



Refrigeration and Air Conditioning Mechanic

2010

Based on the Interprovincial Program Guide
pg. 12 for Program Structure



The Joint Planning Committee (JPC) recognizes this Interprovincial Program Guide as the national curriculum for the occupation of Refrigeration and Air Conditioning Mechanic.

Acknowledgements

The Joint Planning Committee and the Interprovincial Program Guide Working Group wishes to acknowledge the contributions of the following industry and instructional representatives who participated in the development of this document.

Sid Bloomfield	Manitoba
Grant Hein	Manitoba
Eric Ellefsen	New Brunswick
Roy Watts	New Brunswick
Barry Goulding	Newfoundland and Labrador
Randy LeDrew	Newfoundland and Labrador
Kenneth McManaman	Nova Scotia
Jason Scott	Prince Edward Island
Lee Bunes	Saskatchewan

In addition to the representatives above, various federal, provincial and territorial representatives contributed to the development of this document including Gerard Ronayne representing the host province of Newfoundland and Labrador.

Table of Contents

Acknowledgements	2
Introduction	4
User Guide	5
IPG Glossary of Terms	7
Essential Skills Profiles	9
Profile Chart.....	10
Nova Scotia Program Structure	12
NOA Comparison Table	14

PROGRAM CONTENT

Level 1	19
Level 2.....	41
Level 3.....	58
Level 4.....	74
Nova Scotia Document Evaluation Form.....	90

Introduction

Jurisdictions have long recognized the benefit of pooling resources in the development and maintenance of apprenticeship training standards. A successful example of this is the Interprovincial Standards (Red Seal) program itself. Essential to the establishment of standards is the development of suitable training systems and programs which enable trades people to acquire certification based on these standards. While certification is the responsibility of Apprenticeship administrators throughout Canada, the development and delivery of technical training is the responsibility of jurisdictions.

In 1999, work to develop common training for apprenticeship programs within the Atlantic Provinces began. To date, 22 Standards have been developed through the Atlantic Standards Partnership (ASP) project to assist programming staff and instructors in the design and delivery of technical training. Similarly, the Canadian Council of Directors of Apprenticeship (CCDA) embarked on a process for the development of national Interprovincial Program Guides (IPGs) for the Boilermaker, Carpenter and Sprinkler System Installer trades. At its January 2005 strategic planning session, the CCDA identified developing common training standards as one of key activities in moving towards a more cohesive apprenticeship system.

With the support of Human Resources and Social Development Canada (HRSDC), several provinces and territories have partnered to build on the ASP and the CCDA processes to further develop IPGs to be used across the country. This partnership will create efficiencies in time and resources and promote consistency in training and apprentice mobility.

User Guide

According to the Canadian Apprenticeship Forum, the Interprovincial Program Guide (IPG) is: "a list of validated technical training outcomes, based upon those sub-tasks identified as common core in the National Occupational Analysis, and validated by industry in the provinces and territories as incorporating the essential tasks, knowledge and skills associated with a given trade."

Learning outcomes contained in the IPG represent the minimum common core content for the development of jurisdictional training standards and outlines. IPGs are developed based on the National Occupational Analyses and extensive industry consultation. The IPG is intended to assist program development staff in the design of jurisdictional plans for training. Each jurisdiction has the flexibility to add additional content.

The IPG was deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. It details units of training, unit outcomes and objectives. It does not impose a delivery model or teaching format.

Jurisdictions and/or training providers will select and develop delivery materials and techniques that accommodate a variety of learning styles and delivery patterns. The IPG does not dictate study materials, textbooks or learning activities to be used in delivery.

The IPG document includes a recommended levelling structure to facilitate mobility for apprentices moving from one jurisdiction to another. Because of difference in jurisdictional regulations and program durations, levels are offered as suggestions only.

Structure

The content of the IPG is divided into units. Unit codes are used as a means of identification and are not intended to convey the order of delivery. Prerequisites have not been detailed. Jurisdictions are free to deliver units one at a time or concurrently provided all outcomes are met.

User Guide *(continued)*

The IPG does not indicate the amount of time to be spent on a particular unit. The length of time required to deliver an outcome successfully will depend upon the learning activities and teaching methods used. Jurisdictions are encouraged to use practical demonstration and opportunities for hands-on learning whenever possible.

The unit outcomes are the specific performances that must be evaluated. Wording of outcomes, "Demonstrate knowledge of..." acknowledges the broad spectrum of ways in which knowledge can be shown. It is at the discretion of each jurisdiction to determine the manner in which outcomes are evaluated; theoretically, practically or a combination of both.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided. Content may be added or extended in jurisdictional training plans.

IPG Glossary of Terms

These definitions are intended as a guide to how language is used in the IPGs.

ADJUST	To put in good working order; regulate; bring to a proper state or position.
APPLICATION	The use to which something is put and/or the circumstance in which you would use it.
CHARACTERISTIC	A feature that helps to identify, tell apart, or describe recognizably; a distinguishing mark or trait.
COMPONENT	A part that can be separated from or attached to a system; a segment or unit.
DEFINE	To state the meaning of (a word, phrase, etc.).
DESCRIBE	To give a verbal account of; tell about in detail.
DIAGNOSE	To analyze or identify a problem or malfunction.
EXPLAIN	To make plain or clear; illustrate; rationalize.
IDENTIFY	To point out or name objectives or types.
INTERPRET	To translate information from observation, charts, tables, graphs, and written material.
MAINTAIN	To keep in a condition of good repair or efficiency.
METHOD	A means or manner of doing something that has procedures attached to it.
OPERATE	How an object works; to control or direct the functioning of.
PROCEDURE	A prescribed series of steps taken to accomplish an end.

IPG Glossary of Terms (cont'd)

PURPOSE	The reason for which something exists or is done, made or used.
TECHNIQUE	Within a procedure, the manner in which technical skills are applied.
TEST	v. To subject to a procedure that ascertains effectiveness, value, proper function, or other quality. n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.
TROUBLESHOOT	To follow a systematic procedure to identify and locate a problem or malfunction and its cause.

Essential Skills Profiles

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

Over the past several years, the Government of Canada has conducted research examining the skills people use at work. From this research, Essential Skills Profiles have been developed for various occupations.

For more information regarding Essential Skills and to access Essential Skills Profiles for specific occupations, visit Human Resources and Social Development Canada's Essential Skills website at:

http://srv108.services.gc.ca/english/general/home_e.shtml

Profile Chart

Profile Chart (*continued*)

Program Structure – Nova Scotia Apprenticeship Program

The courses listed below are required technical training in the Nova Scotia Refrigeration and Air Conditioning Mechanic Apprenticeship Program.

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Interprovincial Program Guide (IPG) Content To Be Covered		
			IPG Units	Pg. #	
Level 1 (6 Weeks)					
	Integrated Milestone	None	MENT-1801	Workplace Mentoring I (NS Specific)	20
RACA-1831	Safety / Tools and Equipment	None	RACM-1	Safety	21
			RACM-2	Tools and Equipment	22
			RACM-13	Hoisting, Lifting, Rigging and Access/Egress Equipment	24
RACA-1832	Refrigeration Fundamentals	RACA 1831	RACM-4	Refrigeration Fundamentals	26
			RACM-5	Refrigerants and Oils	28
*RACA-1833	Air Conditioners, Refrigeration and Piping *(2 week course)	RACA 1831 RACA 1832	RACM-0	Trade Documents	30
			RACM-3	Piping, Tubing, Soldering, and Brazing	31
			RACM-7	Leak Testing, Evacuation and Charging	33
			RACM-44	Blueprint Reading	35
RACA-1834	Compressors 1 / Ancillary Devices	RACA 1831	RACM-6	Valves and Ancillary Devices	36
			RACM-15	Compressors I	37
RACA-1835	Electrical Fundamentals / Motors 1	RACA 1831	RACM-8	Electrical Fundamentals	38
			RACM-9	Motors I	40
Level 2 (6 Weeks)					
RACA-1836	Evaporation	RACA 1832	RACM-14	Pressure Enthalpy Diagrams	42
			RACM-19	Evaporators	43
RACA-1837	Metering Devices / Flow Controls	RACA 1832	RACM-20	Metering Devices	45
			RACM-21	Refrigerant Flow Controls	46
RACA-1838	Compressors 2 / Condensers	RACA 1834	RACM-16	Compressors II	47
			RACM-18	Condensers	49
RACA-1839	AC Installation	RACA 1833	RACM-12	Air Conditioning Fundamentals	50
			RACM-24	Refrigeration and Air Conditioning Installation	51

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Interprovincial Program Guide (IPG) Content To Be Covered		
			IPG Units		Pg. #
*RACA-1840	Control Circuits *(2 week course)	RACA 1835	RACM-10	Motors II	53
			RACM-11	Control Fundamentals	55
			RACM-25	Control Circuits and Wiring Diagrams	56
			RACM-33	Fans, Mechanical Drives, Air Filters and Air Cleaners	57
Level 3 (6 Weeks)					
RACA- 1841	Refrigeration System Design	RACA 1836	RACM-28	Refrigeration System Design	59
		RACA 1837 RACA 1838	RACM-29	Refrigeration Load Calculations	61
RACA-1842	Compressor Modulation	RACA 1838	RACM-17	Compressors III	62
RACA-1843	Commercial Refrigeration	RACA 1834 RACA 1836 RACA 1839	RACM-22	Evaporative Condensers and Cooling Towers	64
			RACM-26	Commercial Refrigeration Systems	66
RACA-1844	Air Conditioning Systems	RACA 1833 RACA 1839	RACM-27	Air Conditioning Systems	68
			RACM-42	Packaged Air Conditioning Units	69
RACA-1845	Heat Pumps	RACA 1833 RACA 1839	RACM-23	Fluid Dynamics and Circulating Pumps	70
			RACM-32	Heat Pump Systems	71
RACA-1846	Troubleshooting Control Systems	RACA 1840	RACM-35	Control Systems	72
			RACM-39	Troubleshooting Refrigeration and Air Conditioning Electronics	73
Level 4 (6 Weeks)					
	Integrated Milestone	MENT-1801	MENT-1802	Workplace Mentoring II <i>(NS Specific)</i>	75
RACA-1847	AC System Design	RACA 1844	RACM-30	Air Conditioning System Design	76
			RACM-31	Air Conditioning Load Calculations	78
RACA-1848	Duct Systems	RACA 1847	RACM-34	Air Measuring Instruments and System Air Balancing	79
			RACM-37	Duct Systems and Design	80
RACA-1849	Heating Systems	NONE	RACM-41	Heating Systems	81
RACA-1852	Industrial Systems	RACA 1840 RACA 1846	RACM-38	Chillers and Chiller Systems	83
			RACM-40	Industrial Refrigeration Systems	85
RACA-1851	Troubleshooting / Job Coordination	RACA 1840 RACA 1846	RACM-36	Troubleshooting with Schematic Wiring Diagrams	86
			RACM-43	Job Coordination	87
RACA-1827	Program Review	Entire Program	RACA-1827	Program Review <i>(NS Specific)</i>	89
Nova Scotia Refrigeration and A/C Mechanic Apprenticeship Program: All Courses are Required.					

NOA Comparison Table

NOA Sub-task		Curriculum Unit	
Task 1 – Utilizes mechanical and architectural drawings, acts, codes, standards, legislation, and service and operating manuals.			
1.01	Interprets blueprints, drawings and schematics.	RACM - 44	Blueprint Reading
1.02	Interprets service and operating manuals, technical bulletins and warranties.	RACM - 43	Job Coordination
1.03	Interprets tables, charts and diagrams.	RACM - 43	Job Coordination
1.04	Interprets manufacturer's specifications.	RACM - 43	Job Coordination
1.05	Complies with government acts, codes, standards and regulations.	RACM - 1 RACM - 7	Safety Leak Testing, Evacuation and Charging
Task 2 – Operates and maintains tools and equipment.			
2.01	Utilizes hand tools.	RACM - 2	Tools and Equipment
2.02	Utilizes portable and stationary power tools.	RACM - 2	Tools and Equipment
2.03	Utilizes oxy-fuel and air-fuel equipment.	RACM - 2	Tools and Equipment
2.04	Utilizes recovery and recycle equipment.	RACM - 7	Leak Testing, Evacuation and Charging
2.05	Utilizes evacuation equipment and tools.	RACM - 7	Leak Testing, Evacuation and Charging
2.06	Utilizes charging equipment and tools.	RACM - 7	Leak Testing, Evacuation and Charging
2.07	Utilizes access/egress equipment.	RACM - 13	Hoisting, Lifting, Rigging and Access/Egress Equipment
2.08	Utilizes hoisting and rigging equipment.	RACM - 13	Hoisting, Lifting, Rigging and Access/Egress Equipment
2.09	Utilizes mechanical measuring equipment.	RACM - 2	Tools and Equipment
2.10	Utilizes electric and electronic diagnostic tools.	RACM - 2	Tools and Equipment
2.11	Utilizes computer equipment to interface with refrigeration and air conditioning systems.	RACM - 35	Control Systems
Task 3 – Demonstrates work practices and procedures.			
3.01	Installs fasteners, brackets and hangers.	RACM - 2	Tools and Equipment
3.02	Performs lock-out tagging and isolation procedures.	RACM - 1	Safety
3.03	Installs piping and tubing.	RACM - 3	Piping, Tubing, Soldering and Brazing
3.04	Applies sealants and adhesives.	RACM - 3	Piping, Tubing, Soldering and Brazing
3.05	Cleans and lubricates parts and components	RACM - 2	Tools and Equipment

NOA Sub-task		Curriculum Unit	
3.06	Performs internal electrical wiring of systems.	RACM - 8	Electrical Fundamentals
Task 4 – Coordinates refrigeration and air conditioning installation and maintenance.			
4.01	Estimates work requirements.	RACM - 43	Job Coordination
4.02	Conducts work area inspection.	RACM - 1	Safety
4.03	Coordinates work requirements.	RACM - 43	Job Coordination
4.04	Maintains customer relations.	RACM - 43	Job Coordination
4.05	Clarifies end user problems with refrigeration and air conditioning systems.	RACM - 43	Job Coordination
4.06	Completes work-related documentation.	RACM - 43	Job Coordination
4.07	Generates maintenance documentation.	RACM - 43	Job Coordination
Task 5 – Performs system components, accessories and materials acquisition and handling.			
5.01	Requisitions equipment.	RACM - 43	Job Coordination
5.02	Receives materials/equipment.	RACM - 43	Job Coordination
5.03	Transfers equipment to designated location.	RACM - 43	Job Coordination
Task 6 – Plans installation of refrigeration and air cooling systems.			
6.01	Verifies refrigeration and air conditioning system parameters and requirements.	RACM - 24 RACM - 9 RACM - 29 RACM - 38	Refrigeration and A/C Installation Motors I Refrigeration Load Calculations Chillers and Chiller Systems
6.02	Selects refrigeration and air cooling components, equipment and accessories.	RACM - 15 RACM - 18 RACM - 24 RACM - 32	Compressors I Condensers Refrigeration and A/C Installation Heat Pump Systems
6.03	Prepares components, equipment and accessories layout.	RACM - 24	Refrigeration and A/C Installation
6.04	Selects refrigerant.	RACM - 5	Refrigerants and Oils
6.05	Sizes pipe.	RACM - 3	Piping, Tubing, Soldering and Brazing
6.06	Lays out piping.	RACM - 3	Piping, Tubing, Soldering and Brazing
6.07	Selects insulation.	RACM - 4	Refrigeration Fundamentals
Task 7 – Installs refrigeration and air cooling systems.			
7.01	Prepares site/location.	RACM - 43	Job Coordination
7.02	Assembles refrigeration and air cooling components, equipment and accessories.	RACM - 16 RACM - 24	Compressors II Refrigeration and A/C Installation
7.03	Positions and secures refrigeration and air cooling components, equipment and accessories.	RACM - 10 RACM - 13	Motors II Hoisting, Lifting, Rigging and Access/Egress Equipment
7.04	Routes and connects refrigerant piping.	RACM - 3	Piping, Tubing, Soldering and Brazing
7.05	Performs leak test on system.	RACM - 7	Leak Testing, Evacuation and Charging
7.06	Evacuates system.	RACM - 7 RACM - 19	Leak Testing, Evacuation and Charging Evaporators
7.07	Charges system.	RACM - 7	Leak Testing, Evacuation and Charging

NOA Sub-task		Curriculum Unit	
Task 8 – Commissions refrigeration and air cooling systems.			
8.01	Performs pre-start-up checks.	RACM - 24	Refrigeration and A/C Installation
8.02	Starts up refrigeration and air conditioning system.	RACM - 24	Refrigeration and A/C Installation
8.03	Completes system charge.	RACM - 7	Leak Testing, Evacuation and Charging
8.04	Sets up primary and secondary refrigeration system adjustable switches, valves and regulators.	RACM - 26	Commercial Refrigeration Systems
Task 9 – Maintains refrigeration and air cooling systems.			
9.01	Inspects refrigeration and air cooling systems.	RACM - 28 RACM - 33	Refrigeration System Design Fans, Mechanical Drives, Air Filters and Air Cleaners
9.02	Tests electrical and electronic components.	RACM - 8	Electrical Fundamentals
		RACM - 39	Troubleshooting Refrigeration and Air Conditioning Electronics
9.03	Tests mechanical components.	RACM - 30	Air Conditioning System Design
9.04	Recommends corrective action.	RACM - 43	Job Coordination
9.05	Selects refrigeration and air cooling equipment and components.	RACM - 6	Valves and Ancillary Devices
		RACM - 24	Refrigeration and A/C Installation
9.06	Replaces defective components and equipment.	RACM - 27	Air Conditioning Systems
9.07	Repairs/overhauls defective components and equipment.	RACM - 17	Compressors III
		RACM - 27	Air Conditioning Systems
9.08	Verifies refrigeration and air cooling system component function.	RACM - 27	Air Conditioning Systems
9.09	Performs predictive maintenance.	RACM - 24	Refrigeration and A/C Installation
9.10	Performs preventative maintenance.	RACM - 24	Refrigeration and A/C Installation
Task 10 – Plans installation of heating, ventilating and air conditioning systems.			
10.01	Verifies heating, ventilating and air conditioning systems, parameters and requirements.	RACM - 12	Air Conditioning Fundamentals
		RACM - 31	Air Conditioning Load Calculations
		RACM - 37	Duct System and Design
		RACM - 41	Heating Systems
10.02	Selects heating, ventilating and air conditioning components and equipment.	RACM - 41	Heating Systems
10.03	Confirms heating, ventilating and air conditioning requirements.	RACM - 22	Evaporative Condensers and Cooling Towers
		RACM - 41	Heating Systems
Task 11 – Installs heating, ventilating and air conditioning systems.			
11.01	Prepares heating, ventilating and air conditioning equipment site/location.	RACM - 43	Job Coordination
11.02	Assembles heating, ventilating and air conditioning equipment.	RACM - 27	Air Conditioning Systems
11.03	Positions and secures heating, ventilating and air conditioning equipment.	RACM - 13	Hoisting, Lifting, Rigging and Access/Egress Equipment
		RACM - 23	Fluid Dynamics and Circulating Pumps

NOA Sub-task		Curriculum Unit	
Task 12 – Commissions heating, ventilating and air conditioning systems.			
12.01	Performs pre-start-up checks.	RACM - 11	Control Fundamentals
12.02	Starts up heating, ventilating and air conditioning systems.	RACM - 14	Pressure Enthalpy Diagrams
Task 13 – Maintains heating, ventilating and air conditioning systems.			
13.01	Inspects heating, ventilating and air conditioning systems.	RACM - 24	Refrigeration and A/C Installation
13.02	Tests electrical/electronic components in heating, ventilating and air conditioning systems.	RACM - 36	Troubleshooting with Schematic Wiring Diagrams
13.03	Tests mechanical components in heating, ventilating and air conditioning systems.	RACM - 27	Air Conditioning Systems
13.04	Recommends corrective action.	RACM - 43	Job Coordination
13.05	Selects heating, ventilating and air conditioning equipment and components.	RACM - 43	Job Coordination
13.06	Replaces defective heating, ventilating and air conditioning components and equipment.	RACM - 24	Refrigeration and A/C Installation
13.07	Repairs/overhauls defective components and equipment for heating, ventilating and air conditioning systems.	RACM - 34	Air Measuring Instruments and System Air Balancing
13.08	Verifies heating, ventilating and air conditioning systems and component function.	RACM - 24 RACM - 34	Refrigeration and A/C Installation Air Measuring Instruments and System Air Balancing
13.09	Performs predictive maintenance on heating system.	RACM - 41 RACM - 42	Heating Systems Packaged Air Conditioning Units
13.10	Performs preventative maintenance on heating, ventilating and air conditioning systems.	RACM - 30	Air Conditioning System Design
Task 14 – Plans installation of control systems.			
14.01	Selects controls.	RACM - 21 RACM - 25	Refrigerant Flow Controls Control Circuits and Wiring Diagrams
14.02	Lays out control system components and wiring.	RACM - 25	Control Circuits and Wiring Diagrams
Task 15 – Installs control systems.			
15.01	Prepares site/location for control system.	RACM - 43	Job Coordination
15.02	Positions and secures control system components.	RACM - 25	Control Circuits and Wiring Diagrams
15.03	Connects system wiring and tubing.	RACM - 11	Control Fundamentals
Task 16 – Commissions control systems.			
16.01	Performs pre-start-up checks.	RACM - 11	Control Fundamentals

NOA Sub-task		Curriculum Unit	
16.02	Sets operating parameters.	RACM - 25	Control Circuits and Wiring Diagrams
16.03	Starts up control system.	RACM - 25	Control Circuits and Wiring Diagrams
Task 17 – Maintains control systems.			
17.01	Inspects control system.	RACM - 11	Control Fundamentals
17.02	Verifies and resets operating parameters.	RACM - 11	Control Fundamentals
17.03	Tests electrical/electronic components in control system.	RACM - 8	Electrical Fundamentals
17.04	Tests mechanical components in control system.	RACM - 2	Tools and Equipment
17.05	Recommends corrective action.	RACM - 43	Job Coordination
17.06	Selects control system equipment and components.	RACM - 11	Control Fundamentals
17.07	Replaces defective control components and equipment.	RACM - 25	Control Circuits and Wiring Diagrams
17.08	Repairs/overhauls defective components and equipment for control system.	RACM - 25	Control Circuits and Wiring Diagrams
17.09	Verifies control system component function.	RACM - 11	Control Fundamentals
17.10	Performs preventative maintenance on control system.	RACM - 11	Control Fundamentals
17.11	Calibrates operating and safety controls.	RACM - 25	Control Circuits and Wiring Diagrams

LEVEL 1

MENT-1801

Workplace Mentoring I

(Nova Scotia Unit of Instruction)

Learning Outcomes:

- Identify and explain strategies for learning workplace skills.
- Demonstrate strategies to assist in learning skills in the workplace.

Objectives and Content:

1. Describe the importance of your own experiences.
2. Identify the partners involved in apprenticeship.
3. Describe the shared responsibilities for workplace learning.
4. Determine your own learning preferences and explain how these relate to learning new skills.
5. Describe the importance of different types of skills in the workplace.
6. Describe the importance of essential skills in the trade.
7. Identify different ways of learning.
8. Identify your learning preferences.
9. Identify different learning needs and strategies to meet learning needs.
10. Identify techniques for effective communication.
11. Identify strategies to assist in learning a skill.

Resource:

- Recommended resource to use in the delivery of this unit:
www.apprenticeship.nsc.ca/mentoring/apprentice.htm

RACM - 1 SAFETY

Learning Outcomes:

- Demonstrate knowledge of safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.

Objectives and Content:

1. Identify types of personal protective clothing and equipment (PPE) and describe their applications.
2. Describe the procedures for care and maintenance of PPE.
3. Identify hazards and describe safe work practices and equipment.
 - i) personal
 - ii) workplace
 - electrical
 - confined space
 - fire
 - tag out/lockout
 - fall protection
 - refrigerants
 - pressurized gases
 - iii) environment
4. Identify and describe workplace safety and health regulations.
 - i) federal
 - material safety data sheets (MSDS)
 - workplace hazardous material information system (WHMIS)
 - transportation of dangerous goods (TDG)
 - ii) provincial/territorial
 - occupational health and safety (OHS)
 - iii) municipal

RACM - 2 TOOLS AND EQUIPMENT

Learning Outcomes:

- Demonstrate knowledge of hand and power tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of measuring and testing devices, their applications, maintenance and procedures for use.
- Demonstrate knowledge of refrigeration tools and equipment, their applications, maintenance and procedures for use.

Objectives and Content:

1. Identify types of hand tools and describe their applications and procedures for use.
2. Describe the procedures used to store and maintain hand tools.
3. Identify types of portable and stationary power tools and describe their applications and procedures for use.
 - i) pneumatic
 - ii) electric
 - iii) hydraulic
 - iv) gas
 - v) powder-actuated
4. Describe the procedures used to store and maintain portable and stationary power tools.
5. Identify types of refrigeration tools and equipment and describe their applications.
 - i) recovery and recycle
 - ii) evacuation
 - iii) charging
6. Identify types of electric and electronic diagnostic tools and describe their applications and procedures for use.

7. Identify types of mechanical measuring equipment and describe their applications and procedures for use.
 - i) vernier/digital calipers
 - ii) micrometers
 - iii) dial indicators
8. Describe the procedures used to store and maintain mechanical measuring equipment.
9. Identify types of monitoring and testing tools and instruments and describe their applications and procedures for use.
 - i) acid test kit
 - ii) oil test kit
 - iii) electrical test meters
 - iv) air flow meters
 - v) leak detectors
10. Describe the procedures used to store and maintain monitoring and testing tools and instruments.

RACM - 13 HOISTING, LIFTING, RIGGING AND ACCESS/EGRESS EQUIPMENT

Learning Outcomes:

- Demonstrate knowledge of hoisting, lifting, rigging and access/egress equipment, their applications and procedures for use.
- Demonstrate knowledge of basic hand signals.

Objectives and Content:

1. Define terminology associated with hoisting, lifting and rigging.
2. Identify and interpret regulatory requirements pertaining to hoisting, lifting, rigging and access/egress equipment.
3. Identify types of rigging equipment and accessories and describe their applications, limitations and procedures for use.
 - i) belts
 - ii) ropes
 - iii) cables
 - iv) slings
 - v) shackles
 - vi) spreader bars
4. Identify types of knots and describe their applications.
5. Describe the procedures used to store and maintain rigging equipment.
6. Identify types of hoisting and lifting equipment and accessories and describe their applications, limitations and procedures for use.
 - i) jacks
 - ii) hoists
 - iii) come-a-longs/tuggers
 - iv) chainfalls
7. Describe the procedures used to store and maintain hoisting and lifting equipment.

8. Identify types of access/egress equipment and describe their applications, limitations and procedures for use.
 - i) ladders
 - ii) staging
 - iii) scaffolding
 - iv) lifts
9. Describe the procedures used to store and maintain access/egress equipment.
10. Identify and interpret basic hand signals used for lifting and hoisting.

RACM - 4 REFRIGERATION FUNDAMENTALS

Learning Outcomes:

- Demonstrate knowledge of refrigeration and the refrigeration cycle.

Objectives and Content:

1. Define terminology and concepts associated with refrigeration.
 - i) temperature
 - ii) heat
 - iii) mass and weight
 - iv) density
 - v) specific gravity
 - vi) specific volume
 - vii) pressure
2. Identify temperature scales and perform conversion calculations.
3. Describe heat flow and identify methods of heat transfer.
4. Identify states of matter and describe their characteristics.
5. Describe basic gas laws associated with refrigeration and perform calculations to demonstrate relationships.
6. Describe the effect of pressure on evaporation, condensing, freezing and melting temperatures.
7. Explain the operation of the vapour compression cycle.
8. Identify components of a vapour compression cycle and describe their purpose and operation.
9. Describe the physical changes of the refrigerant as it circulates through the system.
10. Describe the pressure/temperature chart and its use in determining refrigerant conditions.

11. Describe superheat and sub-cooling and their significance in the refrigeration cycle.
12. Describe the pressure enthalpy diagram and its applications.
13. Explain how to plot the basic cycle using a pressure enthalpy diagram.
14. Perform calculations to determine refrigeration values using pressure enthalpy diagrams.
 - i) mass flow rate
 - ii) heat of compression
 - iii) net refrigeration effect
 - iv) system capacity
 - v) ton of refrigeration
 - vi) coefficient of performance (COP)
 - vii) horsepower per ton
15. Identify factors that affect capacity.
 - i) condensing pressure/temperature
 - ii) evaporating pressure/temperature
 - iii) heat of compression
 - iv) sub-cooling
 - v) superheat

RACM - 5 REFRIGERANTS AND OILS

Learning Outcomes:

- Demonstrate knowledge of refrigerants and oils, their applications and procedures for use.
- Demonstrate knowledge of regulatory requirements pertaining to refrigerants and oils.
- Demonstrate knowledge of recovery and recycling equipment, its maintenance and procedures for use.
- Demonstrate knowledge of the procedures used to recover and recycle refrigerants and oils.

Objectives and Content:

1. Define terminology associated with refrigerants and oils.
2. Identify hazards, health concerns and safe work practices pertaining to the handling, storing, and disposing of refrigerants and oils.
3. Identify types of refrigerants and describe their characteristics and applications.
 - i) primary
 - ii) secondary
4. Identify refrigerant containers and colour coding classifications.
5. Identify types of oils and describe their characteristics and applications.
6. Identify and interpret codes and regulations pertaining to refrigerants and oils.
7. Describe the environmental effects of refrigerants.
 - i) ozone depletion
 - ii) global warming
8. Describe the procedures used to perform refrigerant and oil conversions.
9. Identify recovery and recycling equipment and describe procedures for their use and maintenance.

10. Describe the procedures used to recover and recycle refrigerants and oils.
11. Describe the procedures used to transport refrigerants and oils.

RACM - 0 TRADE DOCUMENTS

Learning Outcomes:

- Demonstrate knowledge of trade documents and their use.
- Demonstrate knowledge of preparing and interpreting trade documents.

Objectives and Content:

1. Identify and interpret trade-related documentation.
 - i) repair orders
 - ii) purchase orders
 - iii) preventative/predictive maintenance sheets
 - iv) service and operating manuals
 - v) technical bulletins
 - vi) inspection forms
 - vii) service records
 - viii) warranties
 - ix) estimates
 - x) transportation of dangerous goods (TDG) forms
 - xi) refrigerant management records
 - xii) material safety data sheets (MSDS)
 - xiii) time cards/sheets
 - xiv) vehicle inspection reports
 - xv) bill of materials

2. Describe the procedures used to complete trade-related documentation.
 - i) repair orders
 - ii) purchase orders
 - iii) preventative/predictive maintenance sheets
 - iv) inspection forms
 - v) service records
 - vi) refrigerant management records
 - vii) time cards/sheets
 - viii) vehicle inspection reports
 - ix) bill of materials

RACM - 3 PIPING, TUBING, SOLDERING AND BRAZING

Learning Outcomes:

- Demonstrate knowledge of refrigeration piping and tubing, their applications and installation.
- Demonstrate knowledge of fittings and their applications.
- Demonstrate knowledge of soldering and brazing equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of fasteners, brackets and hangers and their applications.
- Demonstrate knowledge of pipe insulation, sealants and adhesives, their applications and procedures for use.

Objectives and Content:

1. Define terminology associated with piping, tubing, soldering and brazing.
2. Identify hazards and safe work practices pertaining to piping, tubing, soldering and brazing.
3. Identify types of refrigeration piping and tubing and describe their characteristics and applications.
4. Identify types of fittings and describe their applications and procedures for use.
5. Describe the process for cutting pipe and tubing to proper sizes.
6. Identify types of flaring and swaging tools and describe their applications and procedures for use and maintenance.
7. Describe the procedures used to bend tubing.
 - i) piping and offsets
 - set
 - run

8. Identify types of equipment and accessories used to solder and braze and describe their applications.
 - i) oxy-fuel
 - ii) air-fuel
9. Identify types of soldering and brazing materials and fillers and describe their characteristics and applications.
10. Describe the procedures used to solder and braze tubing.
11. Identify types of threaded pipe and describe their characteristics and applications.
12. Describe the procedures used to install piping and tubing.
13. Identify types of pipe hangers, brackets and fasteners and describe their characteristics and applications.
14. Describe the procedures used to install pipe hangers, brackets and fasteners.
15. Identify types of pipe and tubing insulation and how it is installed.
16. Identify types of sealants and adhesives and describe their applications and procedures for use.

RACM - 7 LEAK TESTING, EVACUATION AND CHARGING

Learning Outcomes:

- Demonstrate knowledge of leak test, evacuation and charging tools and equipment, their maintenance and procedures for use.
- Demonstrate knowledge of the procedures used to leak test refrigeration systems.
- Demonstrate knowledge of the procedures used to evacuate refrigeration systems.
- Demonstrate knowledge of the procedures used to charge refrigeration systems.

Objectives and Content:

1. Define terminology associated with leak testing, evacuation and charging.
2. Identify and interpret codes and regulations pertaining to leak testing, evacuation and charging.
3. Identify types of leak detection tools and describe their applications and procedures for use.
4. Describe the procedures used to leak test a refrigeration system.
5. Identify types of evacuation tools and equipment and describe their procedures for use and maintenance.
6. Describe the procedures used to evacuate and dehydrate a system.
7. Identify types of charging tools and equipment and describe their procedures for use and maintenance.
 - i) charging cylinders
 - ii) charging scales
8. Identify methods to charge oil into a system and describe their associated procedures.

9. Identify methods to charge refrigerant into a system and describe their associated procedures.
- i) superheat
 - ii) sub-cooling
 - iii) critical charge
 - iv) charge charts

RACM - 44 BLUEPRINT READING

Learning Outcomes:

- Demonstrate knowledge of blueprints and their applications.

Objectives and Content:

1. Identify the types of drawings and describe their applications.
 - i) civil/site
 - ii) architectural
 - iii) mechanical
 - iv) structural
 - v) electrical
 - vi) shop drawings
 - vii) sketches
 - viii) as-built
2. Identify the views used on blueprints.
 - i) elevation
 - ii) plan
 - iii) section
 - iv) detail
 - v) auxiliary
3. Identify and interpret information found on blueprints.
 - i) lines
 - ii) legend
 - iii) symbols and abbreviations
 - mechanical
 - electrical
 - architectural
 - iv) title block
 - v) notes and specifications
 - vi) schedules
4. Describe the use of blueprint scales.
5. Describe metric and imperial systems of measurement and perform conversions.

RACM - 6 VALVES AND ANCILLARY DEVICES

Learning Outcomes:

- Demonstrate knowledge of refrigeration valves, their applications and procedures for use.
- Demonstrate knowledge of refrigeration ancillary devices, their applications and procedures for use.
- Demonstrate knowledge of the procedures used to install valves and ancillary devices.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot valves and ancillary devices.

Objectives and Content:

1. Define terminology associated with valves and ancillary devices.
2. Identify types of valves and describe their applications and procedures for use.
3. Identify types of ancillary devices and describe their applications and operations.
 - i) regulators
 - ii) filters and driers
 - iii) liquid/moisture indicators
 - iv) suction accumulators
 - v) oil separators
 - vi) liquid receivers
 - vii) pressure relief devices
 - viii) heat exchangers
4. Describe the procedures used to install valves.
5. Describe the procedures used to maintain and troubleshoot valves.
6. Describe the procedures used to install ancillary devices.
7. Describe the procedures used to maintain and troubleshoot ancillary devices.

RACM - 15 COMPRESSORS I

Learning Outcomes:

- Demonstrate knowledge of fundamental principles of compressors.
- Demonstrate knowledge of compressors, their components and operation.

Objectives and Content:

1. Define terminology associated with compressors.
2. Identify hazards and describe safe work practices pertaining to compressors.
3. Describe the purpose and operating principles of the compressor in the refrigeration system.
4. Identify types of compressors and describe their characteristics and applications.
 - i) reciprocating
 - ii) scroll
 - iii) rotary
 - iv) screw
 - v) centrifugal
 - vi) swing
5. Identify compressor components and describe their purpose and operation.
6. Identify methods of compressor lubrication.
7. Identify methods used to cool compressors.
8. Explain compressor efficiency and how it is determined.

RACM - 8 ELECTRICAL FUNDAMENTALS

Learning Outcomes:

- Demonstrate knowledge of fundamental concepts of electricity.
- Demonstrate knowledge of measuring voltage, resistance, current and power, and calculating their interrelationship.
- Demonstrate knowledge of electrical circuits and loads.
- Demonstrate knowledge of conductors, relays, switches, contactors, overloads and transformers and their operation.
- Demonstrate knowledge of electronic controls and their operation.
- Demonstrate knowledge of electrical wiring diagrams.
- Demonstrate knowledge of interior system electrical wiring.

Objectives and Content:

1. Define terminology associated with electrical fundamentals.
2. Identify hazards and safe work practices pertaining to electricity.
3. Identify units of electrical measurement and symbols.
4. Describe current and electron flow in both direct and alternating current circuits.
5. Identify types of conductors and describe their characteristics and applications.
6. Identify the factors used to determine conductor ampacity rating.
7. Identify types of wire insulating materials and describe their characteristics and applications.
8. Describe the relationship between voltages, current, resistance and power.
9. Calculate voltage, current and resistance in series, parallel, and combination circuits.
10. Describe the selection of resistors using rating and coding information.

11. Identify types of electrical circuits and describe their characteristics.
 - i) series
 - ii) parallel
 - iii) series-parallel
12. Describe an overloaded, grounded, open and short circuit.
13. Identify types of distribution panels and wiring configurations used in single and three-phase systems.
14. Identify types of over-current and overload protection devices and describe their characteristics and applications.
15. Identify types of relays, switches and contactors and describe their characteristics and applications.
16. Identify types of transformers and describe their characteristics and applications.
17. Describe electronic control boards, their purpose and operation.
18. Describe the procedures used to diagnose electronic control boards.
19. Identify types of electrical wiring diagrams and describe their purpose.

RACM - 9 MOTORS I

Learning Outcomes:

- Demonstrate knowledge of motors, their components and operation.
- Demonstrate knowledge of motors controls and their operation.

Objectives and Content:

1. Define terminology associated with single-phase motors and motor controls.
2. Explain the principles of single-phase motor operation.
3. Identify types of motors and describe their characteristics, components and operation.
 - i) single-phase
 - ii) three-phase
 - iii) electrically commutated motors (ECM)
4. Identify and interpret information found on motor nameplates.
5. Calculate voltage, resistance and current in motor circuits.
6. Identify types of capacitors and describe their characteristics and applications.
7. Describe the procedures used to test capacitors.
8. Identify types of starting devices for single-phase motors and describe their characteristics, wiring configuration and operation.
9. Describe the effects of load and voltage changes on motor operation.
10. Describe methods used to change speed and rotation of single-phase motors.

LEVEL 2

RACM - 14 PRESSURE ENTHALPY DIAGRAMS

Learning Outcomes:

- Demonstrate knowledge of pressure enthalpy diagrams and their use in troubleshooting refrigeration systems.

Objectives and Content:

1. Define terminology associated with pressure enthalpy diagrams and system analysis.
2. Locate and interpret information found on pressure enthalpy diagrams.
3. Describe the factors affecting system capacity.
 - i) saturated discharge temperature
 - ii) saturated suction temperature
 - iii) liquid sub-cooling
 - iv) suction superheat
 - v) suction to liquid heat exchanger
 - vi) high and low side pressure drops
4. Plot a refrigeration cycle using a pressure enthalpy diagram and perform associated calculations.
5. Describe theoretical horsepower and brake horsepower.
6. Describe the effects of pressure loss in refrigeration piping.
7. Describe the concept of system equilibrium and the factors that determine system balance.
8. Describe the effect of an unbalanced system on system performance.
9. Apply cycle diagrams to assist with system troubleshooting.

RACM - 19 EVAPORATORS

Learning Outcomes:

- Demonstrate knowledge of evaporators and their operation.
- Demonstrate knowledge of the procedures used to install evaporators and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot evaporators and their components.

Objectives and Content:

1. Define terminology associated with evaporators.
2. Describe the purpose and operation of evaporators.
3. Identify types of evaporators and describe their characteristics and applications.
 - i) counter, cross and parallel flow
 - ii) direct expansion, flooded and liquid overfeed
 - iii) forced and induced
 - iv) plate or eutectic
 - v) brazed plate/plate and frame
 - vi) primary and secondary surface
 - vii) chiller barrel (fluid cooler)
4. Identify evaporator system components and describe their purpose and operation.
 - i) drain pan heaters
 - ii) evaporator fans and controls
 - iii) drain lines
 - iv) flow switches
5. Identify defrost methods and describe electrical and piping considerations.
6. Describe the factors and conditions that determine evaporator capacity and efficiency.
7. Describe the procedures used to size evaporators.

8. Describe the procedures used to install evaporators and their components.
9. Describe the procedures used to maintain and troubleshoot evaporators and their components.

RACM – 20 METERING DEVICES

Learning Outcomes:

- Demonstrate knowledge of metering devices and their operation.
- Demonstrate knowledge of the procedures used to install metering devices.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot metering devices.

Objectives and Content:

1. Define terminology associated with metering devices.
2. Describe the purpose and operation of metering devices.
3. Identify types of metering devices and describe their characteristics and applications.
 - i) dry expansion
 - ii) flooded
4. Identify metering device components and describe their purpose and operation.
5. Describe the procedures used to install metering devices.
6. Describe the procedures used to maintain and troubleshoot metering devices.
7. Identify metering device failures and describe their causes and remedies.

RACM - 21 REFRIGERANT FLOW CONTROLS

Learning Outcomes:

- Demonstrate knowledge of refrigerant flow controls and their operation.
- Demonstrate knowledge of the procedures used to install refrigerant flow controls.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot refrigerant flow controls.

Objectives and Content:

1. Define terminology associated with refrigerant flow controls.
2. Describe the purpose and operation of refrigerant flow controls.
3. Identify types of refrigerant flow controls and describe their characteristics and applications.
 - i) direct acting
 - ii) pilot operated
4. Identify refrigerant flow control components and describe their purpose and operation.
5. Describe the procedures used to install refrigerant flow controls.
6. Describe the procedures used to maintain and troubleshoot refrigerant flow controls.
7. Identify refrigerant flow control failures and describe their causes and remedies.

RACM - 16 COMPRESSORS II

Learning Outcomes:

- Demonstrate knowledge of the procedures used to install hermetic and semi-hermetic compressors and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot hermetic and semi-hermetic compressors and their components.

Objectives and Content:

1. Define terminology associated with hermetic and semi-hermetic compressors.
2. Identify hazards and describe safe work practices pertaining to hermetic and semi-hermetic compressors.
3. Identify and interpret codes and regulations pertaining to hermetic and semi-hermetic compressors.
4. Describe compressor classifications according to temperature ranges and displacement.
5. Explain compressor efficiency and how it is determined.
6. Describe the procedures used to install hermetic and semi-hermetic compressors and their components.
7. Describe the procedures used to maintain and troubleshoot hermetic and semi-hermetic compressors and their components.
8. Describe control strategies for compressor protection and liquid refrigerant control.
 - i) solenoid drop
 - ii) pump out cycle
 - iii) pump down cycle
9. Identify compressor failures and describe their causes and remedies.
 - i) mechanical
 - ii) electrical

10. Describe the procedures used to start-up and shut-down hermetic and semi-hermetic compressors.

RACM - 18 CONDENSERS

Learning Outcomes:

- Demonstrate knowledge of condensers and their operation.
- Demonstrate knowledge of the procedures used to install condensers and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot condensers and their components.

Objectives and Content:

1. Define terminology associated with condensers.
2. Describe the purpose of condensers.
3. Identify types of condensers and describe their characteristics and applications.
 - i) air-cooled
 - ii) water-cooled
 - iii) evaporative
4. Identify condenser components and describe their purpose and operation.
5. Identify methods of heat reclaim and describe their associated procedures.
6. Identify methods of head pressure control and describe their associated procedures.
 - i) air-cooled
 - ii) water-cooled
 - iii) evaporative
7. Describe the factors and conditions that determine condenser capacity and efficiency.
8. Describe the procedures used to size condensers.
9. Describe the procedures used to install condensers and their components.
10. Describe the procedures used to maintain and troubleshoot condensers and their components.

RACM - 12 AIR CONDITIONING FUNDAMENTALS

Learning Outcomes:

- Demonstrate knowledge of air conditioning fundamentals.
- Demonstrate knowledge of air conditioning systems, their components and operation.

Objectives and Content:

1. Define terminology associated with air conditioning.
2. Identify the factors that affect human comfort with respect to air quality.
3. Identify types of air conditioning systems and describe their components and operation.
4. Explain air circulation and ventilation.
5. Identify tools and instruments used to determine air quality.
6. Describe indoor and outdoor design conditions.

RACM - 24 REFRIGERATION AND AIR CONDITIONING INSTALLATION

Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare for and install refrigeration systems and their components.
- Demonstrate knowledge of the procedures used to prepare for and install refrigeration components of air conditioning systems.

Objectives and Content:

1. Identify and interpret codes, regulations and manufacturers' specifications pertaining to refrigeration and air conditioning installations.
2. Describe the procedures used to prepare for refrigeration and air conditioning system installations.
 - i) select tools and equipment
 - ii) select components
 - iii) select piping and fittings
 - iv) select ancillary devices
 - v) use electrical diagrams
 - vi) use piping schematic diagrams
3. Describe the procedures used to install refrigeration and air conditioning systems.
 - i) piping
 - ii) wiring
 - iii) leak testing
 - iv) evacuation
 - v) charging
4. Describe the factors to consider when performing a system start-up.
 - i) phasing, voltage imbalance and amperage
 - ii) refrigerant charge adjustments
 - iii) oil levels
 - iv) operating pressures and temperatures
 - v) system control adjustments
 - vi) manufacturers' recommendations

5. Describe documentation requirements for system installation, start-up and commissioning.

RACM - 10 MOTORS II

Learning Outcomes:

- Demonstrate knowledge of the procedures used to install single and multi-phase motors and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot single and multi-phase motors and their components.
- Demonstrate knowledge of the procedures used to install motor controls.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot motor controls.

Objectives and Content:

1. Define terminology associated with multi-phase motors and motor controls.
2. Explain the principles of multi-phase motor operation.
3. Identify types of starting devices for multi-phase motors and describe their characteristics, wiring configuration and operation
4. Identify single and multi-phase motor failures and describe their causes and remedies.
 - i) electrical
 - ii) mechanical
5. Describe methods used to change speed and rotation of multi-phase motors.
 - i) variable frequency drives (VFD)
6. Describe the procedures used to install single and multi-phase motors and their components.
 - i) single-phase
 - ii) three-phase
 - iii) electrically commutated motors (ECM)
7. Describe the procedures used to maintain and troubleshoot single and multi-phase motors and their components.
8. Describe the procedures used to install motor controls.

9. Describe the procedures used to maintain and troubleshoot motor controls.

RACM - 11 CONTROL FUNDAMENTALS

Learning Outcomes:

- Demonstrate knowledge of control fundamentals and applications.
- Demonstrate knowledge of system controls, their components and operation.

Objectives and Content:

1. Define terminology associated with system control.
2. Identify types of control systems and describe their components and operation.
3. Identify types of control circuits and describe their applications, components and operation.
4. Identify types of control devices and describe their applications and operation.
5. Explain open and closed loop control.
6. Describe control and control actions with respect to loads, switches and circuits.
7. Identify types of monitoring controls and describe their applications and operation.
 - i) flow
 - ii) humidity
 - iii) liquid level
 - iv) pressure
 - v) temperature

RACM - 25 CONTROL CIRCUITS AND WIRING DIAGRAMS

Learning Outcomes:

- Demonstrate knowledge of the procedures used to install control circuits.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot control circuits.
- Demonstrate knowledge of wiring diagrams and their use.

Objectives and Content:

1. Define terminology associated with control circuits and wiring diagrams.
2. Describe the operating principles of control systems.
3. Describe the operation of a control circuit and its wiring configuration within system design.
4. Identify types of controls and describe their applications.
 - i) operating
 - ii) safety
 - iii) defrost
5. Identify types of wiring diagrams and describe their characteristics and applications.
 - i) pictorial
 - ii) schematic
6. Identify and interpret information and symbols found on schematic diagrams.
7. Sketch a schematic wiring diagram based on a written sequence of control events.
8. Sketch a schematic wiring diagram from a pictorial diagram.
9. Sketch a pictorial diagram from a schematic wiring diagram.
10. Describe the procedures used to install control circuits.
11. Describe the procedures used to maintain and troubleshoot control circuits.

RACM - 33 FANS, MECHANICAL DRIVES, AIR FILTERS AND AIR CLEANERS

Learning Outcomes:

- Demonstrate knowledge of fans, mechanical drives, air filters and air cleaners, their components and operation.
- Demonstrate knowledge of the procedures used to install fans, mechanical drives, air filters and air cleaners, and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot fans, mechanical drives, air filters and air cleaners, and their components.

Objectives and Content:

1. Define terminology associated with fans, mechanical drives and air filters.
2. Identify types of fans and describe their characteristics and applications.
3. Identify fan components and describe their purpose and operation.
4. Identify and interpret information found on fan performance curve charts.
5. Describe factors that affect fan performance.
6. Identify types of mechanical drives and describe their characteristics and applications.
7. Identify types of mechanical drive components and describe their purpose and operation.
8. Identify types of air filters and air cleaners and describe their characteristics and applications.
9. Describe the procedures used to install fans, mechanical drives, air filters and air cleaners, and their components.
10. Describe the procedures used to maintain and troubleshoot fans, mechanical drives, air filters and air cleaners, and their components.

LEVEL 3

RACM - 28 REFRIGERATION SYSTEM DESIGN

Learning Outcomes:

- Demonstrate knowledge of refrigeration system design principles.
- Demonstrate knowledge of refrigeration system components and their selection based on design criteria.
- Demonstrate knowledge of refrigeration system capacity control.
- Demonstrate knowledge of developing piping schematics.
- Demonstrate knowledge of developing electrical schematics.

Objectives and Content:

1. Define terminology associated with refrigeration system design.
2. Identify and interpret codes and regulations pertaining to refrigeration system design.
3. Explain fundamental principles of refrigeration system design.
4. Interpret graphs and tables for refrigeration system design.
5. Identify capacity ratings of refrigeration system components.
6. Perform calculations for refrigeration system design.
 - i) horsepower per ton
 - low temperature system
 - medium temperature system
 - high temperature system
7. Describe the selection of components and ancillary devices for refrigeration systems based on design criteria.
8. Describe the selection of refrigerant based on design criteria.
9. Describe the factors to consider in the design and layout of refrigeration systems.
10. Describe the importance of balancing system capacity with system load.

11. Describe the factors to consider when sizing pipe for refrigeration piping systems.
12. Describe the procedures used to size pipe for refrigeration piping systems.
13. Develop piping schematics for refrigeration systems.
14. Develop electrical schematics for refrigeration systems.

RACM - 29 REFRIGERATION LOAD CALCULATIONS

Learning Outcomes:

- Demonstrate knowledge of performing refrigeration load calculations.

Objectives and Content:

1. Define terminology associated with refrigeration load calculations.
2. Perform load calculations and determine total loads for refrigeration systems.
 - i) transmission
 - K, C, U and R values
 - solar load
 - ii) air change
 - infiltration
 - ex-filtration
 - usage
 - iii) product
 - sensible heat
 - latent heat
 - heat of respiration
 - iv) miscellaneous
 - fans
 - lights
 - motors
 - people
 - equipment
 - v) defrost load
 - air
 - electric
 - hot gas
 - vi) BTU/hr total

RACM - 17 COMPRESSORS III

Learning Outcomes:

- Demonstrate knowledge of capacity control.
- Demonstrate knowledge of the procedures used to install large commercial/industrial compressors and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot large commercial/industrial compressors and their components.

Objectives and Content:

1. Define terminology associated with large commercial/industrial compressors.
2. Identify hazards and describe safe work practices pertaining to large commercial/industrial compressors.
3. Identify and interpret codes and regulations pertaining to large commercial/industrial compressors.
4. Identify specialized tools and equipment and describe their applications and procedures for use.
5. Identify methods used to cool compressors.
6. Identify methods of forced compressor lubrication.
7. Identify methods of compressor capacity control.
8. Describe the procedures used to install large commercial/industrial compressors and their components.
9. Describe procedures used to maintain and troubleshoot large commercial/industrial compressors and their components.
10. Identify compressor failures and describe their causes and remedies.
 - i) mechanical
 - ii) electrical

11. Describe the procedures used to start-up and shut-down large commercial/industrial compressors.

RACM - 22 EVAPORATIVE CONDENSERS AND COOLING TOWERS

Learning Outcomes:

- Demonstrate knowledge of evaporative condensers and cooling towers, their components and operation.
- Demonstrate knowledge of the procedures used to install evaporative condensers and cooling towers.
- Demonstrate knowledge to maintain and troubleshoot evaporative condensers and cooling towers.

Objectives and Content:

1. Define terminology associated with evaporative condensers and cooling towers.
2. Describe the purpose and operating principles of evaporative condensers.
3. Identify types of evaporative condensers and describe their characteristics and applications.
4. Identify evaporative condenser components and describe their purpose and operation.
5. Describe the factors that influence the effectiveness of evaporative condensers.
6. Describe and determine the capacity of an evaporative condenser using psychrometric processes.
7. Identify methods to control head pressure and describe their associated procedures.
8. Identify potential evaporative condenser problems and describe their causes and remedies.
9. Describe the procedures used to install evaporative condensers.
10. Describe the procedures used to maintain and troubleshoot evaporative condensers.

11. Describe the procedures used to start-up, operate and shut-down evaporative condensers.
12. Describe the purpose and operating principles of cooling towers.
13. Identify types of cooling towers and describe their characteristics and applications.
14. Identify cooling tower components and describe their purpose and operation.
15. Describe the factors that influence the effectiveness of cooling towers.
16. Describe and determine the capacity of a cooling tower using psychrometric processes.
17. Identify potential water problems and describe their causes and remedies.
18. Describe the procedures used to install cooling towers.
19. Describe the procedures used to maintain and troubleshoot cooling towers.
20. Describe the procedures used to start-up, operate and shut-down cooling towers.

RACM - 26 COMMERCIAL REFRIGERATION SYSTEMS

Learning Outcomes:

- Demonstrate knowledge of commercial refrigeration systems, their components and operation.
- Demonstrate knowledge of the procedures used to install commercial refrigeration systems and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot commercial refrigeration systems and their components.
- Demonstrate knowledge of specialty systems and their applications.

Objectives and Content:

1. Define terminology associated with commercial refrigeration systems.
2. Identify and interpret codes and regulations pertaining to commercial refrigeration systems.
3. Identify types of commercial refrigeration systems and describe their characteristics and applications.
4. Identify types of specialty systems and describe their characteristics and applications.
 - i) ultra-low
 - ii) cryogenic
 - iii) cascade
5. Identify commercial refrigeration system components and describe their purpose and operation.
6. Identify factors that optimize storage of refrigerated and frozen products.
7. Describe the procedures used to install commercial refrigeration systems and their components.
8. Describe the procedures used to maintain and troubleshoot commercial refrigeration systems and their components.

9. Describe the procedures used to start-up and shut-down commercial refrigeration systems.

RACM - 27 AIR CONDITIONING SYSTEMS

Learning Outcomes:

- Demonstrate knowledge of residential and commercial air conditioning systems, their components and operation.
- Demonstrate knowledge of the procedures used to install residential and commercial air conditioning systems and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot residential and commercial air conditioning systems and their components.

Objectives and Content:

1. Define terminology associated with residential and commercial air conditioning systems.
2. Identify types of residential and commercial air conditioning systems and describe their characteristics and applications.
3. Identify types of residential and commercial air conditioning system components and describe their purpose and operation.
4. Describe the procedures used to install residential and commercial air conditioning equipment and their components.
5. Describe the procedures used to maintain and troubleshoot residential and commercial air conditioning equipment and their components.
6. Describe potential residential and commercial air conditioning problems and their causes and remedies.
7. Describe the procedures used to calibrate and adjust air conditioning system components.
8. Describe the procedures used to start-up and shut-down air conditioning systems.

RACM - 42 PACKAGED AIR CONDITIONING UNITS

Learning Outcomes:

- Demonstrate knowledge of packaged air conditioning units, their components and operation.
- Demonstrate knowledge of the procedures used to install packaged air conditioning units and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot packaged air conditioning units and their components.

Objectives and Content:

1. Define terminology associated with packaged air conditioning units.
2. Identify hazards and describe safe work practices when working with packaged air conditioning units.
3. Identify and interpret codes and regulations pertaining to packaged air conditioning units.
4. Identify types of packaged air conditioning units and describe their characteristics and applications.
5. Identify packaged air conditioning unit components and describe their purpose and operation.
6. Perform calculations for packaged air conditioning units.
7. Identify potential problems and describe their causes and remedies.
8. Describe the procedures used to install packaged air conditioning units and their components.
9. Describe the procedures used to maintain and troubleshoot packaged air conditioning units and their components.
10. Describe the procedures used to start-up and shut-down packaged air conditioning units.

RACM – 23 FLUID DYNAMICS AND CIRCULATING PUMPS

Learning Outcomes:

- Demonstrate knowledge of fluid dynamics within piping systems.
- Demonstrate knowledge of circulating pumps, their components and operation.

Objectives and Content:

1. Define terminology associated with fluid dynamics and circulating pumps.
2. Explain principles of fluid dynamics.
3. Perform calculations for fluid dynamics and pump sizing.
4. Identify types of circulating pumps and describe their characteristics and applications.
5. Identify circulating pump components and describe their purpose and operation.
6. Describe the factors to consider when selecting a circulating pump.
 - i) system parameters
 - ii) pump curves
 - iii) circuit configurations
7. Identify potential problems of air in an open or closed system and their causes and remedies.
8. Describe the procedures to purge air from an open or closed system.

RACM - 32 HEAT PUMP SYSTEMS

Learning Outcomes:

- Demonstrate knowledge of heat pump systems, their components and operation.
- Demonstrate knowledge of the procedures used to install heat pump systems and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot heat pump systems and their components.

Objectives and Content:

1. Define terminology associated with heat pump systems.
2. Identify and interpret codes and regulations pertaining to heat pump systems.
3. Describe the operating principles of heat pump systems.
4. Identify types of heat pumps and describe their characteristics and applications.
5. Identify heat pump components and describe their purpose and operation.
6. Describe the operation of the defrost cycle as it relates to heat pumps.
7. Describe the environmental considerations when installing heat pumps.
8. Describe water quality as it relates to open loop systems.
9. Perform calculations for heat pump systems.
10. Describe control sequences for heat pumps.
11. Describe the procedures used to install heat pumps and their components.
12. Describe the procedures used to maintain and troubleshoot heat pumps and their components.

RACM - 35 CONTROL SYSTEMS

Learning Outcomes:

- Demonstrate knowledge of control systems, their components and operation.
- Demonstrate knowledge of the procedures used to install control systems and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot control systems and their components.

Objectives and Content:

1. Define terminology associated with control systems.
2. Identify control principles and describe their operation.
 - i) two position control
 - ii) floating control
 - iii) pulse width modulation
 - iv) Proportional (P)
 - v) Proportional plus Integral (PI)
 - vi) Proportional plus Integral plus Derivative (PID)
3. Identify types of control systems and describe their characteristics and applications.
 - i) electric
 - ii) electronic
 - iii) pneumatic
 - iv) direct digital control (DDC)
4. Identify control system components and describe their purpose and applications.
5. Describe the procedures used to install control systems and their components.
6. Describe the procedures used to maintain and troubleshoot control systems and their components.
7. Describe the procedures used to start-up and commission control systems.

Learning Outcomes:

- Demonstrate knowledge of testing tools and equipment, their applications and procedures for use.
- Demonstrate knowledge of the procedures used to troubleshoot electronic components and control boards.

Objectives and Content:

1. Define terminology associated with electronics.
2. Identify electronic components and describe their purpose and operation.
3. Identify tools and equipment used to test and troubleshoot electronic components and describe their applications and procedures for use.
4. Describe the procedures used to troubleshoot electronic components and control boards.

LEVEL 4

MENT-1802

Workplace Mentoring II (Nova Scotia Unit of Instruction)

Learning Outcomes:

- Identify and explain strategies for teaching workplace skills.
- Demonstrate strategies to assist in teaching skills in the workplace

Objectives and Content:

1. Describe the impact of your own experiences in teaching skills.
2. Identify the different roles played by a workplace mentor.
3. Describe the six-step approach to teaching skills.
4. Explain the importance of identifying the point of the lesson.
5. Identify how to choose a good time to present a lesson.
6. Explain the importance of linking the lessons.
7. Identify the components of the skill (the context).
8. Describe considerations for demonstrating a skill.
9. Identify types of skill practice.
10. Describe considerations in setting up opportunities for skill practice.
11. Explain the importance of providing feedback.
12. Identify techniques for giving effective feedback.
13. Describe a skill assessment.
14. Identify methods of assessing progress.
15. Explain how to adjust a lesson to different situations.

Resource:

- Recommended resource to use in the delivery of this unit:
www.apprenticeship.nsc.ca/mentoring/apprentice.htm

RACM - 30 AIR CONDITIONING SYSTEM DESIGN

Learning Outcomes:

- Demonstrate knowledge of air conditioning system design principles.
- Demonstrate knowledge of air volume requirements of air conditioning systems.
- Demonstrate knowledge of air conditioning system components and their selection based on design criteria.
- Demonstrate knowledge of air conditioning system capacity control.
- Demonstrate knowledge of developing piping schematics.
- Demonstrate knowledge of developing electrical schematics.

Objectives and Content:

1. Define terminology associated with air conditioning system design.
2. Identify and interpret codes and regulations pertaining to air conditioning system design.
3. Explain fundamental principles of air conditioning system design.
4. Interpret graphs and tables for air conditioning system design.
5. Identify capacity ratings of air conditioning system components.
6. Perform calculations for air conditioning system design.
 - i) air volumes and velocities
 - ii) operating capacity
 - iii) design capacity
 - iv) heating load
 - v) cooling load
 - vi) peak load
 - vii) transfer rates
 - viii) sizing of humidity control equipment
7. Identify methods of zoning and describe their applications.

8. Identify types of system design and their applications.
 - i) constant air volume
 - ii) variable air volume
9. Describe the selection of components and ancillary devices for air conditioning systems based on design criteria.
10. Describe the factors to consider in the design and layout of air conditioning systems.
11. Describe the importance of balancing system capacity with system load.
12. Describe the factors to consider when sizing pipe for air conditioning piping systems.
 - i) humidification
 - ii) dehumidification
 - iii) refrigeration piping
 - iv) secondary refrigeration piping
 - v) drainage
 - vi) condenser water piping
13. Describe the procedures used to size pipe for air conditioning piping systems.
14. Develop piping schematics for air conditioning systems.
15. Develop electrical schematics for air conditioning systems.

RACM - 31 AIR CONDITIONING LOAD CALCULATIONS

Learning Outcomes:

- Demonstrate knowledge of performing air conditioning load calculations.

Objectives and Content:

1. Define terminology associated with air conditioning load calculations.
2. Perform heat gain and heat loss calculations for air conditioning systems.
 - i) transmission
 - K, C, U and R values
 - solar load
 - ii) air change
 - infiltration
 - ex-filtration
 - ventilation
 - iii) heat gain/loss
 - sensible
 - latent
 - iv) miscellaneous
 - lighting
 - occupancy
 - equipment
 - v) BTU/hr total

RACM - 34 AIR MEASURING INSTRUMENTS AND SYSTEM AIR BALANCING

Learning Outcomes:

- Demonstrate knowledge of the principles of air measurement and air quality management.
- Demonstrate knowledge of the procedures used to measure air flow quantity.
- Demonstrate knowledge of air measuring instruments, their applications and procedures for use.
- Demonstrate knowledge of system air balancing procedures.

Objectives and Content:

1. Define terminology associated with air measuring instruments and system air balancing.
2. Identify and interpret codes and regulations pertaining to air measurement and system air balancing.
3. Explain fundamental principles of air movement and air quality management.
4. Identify types of air measurement instruments and describe their applications and procedures for use.
5. Identify types of charts used to monitor and balance air systems and describe their applications and procedures for use.
6. Describe conditions affecting air properties.
7. Perform calculations for system air balancing.
8. Describe the procedures used in system air balancing.

RACM - 37 DUCT SYSTEMS AND DESIGN

Learning Outcomes:

- Demonstrate knowledge of duct system design.
- Demonstrate knowledge of duct systems, their components and operation.
- Demonstrate knowledge of the procedures used to install duct systems and their components.
- Demonstrate knowledge of the procedures to maintain and troubleshoot duct systems and their components.

Objectives and Content:

1. Define terminology associated with duct systems and design.
2. Identify hazards and describe safe work practices pertaining to duct systems.
3. Identify and interpret codes and regulations pertaining to duct systems.
4. Identify types of duct systems and describe their characteristics and applications.
5. Identify duct system components and describe their purpose and operation.
6. Describe the factors affecting duct system sizing, layout and design.
7. Identify methods of sizing duct and describe their associated procedures.
8. Identify types of charts used to plan duct systems and describe their applications and procedures for use.
9. Identify types of duct insulation and sealants and describe their applications.
10. Identify potential problems and describe their causes and remedies.
11. Describe the procedures used to install duct systems and their components.
12. Describe the procedures used to maintain and troubleshoot duct systems and their components.

RACM - 41 HEATING SYSTEMS

Learning Outcomes:

- Demonstrate knowledge of heating systems, their components and operation.
- Demonstrate knowledge of the procedures used to install heating systems and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot heating systems and their components.

Objectives and Content:

1. Define terminology associated with heating systems.
2. Identify hazards and describe safe work practices when working with heating fuels.
3. Describe the physical and chemical properties of heating fuels.
4. Identify and interpret codes and regulations pertaining to heating systems.
 - i) jurisdictional certifications
5. Identify types of heating systems and describe their characteristics and applications.
 - i) gas
 - ii) oil
 - iii) electric
6. Identify types of heating system components and describe their purpose and operation.
7. Perform calculations for heating systems.
8. Identify potential problems and describe their causes and remedies.
9. Identify specialized tools and equipment and describe their applications and procedures for use.
10. Describe the procedures used to install heating systems and their components.

11. Describe the procedures used to maintain and troubleshoot heating systems and their components.
12. Describe the procedures used to start-up and shut-down heating systems.

RACM - 38 CHILLERS AND CHILLER SYSTEMS

Learning Outcomes:

- Demonstrate knowledge of chillers and chiller systems, their components and operation.
- Demonstrate knowledge of the procedures used to install chillers, chiller systems and their components.
- Demonstrate knowledge of the procedures to maintain and troubleshoot chillers, chiller systems and their components.

Objectives and Content:

1. Define terminology associated with chillers and chiller systems.
2. Identify hazards and describe safe work practices pertaining to chillers and chiller systems.
3. Identify and interpret codes and regulations pertaining to chillers and chiller systems.
4. Explain the operating principles of chiller systems.
 - i) primary
 - ii) secondary
5. Identify chiller applications and describe their characteristics.
 - i) air conditioning
 - ii) ice rink/surface
 - iii) process
 - iv) supermarket
6. Identify chiller components and describe their purpose and operation.

7. Identify types of chiller systems and describe their characteristics and applications.
 - i) reciprocating
 - ii) screw
 - iii) scroll
 - iv) rotary
 - v) centrifugal
 - vi) absorption
8. Identify chiller system components and describe their purpose and operation.
9. Interpret schematic diagrams for chiller systems.
10. Describe the operating cycles of chiller systems.
 - i) motor cooling
 - ii) lubrication
 - iii) refrigeration
11. Describe the methods of chiller capacity control.
12. Describe the procedures used to install chillers and chiller systems and their components.
13. Describe the procedures used to maintain and troubleshoot chillers and chiller systems and their components.
14. Describe the procedures used to start-up and shut-down chiller systems.

RACM – 40 INDUSTRIAL REFRIGERATION SYSTEMS

Learning Outcomes:

- Demonstrate knowledge of industrial refrigeration systems, their components and operation.
- Demonstrate knowledge of the procedures used to install industrial refrigeration systems and their components.
- Demonstrate knowledge of the procedures used to maintain and troubleshoot industrial refrigeration systems and their components.

Objectives and Content:

1. Define terminology associated with industrial refrigeration systems.
2. Identify and interpret codes and regulations pertaining to industrial refrigeration systems.
3. Identify hazards and safe work practices pertaining to industrial refrigeration systems.
4. Identify types of industrial refrigeration systems and describe their characteristics and applications.
5. Identify industrial refrigeration system components and describe their purpose and operation.
6. Describe the procedures used to install industrial refrigeration systems and their components.
7. Describe the procedures used to maintain and troubleshoot industrial refrigeration systems and their components.
8. Describe the procedures used to start-up and shut-down industrial refrigeration systems.

RACM - 36 TROUBLESHOOTING WITH SCHEMATIC WIRING DIAGRAMS

Learning Outcomes:

- Demonstrate knowledge of advanced schematic wiring diagrams and their use in troubleshooting complex systems.

Objectives and Content:

1. Interpret advanced schematic wiring diagrams for use in troubleshooting complex systems.
 - i) manufacturers' drawings
 - ii) as-built drawings

2. Identify troubleshooting techniques using advanced schematic wiring diagrams and describe their associated procedures.

RACM - 43 JOB COORDINATION

Learning Outcomes:

- Demonstrate knowledge of effective job coordinating practices.
- Demonstrate knowledge of equipment and material acquisition.

Objectives and Content:

1. Identify sources of information relevant to job coordinating.
 - i) trade-related documentation
 - ii) related professionals
 - iii) customers
 - iv) co-workers

2. Identify information gathering and communication techniques.
 - i) questioning
 - ii) translating technical information
 - iii) using communication equipment

3. Identify and interpret regulatory requirements.
 - i) standards and regulations
 - ii) codes and by-laws
 - iii) permits
 - iv) inspections

4. Estimate work requirements.
 - i) tools and equipment
 - ii) components and accessories
 - iii) time and costs

5. Describe the procedures used to coordinate work requirements.
 - i) conduct work area inspection
 - ii) coordinate work requirements
 - iii) maintain customer relations
 - iv) clarify end user problems and concerns
 - v) complete work-related documentation
 - vi) generate maintenance documentation
 - vii) requisition equipment, components and accessories
 - viii) receive equipment, components and accessories
 - ix) transfer equipment to designated location

RACA-1827

Program Review

(Nova Scotia Unit of Instruction)

Learning Outcomes:

- Upon successful completion of this unit, the apprentice will complete a study plan based on the National Occupational Analysis.

Objectives and Content:

1. Identify areas of the program where knowledge of theory is weakest.
2. Identify areas where workplace experience is lacking or weak.
3. Identify resources necessary to address areas of shortfall.
4. Identify timelines to address areas of weakness.

Suggested Learning Activities:

1. Conduct a mock certification exam to be used for diagnostic purposes.
2. Review the National Occupational Analysis.
3. Review the Apprentice Logbook.
4. Review the Exam Preparation information found at www.nsapprenticeship.ca under Quick Links, Exam Preparation.
5. Conduct a final mock certification exam.

Resources:

These are the recommended resources to use in the delivery of this unit:

- Exam Preparation information, including videos, occupational analyses, exam counseling sheets, practice exams and sample questions, and other study materials and resources, can be found at www.nsapprenticeship.ca under Quick Links, Exam Preparation.
- Apprentice's personal logbook
- Applicable codes and regulations
- Program texts

Evaluation: pass/fail

Nova Scotia Document Evaluation Form

Thank you for your interest in the development and revision of this document. Upon review of the document, please record your feedback in relation to the following items:

- course division and organization
- relevancy of the content
- errors or omissions
- other suggestions for improvement and consideration

Overall comments are to be entered on this evaluation form and specific changes are to be entered directly on the document in the relevant area(s). When making proposed corrections(s) in the document, please use red ink. When all feedback has been recorded, return this evaluation form along with the document to the Apprenticeship Office noted at the bottom of the page.

(PLEASE PRINT)

Trade: Refrigeration & Air Conditioning Mechanic

Full Name: _____

Type of Position: (Trade Practitioner, Instructor, etc.): _____

Company: _____

Address: _____

Telephone: _____

Comments: (Use a separate sheet of paper if necessary)

Return Evaluation Form and Document to:

Nova Scotia Apprenticeship Agency
1256 Barrington Street, 3rd Floor
PO Box 578
Halifax, NS B3J 2S9