conditioning and refrigeration chillers
- describe cooling towers

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the operation of air conditioning, refrigeration chillers and cooling towers*
 - *explaining the different variations of HVAC system found in industry*
 - *identifying the differences between air distribution systems*
-

Refrigeration Service Application**30 hours**

- service two stage and extra low temperature equipment
- service ice making equipment
- calibrate refrigeration control systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating the servicing of two stage and extra low temperature equipment*
 - *demonstrating servicing of ice making equipment*
 - *explaining how to calibrate refrigeration control systems*
-

HVAC Service Applications**15 hours**

- service rooftop heat-cool systems
- service large split systems
- service computer room systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating and explaining techniques uses in servicing of HVAC Systems*
 - *observing the apprentice completing servicing of rooftop heat-cool systems, large split systems and computer systems*
-

Control System Applications**30 hours**

- design advanced control systems
- assemble control wiring
- calibrate pneumatic controls
- conduct operational tests

Mentors can assist the apprentice to prepare for this section of technical training by:

- *observing and giving advice to the apprentice assembling control wiring*
 - *demonstrating operational tests*
 - *observing the apprentice calibrating controls*
-

Trade Mentoring**12 hours**

- demonstrate knowledge of trade terminology
- demonstrate knowledge of effective communication practices
- demonstrate knowledge of strategies for learning and teaching skills in the workplace

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing the opportunity for the apprentice to mentor new apprentices*
- *provide opportunities for an apprentice to learn new skills and provide feedback*



Consider apprenticeship training as an investment in the future of your company and in the future of your workforce. Ultimately, skilled and certified workers increase your bottom line.

Get involved in the apprenticeship training system. Your commitment to training helps to maintain the integrity of the trade.

Do you have employees who have been working in the trade for a number of years but don't have trade certification? Contact your local apprenticeship office for details on how they might obtain the certification they need.

Saskatchewan Apprenticeship & Trade Certification Commission

2140 Hamilton St Regina SK S4P 2E3

Tel: (306) 787-2444

Fax: (306) 787-5105

Toll Free: 1-877-363-0536

Website: www.saskapprenticeship.ca

District Offices

Estevan (306) 637-4930

La Ronge (306) 425-4385

Moose Jaw (306) 694-3735

North Battleford (306) 446-7409

Prince Albert (306) 953-2632

Saskatoon (306) 933-8476

Swift Current (306) 778-8945

Yorkton (306) 786-1394

