Refrigeration and Air Conditioning Mechanic

Guide to Course Content

2025

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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 GUIDE TO COURSE CONTENT

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.

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

Technical Training Course Content for the Refrigeration and Air Conditioning Mechanic trade: a chart which outlines the model for SATCC technical training sequencing. For the harmonized level of training, a cross reference to the Harmonized apprenticeship technical training sequencing, at the learning outcome level, is provided.

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.

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

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

***Any person who is not a journeyperson Refrigeration and Air Conditioning Mechanic must become registered as an apprentice to work in this trade.**

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

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

Entrance Requirements for Apprenticeship Training

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

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

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

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

Designated Trade Name	**Math Credit** at the Indicated Grade Level❶	**Science Credit** at Grade Level (preferred class in brackets)
Refrigeration and Air Conditioning Mechanic	WA 20 or F 20 or P 20 or Math 20	Grade 10

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

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

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

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
Enthalpy and Psychrometrics	RFRG 481	32
Load Calculation and Equipment Selection	RFRG 482	25
Advanced Commercial and Industrial Systems	RFRG 483	32
HVAC Systems and Refrigeration Systems	RFRG 484	34
Refrigeration Service Application	RFRG 485	30
HVAC Service Applications	RFRG 486	15
Control Systems Applications	RFRG 487	30
Trade Mentoring	RFRG 489	12
		240

TECHNICAL TRAINING COURSE CONTENT

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

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

Level One — 8 weeks — 240 hours

Controls — 14 hours

- identify electrical controls
- install basic cycling controls
- set up basic circuits
- adjust basic cycling controls

RSOS topics covered in this section of training:

D-10 Installs Control Systems
D-10.01 Places control system components
D-10.02 Connects control systems

Electrical — 24 hours

- 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

RSOS topics covered in this section of training:

D-8 Plans Installation of Control Systems
D-9.03 Places HVAC/R equipment, components and accessories
D-9.04 Installs fasteners, brackets and hangers
D-9.05 Installs HVAC/R piping and tubing
D-9.06 Applies HVAC/R holding charge

Graphics — 14 hours

- draw a 2-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

RSOS topics covered in this section of training:

A-3 Organizes Work
A-3.02 Uses documentation and reference material
A-3.03 Plans job tasks and procedures

A-4 Uses Communication and Mentoring Techniques
A-4.01 Communication techniques

Mathematics — 14 hours

- use basic mathematics
- perform trade calculations

This section of training exceeds the minimum sequencing as set out in the Refrigeration and Air Conditioning Mechanic RSOS.

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

RSOS topics covered in this section of training:

C-7 Plans Installation of HVAC/R Systems
C-7.03 Determines placement of HVAC/R equipment, components and accessories

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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

RSOS topics covered in this section of training:

C-7 Plans Installation of HVAC/R Systems
C-7.03 Determines placement of HVAC/R equipment, components and accessories

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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

RSOS topics covered in this section of training:

D-9 Installs HVAC/R systems
D-9.03 Places HVAC/R equipment, components and accessories
D-9.04 Installs fasteners, brackets and hangers
D-9.05 Installs HVAC/R piping and tubing
D-9.06 Applies HVAC/R holding charge

F-13 Maintains HVAC/R Systems
F-13.01 Inspects HVAC/R systems
F-13.02 Performs predictive and scheduled maintenance on HVAC/R systems
F-13.03 Tests HVAC/R system components and accessories

Refrigerants — 14 hours

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

RSOS topics covered in this section of training:

B-6 Performs Trade Activities
B-6.02 Performs leak and pressure tests on system
B-6.04 Uses refrigerants, gases and oils

Basic System Applications — 24 hours

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

RSOS topics covered in this section of training:

B-6 Performs Trade Activities
B-6.01 Performs brazing and soldering
B-6.02 Performs leak and pressure tests on system
B-6.03 Evacuates systems
B-6.04 Uses refrigerants, gases and oils
B-6.05 Performs field wiring of systems
B-6.06 Applies sealants and adhesives

Hand Skills and Service Techniques — 24 hours

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

RSOS topics covered in this section of training:

B-6 Performs Trade Activities
B-6.01 Performs brazing and soldering
B-6.02 Performs leak and pressure tests on system
B-6.03 Evacuates systems
B-6.04 Uses refrigerants, gases and oils
B-6.05 Performs field wiring of systems
B-6.06 Applies sealants and adhesives

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

RSOS topics covered in this section of training:

B-6 Performs Trade Activities
B-6.01 Performs brazing and soldering
B-6.02 Performs leak and pressure tests on system
B-6.03 Evacuates systems
B-6.04 Uses refrigerants, gases and oils
B-6.05 Performs field wiring of systems
B-6.06 Applies sealants and adhesives

Hand Tools — 18 hours

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

RSOS topics covered in this section of training:

A-2 Uses Tools and Equipment
A-2.01 Uses hand tools
A-2.02 Uses portable and stationary power tools
A-2.03 Uses brazing and soldering equipment
A-2.04 Uses recovery and recycling equipment
A-2.05 Uses evacuation tools and equipment
A-2.06 Uses charging tools and equipment
A-2.07 Uses diagnostic and measuring tools and equipment
A-2.08 Uses access equipment
A-2.09 Uses rigging, hoisting and lifting equipment
A-2.10 Uses digital technology

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

RSOS topics covered in this section of training:

A-1 Safety-Related Functions
A-1.01 Maintains safe work environment
A-1.02 Performs lock-out, tag-out and isolation procedures
A-1.03 Use personal protective equipment (PPE) and safety equipment

A-2 Uses Tools and Equipment
A-2.08 Uses access equipment
A-2.09 Uses rigging, hoisting and lifting equipment

HVAC Basics **16 hours**

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

RSOS topics covered in this section of training:

B-6 Performs Trade Activities
B-6.01 Performs brazing and soldering
B-6.02 Performs leak and pressure tests on system
B-6.03 Evacuates systems
B-6.04 Uses refrigerants, gases and oils
B-6.05 Performs field wiring of systems
B-6.06 Applies sealants and adhesives

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

For details regarding the In Context Topic, see page 28

Level Two — 8 weeks — 240 hours

Electricity and Electrical Applications — 16 hours

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

RSOS topics covered in this section of training:

B-6 Performs trade activities
B-6.05 Performs field wiring of systems
D-10 Installs control systems
D-10.01 Places control system components

Electrical — 18 hours

- describe the differences between DC and AC electrical circuits
- perform circuit measurements
- describe reactance
- describe 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
- compare the operating characteristics of several single-phase AC motor types

RSOS topics covered in this section of training:

F-15 Maintains and services control systems
F-15.01 Performs maintenance and inspection on control systems
F-15.02 Troubleshoots control systems
F-15.03 Calibrates operating and safety controls
F-15.04 Repairs control systems

Trade Mathematics — 12 hours

- use metric and imperial units
- perform trade calculations

This section of training exceeds the minimum sequencing as set out in the Refrigeration and Air Conditioning Mechanic RSOS.

Intro to Commercial Applications — 20 hours

- compare temperature applications
- compare defrost methods
- design piping arrangements
- select conversion procedures
- choose dehydration and evacuation methods

RSOS topics covered in this section of training:

B-6 Performs trade activities
B-6.04 Uses refrigerants, gases and oils

C-7 Plans installation of HVAC/R systems
C-7.02 Selects HVAC/R equipment, components and accessories
C-7.03 Determines placement of HVAC/R equipment, components and accessories
C-7.04 Performs HVAC/R material take-off

Refrigeration Flow Controls and Accessories — 18 hours

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

RSOS topics covered in this section of training:

B-6 Performs trade activities
B-6.04 Uses refrigerants, gases and oils

F-13 Maintains HVAC/R systems
F-13.01 Inspects HVAC/R systems
F-13.03 Tests HVAC/R system components and accessories

F-14 Troubleshoots HVAC/R systems
F-14.01 Troubleshoots HVAC/R systems
F-14.02 Repairs HVAC/r systems

Drafting — 12 hours

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

RSOS topics covered in this section of training:

A-3 Organizes Work
A-3.01 Interprets drawings and specifications
A-3.02 Uses documentation and reference material
A-3.03 Plans job tasks and procedures

Motors and Motors Electrics — 18 hours

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

RSOS topics covered in this section of training:

F-13 Maintains HVAC/R systems
F-13.01 Inspects HVAC/R systems
F-13.02 Performs predictive and scheduled maintenance on HVAC/R systems
F-13.03 Tests HVAC/R system components and accessories

Comprehensive System Analysis — 16 hours

- manage system problems
- select system components and accessories

- select service procedure

RSOS topics covered in this section of training:

F-13 Maintains HVAC/R systems
F-13.01 Inspects HVAC/R systems
F-13.02 Performs predictive and scheduled maintenance on HVAC/R systems
F-13.03 Tests HVAC/R system components and accessories

F-14 Troubleshoots HVAC/R systems
F-14.01 Troubleshoots HVAC/R systems
F-14.02 Repairs 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

RSOS topics covered in this section of training:

C-7 Plans installation of HVAC/R systems
C-7.02 Selects HVAC/R equipment, components and accessories
C-7.03 Determines placement of HVAC/R equipment, components and accessories
C-7.04 Performs HVAC/R material take-off

D-9 Installs HVAC/R systems
D-9.02 Assembles HVAC/R equipment, components and accessories
D-9.03 Places HVAC/R equipment, components and accessories

D-10 Installs control systems
D-10.01 Places control system components
D-10.02 Connects control systems

Medium Temp Applications — 34 hours

- construct refrigerated fixtures
- set up system controls
- manage system problems

RSOS topics covered in this section of training:

B-5 Performs work site preparation
6.04 Uses refrigerants, gases and oils
6.05 Performs field wiring of systems

Control Systems — 26 hours

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

RSOS topics covered in this section of training:

C-8 Plans installation of control systems
C-8.02 Selects control system components and accessories
C-8.03 Determines placement of control system components and accessories
C-8.04 Performs control system material take-off

D-10 Installs control systems
D-10.01 Places control system components
D-10.02 Connects control systems

F-15 Maintains and services control systems
F-15.01 Performs maintenance and inspection on control systems
F-15.02 Troubleshoot control systems
F-15.03 Calibrates operating and safety controls
F-15.04 Repairs control systems

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

RSOS topics covered in this section of training:

F-15 Maintains and services control systems
F-15.01 Performs maintenance and inspection on control systems
F-15.02 Troubleshoot control systems
F-15.03 Calibrates operating and safety controls
F-15.04 Repairs control systems

Level two topics from the RSOS that are taught in context:

A-1 Safety Related Functions
A-2 Tools and Equipment

For details regarding the In Context Topic, see page 28

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.

RSOS topics covered in this section of training:

F-15 Maintains and services control systems
F-15.01 Performs maintenance and inspection on control systems
F-15.02 Troubleshoot control systems
F-15.03 Calibrates operating and safety controls
F-15.04 Repairs control systems

Graphics — 14 hours

- sketch an exploded isometric.
- mechanical and architectural sets of plans.
- interpret blueprints and manufacturer's drawings

RSOS topics covered in this section of training:

A-3 Organizes Work
A-3.01 Interprets drawings and specifications
A-3.02 Uses documentation and reference material
A-3.03 Plans job tasks and procedures

Mathematics — 12 hours

- use basic geometry and trigonometry
- perform trade calculations

This section of training exceeds the minimum sequencing as set out in the Refrigeration and Air Conditioning Mechanic RSOS.

Systems and Service Management — 14 hours

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

RSOS topics covered in this section of training:

F-14 Troubleshoots HVAC/R systems
F-14.01 Troubleshoots HVAC/R systems
F-14.02 Repairs HVAC/r systems

Piping and Line Sizing — 16 hours

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

RSOS topics covered in this section of training:

C-7 Plans installation of HVAC/R systems
C-7.01 Verifies HVAC/R system parameters and requirements
C-7.02 Selects HVAC/R equipment, components and accessories
C-7.03 Determines placement of HVAC/R equipment, components and accessories
C-7.04 Performs HVAC/R material take-off

D-9 Installs HVAC/R systems
D-9.01 Confirms system layout

Capacity and Head Pressure — 16 hours

- compare capacity control methods
- examine head pressure control methods

RSOS topics covered in this section of training:

C-8 Plans installation of control systems
C-8.01 verifies control system parameters and requirements
C-8.02 Selects control system components and accessories
C-8.03 Determines placement of control system components and accessories

D-10 Installs control systems
D-10.01 Places control system components
D-10.02 Connects control systems
E-12 Commissions control systems
E-12.02 Verifies/sets operating parameters

Commercial Refrigeration Systems and Service — 18 hours

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

RSOS topics covered in this section of training:

F-14 Troubleshoots HVAC/R systems
F-14.01 Troubleshoots HVAC/R systems
F-14.02 Repairs HVAC/R systems

HVAC Design and Applications — 32 hours

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

RSOS topics covered in this section of training:

C-7 Plans installation of HVAC/R systems
C-9.02 Assembles HVAC/R equipment, components and accessories
C-9.03 Places HVAC/R equipment, components and accessories

Practical Refrigeration Applications — 28 hours

- examine ice machines
- examine reach-ins
- examine walk-in coolers
- examine display cases

RSOS topics covered in this section of training:

F-14 Services HVAC/R systems
F-14.01 Troubleshoots HVAC/R systems
F-14.02 Repairs HVAC/R systems

HVAC Applications — 28 hours

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

RSOS topics covered in this section of training:

E-11 Commissions HVAC/R systems
E-11.01 Performs pre-start-up checks for HVAC/R systems
E-11.02 Performs start-up of HVAC/R systems
E-11.03 Completes HVAC/R system charge
E-11.04 Sets up primary and secondary HVAC/R system components

Control System Wiring — 30 hours

- determine electrical requirements
- wire electrical systems

RSOS topics covered in this section of training:

C-7 Plans installation of HVAC/R systems
C-7.01 Verifies HVAC/R system parameters and requirements
C-7.02 Selects HVAC/R equipment, components and accessories
C-7.03 Determines placement of HVAC/R equipment, components and accessories
C-7.04 Performs HVAC/R material take-off

Troubleshooting and System Analysis **14 hours**

- manage systems problems
- select system components
- select service procedures
- choose system accessories

RSOS topics covered in this section of training:

F-15 Maintains and services control systems
F-15.01 Performs maintenance and inspection on control systems
F-15.02 Troubleshoot control systems
F-15.03 Calibrates operating and safety controls
F-15.04 Repairs control systems

Level three topics from the RSOS that are taught in context:

A-1 Safety Related Functions
A-2 Tools and Equipment
F-13 Maintains HVAC/R Systems

For details regarding the In Context Topic, see page 28

Level Four — 8 weeks — 240 hours

Electrical — 18 hours

- describe a diode
- describe the operation of a DC power supply circuit
- explain the operation of a transistor
- explain the operation of thyristors
- describe the basic operation of programmable logic controllers
- explain power factor
- describe power factor correction

RSOS topics covered in this section of training:

F-15 Maintains and services control systems
F-15.01 Performs maintenance and inspection on control systems
F-15.02 Troubleshoot control systems
F-15.03 Calibrates operating and safety controls
F-15.04 Repairs control systems

Graphics — 12 hours

- views/isometrics/oblique's/symbols
- spec reading questions
- detailed listing of all equipment

RSOS topics covered in this section of training:

A-3 Organizes Work
A-3.01 Interprets drawings and specifications
A-3.02 Uses documentation and reference material
A-3.03 Plans job tasks and procedures

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

RSOS topics covered in this section of training:

C-7 Plans installation of HVAC/R systems
C-7.01 Verifies HVAC/R system parameters and requirements
C-7.02 Selects HVAC/R equipment, components and accessories
C-7.03 Determines placement of HVAC/R equipment, components and accessories
C-7.04 Performs HVAC/R material take-off

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

RSOS topics covered in this section of training:

C-7 Plans installation of HVAC/R systems
C-7.01 Verifies HVAC/R system parameters and requirements
C-7.02 Selects HVAC/R equipment, components and accessories
C-7.03 Determines placement of HVAC/R equipment, components and accessories
C-7.04 Performs HVAC/R material take-off

Advanced Commercial and Industrial Systems — 32 hours

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

RSOS topics covered in this section of training:

C-8 Plans installation of control systems
C-8.01 verifies control system parameters and requirements
C-8.02 Selects control system components and accessories
C-8.03 Determines placement of control system components and accessories
C-8.04 Performs control system material take off

HVAC Variations and Refrigeration Systems — 34 hours

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

RSOS topics covered in this section of training:

E-11 Commissions HVAC/R systems
E-11.01 Performs pre-startup check for HVAC/R systems
E-11.02 Performs startup of HVAC/R systems
E-11.03 Completes HVAC/R system charge
E-11.04 Sets up primary and secondary HVAC/R system components

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Refrigeration Service Application — 30 hours

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

RSOS topics covered in this section of training:

F-14 Troubleshoots HVAC/R systems
F-14.01 Troubleshoots HVAC/R systems
F-14.02 Repairs HVAC/R systems

HVAC Service Applications — 15 hours

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

RSOS topics covered in this section of training:

F-15 Maintains and services control systems
15.01 Performs maintenance and inspection on control systems

15.02 Troubleshoots control systems
15.03 Calibrates operating and safety controls
15.04 Repairs control systems

Control System Applications — 30 hours

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

RSOS topics covered in this section of training:

C-8 Plans installation of control systems
C-8.01 verifies control system parameters and requirements
C-8.02 Selects control system components and accessories
C-8.03 Determines placement of control system components and accessories
C-8.04 Performs control system material take off

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

RSOS topics covered in this section of training:

A-4 Uses Communication and Mentoring Techniques
A-4.01 Uses communication techniques
A-4.02 Uses mentoring techniques

Level four topics from the RSOS that are taught in context:

A-1 Safety Related Functions
A-2 Tools and Equipment
F-13 Maintains HVAC/R Systems

For details regarding the In Context Topic, see page 28

IN CONTEXT TOPICS

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

A-1 Safety-Related Functions
A-1.01 Maintains safe work environment
A-1.02 Performs lock-out, tag-out and isolation procedures
A-1.03 Use personal protective equipment (PPE) and safety equipment

A-2 Tools and Equipment
A-2.01 Uses hand tools
A-2.02 Uses portable and stationary power tools
A-2.03 Uses brazing and soldering equipment
A-2.04 Uses recovery and recycling equipment
A-2.05 Uses evacuation tool and equipment
A-2.06 Uses charging tools and equipment
A-2.07 Uses diagnostic and measuring tools and equipment
A-2.08 Uses access equipment
A-2.09 Uses rigging, hoisting and lifting equipment
A-2.10 Uses digital technology

F-13 Maintains HVAC/R systems
F-13.01 Inspects HVAC/R systems
F-13.02 Performs predictive and scheduled maintenance on HVAC/R systems
F-13.03 Tests HVAC/R system components and accessories