



ONTARIO COLLEGE OF TRADES
ORDRE DES MÉTIERS DE L'ONTARIO

Apprenticeship
Training Standard

Refrigeration and
Air Conditioning Systems
Mechanic – Branch 1

Trade Code: 313A

Development Date: September 2004

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COMPETENCY ANALYSIS PROFILE
Refrigeration and Air Conditioning Systems Mechanic - Branch 1 – 313A

(All unshaded skill sets must be demonstrated/completed)

SKILL SETS

SKILLS

PROTECT SELF AND OTHERS	Identify, interpret, and comply with safety directives	Wear, adjust, and maintain personal protective equipment	Practise good housekeeping in the workplace	Handle and dispose designated substances and refrigerants	Follow fire safety procedures
6238.0	6238.01	6238.02	6238.03	6238.04	6238.05
	Operate emergency safety equipment	Follow first aid procedures	Report injuries	Lock out equipment for repair or maintenance	Work within safe physical limits
	6238.06	6238.07	6238.08	6238.09	6238.10
	Operate material handling equipment	Operate worker elevating platforms	Handle and transport compressed gases and equipment		
	6238.11	6238.12	6238.13		

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SKILL SETS

SKILLS

PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION & AIR CONDITIONING (R&AC) SYSTEM 6239.0	Read and interpret job documentation	Identify type of R&AC system	Identify and select R&AC system components and equipment	Identify design parameters of R&AC system	Calculate the R&AC system operating parameters
	6239.01	6239.02	6239.03	6239.04	6239.05
	Identify and select R&AC system operating controls	Identify and select R&AC system safety controls	Identify and select R&AC system functional controls	Identify and select R&AC system accessories	Identify and select welding, cutting, brazing, soldering, or purging equipment
	6239.06	6239.07	6239.08	6239.09	6239.10
	Identify and select hand tools	Identify and select power tools	Identify and select electrical measuring devices	Identify and select R&AC pressure, temperature, and flow measuring devices	Identify and select R&AC specialty instruments
	6239.11	6239.12	6239.13	6239.14	6239.15
Identify and select R&AC precision measuring instruments	Identify and select the R&AC installation and material handling equipment	Identify and select material handling and worker elevating methods and equipment	Coordinate permits, inspections, and sub-trades	Complete planning work sheets	
6239.16	6239.17	6239.18	6239.19	6239.20	
Communicate with others					
6239.21					

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SKILL SETS

SKILLS

INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP) 6240.0	Inspect AC and HP at site 6240.01	Perform a site evaluation 6240.02	Prepare work site 6240.03	Prepare site for installation 6240.04	Assemble and install AC and HP components and accessories 6240.05
	Braze and solder AC and HP piping 6240.06	Check AC and HP system for leaks 6240.07	Evacuate and dehydrate system 6240.08	Wire-in AC and HP 6240.09	Charge AC and HP system with refrigerant 6240.10
	Set and verify AC and HP electrical, electronic, and automated control systems 6240.11	Check and adjust air flow, water, and glycol levels 6240.12	Verify charging of AC and HP system 6240.13	Verify AC and HP system operating parameters 6240.14	Commission AC and HP system 6240.15
	Complete AC and HP installation and start-up documentation 6240.16				

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SKILL SETS

SKILLS

SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)	Troubleshoot AC and HP accessories and components	Replace or repair AC and HP accessories and components	Replace or repair system zoning components	Repair or replace AC and HP operating and safety controls	Clean or replace AC and HP electrical components
6241.0	6241.01	6241.02	6241.03	6241.04	6241.05
	Test or replace AC and HP electronic components	Rewire and repair AC and HP system wiring	Clean or replace actuator and damper/zone controls	Repair or replace refrigerant flow and metering devices	Clean and replace heat transfer devices, coils, and heat exchangers
	6241.06	6241.07	6241.08	6241.09	6241.10
	Adjust and replace heat transfer medium	Test or replace AC and HP electrical heaters, HRV/ERV and electronic air cleaners	Replace or repair system piping	Replace or repair AC and HP condensate drains and accessory components	Check system for leakage
	6241.11	6241.12	6241.13	6241.14	6241.15
	Replace air cooling compressor	Clean or replace AC and HP filter system and components	Replace or repair the air side of AC and HP equipment	Replace or repair air handler components	Replace or repair AC and HP fans and motors
	6241.16	6241.17	6241.18	6241.19	6241.20
	Check operations and functions of total AC and HP system	Complete AC and HP service and maintenance records	Clean up work site		
	6241.21	6241.22	6241.23		

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SKILL SETS

SKILLS

INSTALL AND COMMISSION REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM 6242.0	Read and interpret R&AC installation and start up documentation	Inspect R&AC system, accessories, and components at work site	Perform a work site evaluation	Prepare work site	Coordinate permits, inspections, and sub-trades
	6242.01	6242.02	6242.03	6242.04	6242.05
	Prepare site for installation	Assemble and install R&AC system, accessories, and components	Assemble R&AC piping and components	Join and install R&AC piping	Check refrigerant piping for leaks
	6242.06	6242.07	6242.08	6242.09	6242.10
	Check component piping for leaks	Assemble and install R&AC electrical system accessories and components	Evacuate and dehydrate R&AC system	Commission R&AC system	Complete the installation and commissioning records
	6242.11	6242.12	6242.13	6242.14	6242.15
	Clean up work site				
	6242.16				

MAINTAIN REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM 6243.0	Troubleshoot R&AC systems and components	Clean and maintain R&AC filters and components	Clean and maintain R&AC condenser, evaporator, and accessory components	Clean and maintain R&AC humidifier and components	Clean or replace R&AC electrical components
	6243.01	6243.02	6243.03	6243.04	6243.05
	Check operation and functions of total R&AC system	Clean up work site	Complete R&AC maintenance documentation		
	6243.06	6243.07	6243.08		

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SKILL SETS

SKILLS

SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM 6244.0	Check R&AC system accessories and components	Replace or repair R&AC mechanical components	Repair or replace R&AC condensate components	Repair or replace R&AC piping, accessories, and components	Repair or replace R&AC refrigerant system, components, and accessories
	6244.01	6244.02	6244.03	6244.04	6244.05
	Repair or replace R&AC open, semi-hermetic, or hermetic compressor	Repair or replace R&AC fans and components	Repair or replace R&AC pneumatics	Replace R&AC controls and switches	Repair or replace Variable Air Volume (VAV) components
	6244.06	6244.07	6244.08	6244.09	6244.10
Repair or replace R&AC metering devices	Replace or repair R&AC electrical and electronic system and components	Decommission packaged R&AC equipment	Decommission split-system R&AC equipment	Decommission R&AC equipment for demolition	
6244.11	6244.12	6244.13	6244.14	6244.15	
Clean up work site	Complete servicing documentation				
6244.16	6244.17				

PERFORM CUSTOMER SERVICE 6245.0	Determine nature of service or maintenance call	Conduct a site evaluation	Perform a diagnostic inspection	Estimate costs of service or maintenance call	Complete service or maintenance schedule
	6245.01	6245.02	6245.03	6245.04	6245.05
Complete job work order	Instruct clients				
6245.06	6245.07				

PREFACE

This training standard was developed by the Workplace Training Branch of the Ministry of Training, Colleges, and Universities (MTCU), in partnership with the Provincial Advisory Committees and in consultation with representatives from the industry. This document is intended to be used by apprentice, supervisor/trainer and sponsor/employer as a "blueprint" for training and as a prerequisite for completion and certification.

This training document becomes the apprentice's only record of workplace training performance.

The supervisor/trainer and apprentice are required to sign off and date the skills following each successful acquisition, unless a skill is marked shaded (optional).

The care and maintenance of this training document are the joint responsibility of the apprentice and the sponsor/employer. By signing off the skill, the supervisor/trainer and the apprentice are indicating that the apprentice has demonstrated competence of the skill. This training standard has been developed specifically for documenting the apprentices acquisition of skills of the trade.

Please Note: Apprenticeship Training and Curriculum Standards were developed by the Ministry of Training, Colleges and Universities (MTCU). As of April 8th, 2013, the Ontario College of Trades (College) has become responsible for the development and maintenance of these standards. The College is carrying over existing standards without any changes.

However, because the Apprenticeship Training and Curriculum Standards documents were developed under either the Trades Qualification and Apprenticeship Act (TQAA) or the Apprenticeship and Certification Act, 1998 (ACA), the definitions contained in these documents may no longer be accurate and may not be reflective of the Ontario College of Trades and Apprenticeship Act, 2009 (OCTAA) as the new trades legislation in the province. The College will update these definitions in the future.

Meanwhile, please refer to the College's website (<http://www.collegeoftrades.ca>) for the most accurate and up-to-date information about the College. For information on OCTAA and its regulations, please visit: <http://www.collegeoftrades.ca/about/legislation-and-regulations>

DEFINITIONS

ACA

Apprenticeship and Certification Act, 1998

Certificate of Apprenticeship (C of A)

Certification issued to individuals who have demonstrated that they have completed an apprenticeship in Ontario.

Certificate of Qualification (C of Q)

Certification issued to C of Q applicants who have achieved a passing grade on the certification exam for their trade.

Competency Analysis Profile

A document that identifies the training needs of an individual trade and details the skills/skill sets that must be demonstrated.

Competence

The ability of an individual to perform a skill repeatedly and without assistance in the workplace to the standard set out in the Training Standard or Schedule of Training.

Including

When used before a list of actions or items, the list is not exhaustive but contains major examples of the actions or items intended.

General Performance Objective (On-the-Job Skill Set)

Describes a set of skills, which include all performance objectives under that skill set.

Industry Committee (IC) - under the ACA and Provincial Advisory Committee (PAC) under the TQAA

Under the ACA and TQAA, the Minister may appoint a provincial committee in any trade or group of trades to advise the Minister in matters relating to the establishment and operation of apprenticeship training programs and trades qualifications.

Journeyman or Equivalent

A person who has acquired the knowledge and skills in a trade, occupation or craft as attested to by a provincial or territorial authority.

Mandatory

Status assigned to unshaded individual skills, skill sets or general performance objective, which must be signed off to demonstrate that the apprentice has completed their program.

Optional

Status assigned to shaded individual skills, skills sets or general performance objective for which sign-off is not required for the apprentice to complete the program.

Sign-off

Signature of the sponsor/employer of record or an individual, to whom that sponsor or employer has delegated signing authority, indicating an apprentice's achievement of competence.

Skill

Individual skill described in the Training Standard (note: does not mean the larger skill groups referred to in the Training Standard as Skill Sets, Training Units, or General Performance Objective, but the individual skills that make up those groups).

Skill Sets

Group of individual skills found in the Training Standard (may also be called Training Unit or General Performance Objective)

Skill Set Completion Form

Lists all skill sets and includes space for sign-off by sponsor/employer of record.

Sponsor/Employer

Means a person that has entered into a registered training agreement under which the person is required to ensure that an individual is provided with workplace-based training in a trade, other occupation, or skill set as part of an apprenticeship program approved by the Director.

Sponsor/Employer of Record

Refers to the sponsor or employer documented as the signatory to the current training agreement or contract. In order for a sponsor/employer to be considered for the training of apprentices, they must identify that the workplace has qualified journeypersons or equivalent on site and can identify that the workplace has the tools, equipment, materials, and processes which have been identified by Provincial Advisory Committees (PACs) or Industry Committees (ICs) to be required for the trade.

Supervisor

An individual who oversees the execution of a task or oversees the actions and work of others.

Trainer

A qualified trainer in a compulsory trade is a journeyperson with a Certificate of Qualification or in a voluntary trade is an individual who is considered equivalent to a journeyperson with a Certificate of Qualification.

TQAA

Trades Qualification and Apprenticeship Act.

Training Standard

A document that has been written in concise statements, which describe how well an apprentice must perform each skill in order to become competent. By using the document, trainers will be able to ensure that the apprentice is developing skills detailed for the occupation.

IMPORTANT DIRECTIONS

Apprentice

1. All complete skills or skill sets must be signed and dated by both the apprentice and sponsor/employer when either all terms of the contract have been completed or the apprentice leaves the employ of the employer.
2. It is the responsibility of the apprentice to inform the local Apprenticeship Client Services Office regarding the following changes:
 - change of sponsor/employer address;
 - change of apprentice name or address;
 - transfer to a new sponsor/employer.
3. The Skill Set Completion Form must be completed and signed by the current sponsor/employer and presented to the local Apprenticeship Client Services Office at the fulfillment of all terms of a Contract of Apprenticeship/Training Agreement.
4. The Apprentice Completion Form with the Completed and Authorized Training Standard must be presented to the local Apprenticeship Client Services Unit.

Sponsors/Employers and Supervisors/Trainers

The Training Standard identifies skills required for this trade/occupation and its related training program.

This Training Standard has been written in concise statements, which describe how an apprentice must perform each skill in order to become competent. Competence means being able to perform the task to the required standard.

By using this Training Standard, supervisors/trainers will be able to ensure that the apprentice is developing the skills detailed for the trade/occupation.

Supervisors/trainers and apprentices are required to sign off and date the skills following each successful acquisition.

Sponsors/employers participating in this training program will be designated as the Signing Authority and are required to attest to successful achievement by signing the appropriate box included at the end of each skill set.

NOTICE OF COLLECTION OF PERSONAL INFORMATION

1. At any time during your apprenticeship training, you may be required to show this training standard to the Ministry of Training, Colleges and Universities (the Ministry). You will be required to disclose the signed Apprenticeship Completion form to the Ministry in order to complete your program. The Ministry will use your personal information to administer and finance Ontario's apprenticeship training system, including confirming your completion and issuing your certificate of apprenticeship.
2. The Ministry will disclose information about your program completion and your certificate of apprenticeship to the Ontario College of Trades, as it is necessary for the College to carry out its responsibilities.
3. Your personal information is collected, used and disclosed by the Ministry under the authority of the Ontario College of Trades and Apprenticeship Act, 2009.
4. Questions about the collection, use and disclosure of your personal information by the Ministry may be addressed to the:

Manager, Employment Ontario Contact Centre
Ministry of Training, Colleges and Universities
33 Bloor St. E, 2nd floor, Toronto, Ontario M7A 2S3
Toll-free: 1-800-387-5656; Toronto: 416-326-5656
TTY: 1-866-533-6339 or 416-325-4084.

ROLES & RESPONSIBILITIES OF APPRENTICE, SPONSOR/EMPLOYER AND SUPERVISOR/TRAINER

Apprentice “Apprenticeship is Learning On-the-job”

- Practice safe work habits.
- Use your apprenticeship training standard as a journal to keep track of which skills you have achieved.
- Talk over your training plan with your Training Consultant, Employer, Union, or Sponsor.
- Know what tools are required for your trade and how to use them.
- Ask questions and keep asking.
- Talk to your employer about your training needs.
- Demonstrate enthusiasm and good work habits.
- Ensure that you and your supervisor/trainer sign off skill/skill sets upon demonstration of competency.

Sponsor/Employer “Training is an Investment”

- Demonstrate safe work habits.
- Attest to successful achievement by signing the skill/skills sets.
- Provide opportunities and time for the apprentice to learn the trade.
- Offer practical trade training experiences that cover all of the skill sets.
- Foster work ethics that support training while minimizing productivity losses.
- Set out clear expectations, then recognize or reward performance excellence.
- Involve both the apprentice and supervisor/trainer in developing the training plan.
- Use the Training Standard as a monitoring tool and part of regular performance evaluations.
- Select supervisors/trainers with good communication skills and who work well with others.
- Encourage supervisors/trainers to take upgrading courses - (e.g. Train the Trainer, Mentor Coach, etc).
- Complete the Skill Set Completion Form once the apprentice has demonstrated competency in the training.
- Ensure that the apprentice always works under the direction of or has access to a qualified supervisor/trainer.
- Vary the apprentice’s exposure to all the skills set out in the training standard.

Supervisor/Trainer

- Demonstrate safe work habits.
- Treat apprentices fairly and with respect.
- Use the Training Standard as a guide to evaluating competence in each skill area. In using the Training Standard, supervisors/trainers will be able to ensure that the apprentice is developing skills detailed for the trade/occupation.
- Review the Training Standard with the apprentice and develop a training plan.
- Respond fully to all questions.
- Be patient. Explain what is to be done then, show how it is done, and then let the apprentice demonstrate the task.
- Provide continuous feedback.
- Sign off individual skills/skill sets once the apprentice demonstrates competence in the skill.

Suggestions for Assessing the Progress of the Apprentice in the Workplace

- Use informal daily observation.
- Provide constructive feedback to build confidence.
- Allow the supervisor/trainer time to teach and demonstrate the skills.
- Take prompt action wherever problems occur.
- Conduct regular performance reviews involving the apprentice, supervisor/trainer and sponsor/employer.
- Use the Training Standard as the reference for establishing the competency of the apprentice.

SKILL SET COMPLETION FORM

SKILLS SETS	TITLE	SIGNING AUTHORITY
6238.00	PROTECT SELF AND OTHERS	
6239.00	PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM	
6240.00	INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP)	
6241.00	SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)	
6242.00	INSTALL AND COMMISSION REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM	
6243.00	MAINTAIN REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM	
6244.00	SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM	
6245.00	PERFORM CUSTOMER SERVICE	

NOTE ON SHADED PERFORMANCE OBJECTIVES AND SKILLS:

- Shaded performance objectives and skill sets are optional. The shaded skills do not have to be demonstrated or signed-off for completion of the on-the-job component of the apprenticeship
- The in-school curriculum learning outcomes will cover all of the skill sets, both shaded and unshaded.
- The Certificate of Qualification examination will test the whole of the trade and may test both shaded and unshaded performance skill sets.

6238.00 PROTECT SELF AND OTHERS

GENERAL PERFORMANCE OBJECTIVE

Protect self and others by: identifying, interpreting, and complying with safety directives; wearing, adjusting, and maintaining personal protective equipment; practising good housekeeping in the workplace; handling and disposing of designated substances and refrigerants; following fire safety and first aid procedures; reporting injuries; locking out equipment for repair or maintenance; working within safe physical limits; operating material handling equipment, elevating worker platforms, and emergency safety equipment; and, handling and transporting compressed gases and equipment.

PERFORMANCE OBJECTIVES

SKILLS

6238.01 **Identify, interpret, and comply with safety directives** provided in applicable Acts, Regulations, Legislation, and Codes including (not limited to) the Occupational Health and Safety Act (OHSA), Worker’s Compensation Act (WCA), Ministry of Environment (MOE) Regulations, Dangerous Goods Transportation Act (DGTA), Workplace Hazardous Materials Information System (WHMIS), Ontario Fire Code (OFC), Canadian Electrical Code (CEC), Mechanical Refrigeration Code (B52), Energy Act (EA), and TSSA Act and Regulations.

Date Completed

Apprentice

Supervisor/Trainer

6238.02 **Wear, adjust, and maintain personal protective equipment** including (not limited to) safety and rubber boots, hard hats, gloves, glasses, goggles, masks, face shields, coveralls, fall-arrest equipment, and ear protectors, to ensure the correct fit and optimum protection for the wearer and the task being performed, in compliance with manufacturer’s specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6238.00 PROTECT SELF AND OTHERS ...cont'd

6238.03 **Practise good housekeeping in the workplace** by cleaning up spills and leaks, keeping work area clean and clear of obstructions, and storing tools or equipment, so that the potential for accident or injury is prevented and tools or equipment are in place and available, in compliance with company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6238.04 **Handle and dispose designated substances and refrigerants** using specified handling and storage equipment and disposing of recovered refrigerant, so that the operator is protected from injury, the environment from contamination, and procedures are followed in compliance with applicable Acts, Regulations, Legislation, and Codes, manufacturer's specifications, and company standards/policies.

Date Completed

Apprentice

Supervisor/Trainer

6238.05 **Follow fire safety procedures** including (not limited to): locating and assessing the severity of the fire; handling fire extinguishing equipment; suppressing minor fires; activating alarms; and, reporting incidents; in accordance with applicable Acts, Regulations, Legislation, and Codes, manufacturer's specifications, and company standards/policies.

Date Completed

Apprentice

Supervisor/Trainer

6238.00 PROTECT SELF AND OTHERS ...cont'd

6238.06 **Operate emergency safety equipment** including (not limited to) fire equipment, respirators, and fall-arrest equipment, ensuring that procedures are carried out in a safe and efficient manner in accordance with company standards/policies, manufacturer's specifications, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6238.07 **Follow first aid procedures** to treat conditions including (not limited to) sudden illness or minor injuries, burns, cuts, abrasions, falls, sprains, chemical inhalations, and contaminants in eyes, by using first aid equipment and following procedures so that the victim is stabilized and prepared for further first aid treatment in accordance with applicable Acts, Codes, Legislation, Regulations, and company standards/policies.

Date Completed

Apprentice

Supervisor/Trainer

6238.08 **Report injuries** to supervisor or first aid personnel promptly and clearly, ensuring that the injured person is attended to, and information is reported precisely and accurately describing how incident occurred, so that future recurrence of similar accidents is prevented, and reporting complies with company standards/policies, applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6238.00 PROTECT SELF AND OTHERS ...cont'd

6238.09 **Lock out equipment for repair or maintenance** by following company procedures including (not limited to): shutting down system; de-energizing equipment; tagging equipment; and, ensuring that power source is off and locked out prior to commencing maintenance or service; so that no damage or injury is caused to the operator or equipment, in compliance with applicable Acts, Regulations, Legislation, and Codes.

Date Completed	Apprentice	Supervisor/Trainer
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6238.10 **Work within safe physical limits** by applying lifting procedures for bending, lifting, transporting, or climbing with heavy loads, so that personal injury is prevented in accordance with applicable Acts, Regulations, Legislation and Codes and company standards/policies.

Date Completed	Apprentice	Supervisor/Trainer
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6238.11 **Operate material handling equipment** including (not limited to) hoists, cranes, slings, cables, and chains, so that the materials, parts, and equipment are removed, transported, and stored in compliance with manufacturer’s specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed	Apprentice	Supervisor/Trainer
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6238.12 **Operate worker elevating platforms** including (not limited to) ladders, boom truck, buckets, scaffolding, scissor lift, or articulating man lift, ensuring that the correct lifting procedures and equipment are used to move and hoist individuals, in compliance with manufacturer’s specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed	Apprentice	Supervisor/Trainer
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6238.00 PROTECT SELF AND OTHERS ...cont'd

6238.13 **Handle and transport compressed gases and equipment** including (not limited to) manifolds, tubing, gases, and hoses, so that all compressed gases are handled, moved, and stored in accordance with applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

Sponsor/Employer Name

Sponsor/Employer Signature

6239.00 PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM

GENERAL PERFORMANCE OBJECTIVE

Plan and prepare for installation, maintenance, or service of refrigeration and air conditioning (R&AC) system by: reading and interpreting job documentation; identifying type and components of R&AC; identifying design parameters; calculating system operating parameters; identifying and selecting operating controls, safety controls, functional controls, system accessories, cutting, brazing, soldering, or purging equipment, hand tools, powers tools, electrical measuring devices, pressure, temperature and flow measuring devices, specialty instruments, precision measuring instruments, materials and material handling equipment, and worker elevating platforms; coordinating permits, inspections, and sub-trades; completing planning records; and communicating with others.

PERFORMANCE OBJECTIVES

SKILLS

6239.01 **Read and interpret job documentation** including (not limited to) work order, manufacturer's specifications, architectural and mechanical engineering drawings, wiring diagrams, manufacturer's installation, operation, and maintenance specifications (IOM), and applicable Acts, Regulations, Legislation, and Codes to identify: type and size of equipment; type and components of system; design and operating parameters of system; required permits and licenses; installation, servicing, or maintenance procedures; location of mechanical causeways; material handling equipment; required tools, equipment, and materials; and any other information need to plan the completion of the installation, servicing, or maintenance job.

Date Completed

Apprentice

Supervisor/Trainer

6239.00 PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6239.02 **Identify type of R&AC system** by reading and interpreting job specifications including (not limited to) work orders, manufacturer's specifications, and architectural and mechanical engineering drawings, to identify any type of Conditioning or refrigeration system including (not limited to) Roof Mounted HVAC System, Chiller System, Split System, Packaging System, Built-Up System, Heat Recovery Ventilation/Energy Recovery Ventilator (HRV/ERV), Filtration System, Refrigeration or Conditioning System, and Controlled Environment System, so that the correct installation, servicing, or maintenance parameters and procedures can be determined in accordance with company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.03 **Identify and select R&AC system components and equipment** including (not limited to) heat recovery ventilator (HRV), controls, dampers, condensing unit, heat pump, energy recovery ventilator (ERV), condensate pumps, air or water cooled condensing unit or cooling tower unit, dry coolers, evaporators or chillers, air handlers, heat and energy recovery evaporator, fans, humidifier/dehumidifier, filtration system, condensate, brine, refrigerant, and pumps, ensuring that the components and equipment selected are the correct ones for the application in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.00 PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6239.04 **Identify design parameters of R&AC system** by reading and interpreting job documentation including (not limited to) work orders, manufacturer's specifications, architectural and mechanical engineering drawings, wiring diagrams, building codes, government codes and legislation, Safety Legislation, American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) codes, MRC - B52, and Manufacturer's Installation, Operation and Maintenance specifications (IOM) to identify: type, size, capacity, and parameters of the equipment; system components and parts; required permits; installation or service procedures; required tools, equipment and materials; location and layout of system; required sub-trades; and any other information needed to plan the installation of the R&AC system.

Date Completed

Apprentice

Supervisor/Trainer

6239.05 **Calculate R&AC system operating parameters** to determine and set out design features including (not limited to): heat loss or gain; ventilation loads; electrical loads; humidification and dehumidification loads; filtration/purification capacity; suspension loads; required equipment and accessories; air flow rates; liquid flow rates; pipe quantity, size, and fittings; drain system and parameters; refrigeration parameters by reading and interpreting industry standards, charts, psychrometric charts, tables, and manuals; and, using tape measures, calculators, scaled rules, and software; in order to determine that the R&AC system is the correct type and size for the application, in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.00 PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6239.06 **Identify and select R&AC system operating controls** including (not limited to) defrost, pressures, on/off switch, humidity, and temperature controls, ensuring that the operating controls and devices selected are the correct ones to measure the operational parameters of the system and that all controls are clean, calibrated, operational, and functioning, in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.07 **Identify and select R&AC system safety controls** including (not limited to) electrical, temperature, pressure, failure switches, relief valves, oil failure controls, and loads or overloads, ensuring that the safety controls selected are the correct ones for the safety parameters of the system and that controls are clean, calibrated, operational, and functioning, in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.08 **Identify and select R&AC system functional controls** including (not limited to) flow rates, levels, multi-staging, capacity control, metering, temperatures, and pressures, ensuring that the controls selected are the correct ones for the parameters of the system and that all functioning controls are clean, calibrated, operational, and functioning, in accordance with design parameters, manufacturer's specifications, codes, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

6239.00 PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6239.09 **Identify and select R&AC system accessories** including (not limited to) filter driers, oil separators, liquid moisture indicators, accumulators, vibration absorbers and indicator lights, ensuring that accessories selected are the correct ones for the R&AC system, in compliance with work order, design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.10 **Identify and select brazing, soldering, welding, cutting, or purging equipment** including (not limited to) compressed gases, manifold, gauges/hoses, torches, welding, brazing or soldering materials, flux, abrasives, and leak testing equipment, ensuring that the equipment selected are the correct ones for the application and that all equipment is cleaned, maintained and ready for use, in accordance with work order, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.11 **Identify and select hand tools** including (not limited to) spanners, reamers, dies, pop-rivet guns, manifolds, levels, layout tools, screw drivers, pliers, wrenches, metal snips, brazing/cutting torches, swaging/flaring tools, hammer, tubing cutters, pipe cutters, reamers, sockets, ratchets, saws, chisels, and specialty tools, ensuring that the hand tools selected are the correct ones for the application and that the tools are ready for use to install, service, or maintain the R&AC system, in accordance with work order, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

6239.00 PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6239.12 **Identify and select power tools** including (not limited to) drills, saws, pipe threaders, vacuum pumps, recovery units, pressure washers, and power-actuated tools, ensuring that the power tools selected are the correct ones for the application and ready for use to install, service, or maintain the system, in accordance with work order, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.13 **Identify and select electrical measuring devices** including (not limited to) ammeters, voltmeters, ohmmeters, multimeters, recorders, phase detectors, megometers, watt meters, and specialty instruments, ensuring that the electrical measuring devices selected are the correct ones for the application and are cleaned, maintained, calibrated and ready for use, in accordance with work order, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.14 **Identify and select the R&AC pressure, temperature, and flow measuring devices** including (not limited to) manifold gauges, manometers, thermometers, anemometers, hydrometers, hygrometers, velometers, psychrometers, thermo-couples, and tachometers, ensuring that the devices are the correct ones to measure the operating parameters of the system and that the devices are cleaned, calibrated, operational, and functioning, in accordance with manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.00 PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6239.15 **Identify and select R&AC speciality instruments** including (not limited to) micron gauges, refrigerant gauges, tachometers, scales, and infrared instruments, ensuring that the instruments are the correct ones to determine conditions and quantities of system and that the instruments are cleaned, calibrated, operational, and functioning, in accordance with manufacturer's specifications, work orders, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.16 **Identify and select R&AC precision measuring instruments** including (not limited to) micron gauges, refrigerant gauges, tachometers, scales, infrared instruments, and speciality measuring instruments, ensuring that the instruments are the correct ones to determine conditions and parameters of the system and that the instruments are cleaned, calibrated, operational, and functioning, in accordance with manufacturer's specifications and company standards/policies.

Date Completed

Apprentice

Supervisor/Trainer

6239.17 **Identify and select the R&AC installation and material handling equipment** including (not limited to): piping; insulation; brazing, soldering, welding, and cutting material; wiring material; electrical components; vibration absorbers; suspension equipment and materials; levelling equipment; fasteners; drain tubing; solvents; nitrogen and refrigerant; material handling and installation tools or equipment; and, chaseway materials and equipment; ensuring that equipment selected are the correct ones to install the system and that materials are available and ready for use, in accordance with work order, design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.00 PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6239.18 **Identify and select material handling and worker elevating methods and equipment** including (not limited to) ladders, boom truck, buckets, scaffolding, scissor lift, articulating man lift, hoists, cranes, slings, cables, and chains, ensuring that equipment selected are the correct ones to lift and move equipment and personnel, in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.19 **Coordinate permits, inspections, and sub-trades** to ensure that all permits and inspections have been arranged prior to installation and sub-trades have been contacted and scheduled, in compliance with industry and company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.20 **Complete planning work sheets** by ensuring that work order, permits, sign-off sheets, or manufacturer's check lists are available and ready for use, to ensure that all aspects of the R&AC installation, servicing, or maintenance can be identified, recorded, and scheduled, in accordance with company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6239.00 PLAN AND PREPARE FOR INSTALLATION, MAINTENANCE, OR SERVICE OF REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6239.21 **Communicate with others** to identify previous job operations, availability of tools, parts, and equipment, scheduling requirements, permits or inspections, and any other information needed to plan the installation or service, ensuring that all information communicated is clear, concise, and accurate.

Date Completed

Apprentice

Supervisor/Trainer

Sponsor/Employer Name

Sponsor/Employer Signature

6240.00 INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP)

GENERAL PERFORMANCE OBJECTIVE

Install and start up air cooling (AC) and heat pump (HP) by: inspecting system at site; performing site evaluation; preparing work site; preparing site for installation; assembling and installing system components, and accessories; brazing and soldering piping; checking for leaks; evacuating or dehydrating system; wiring-in system; charging system with refrigerant; setting and verifying electrical, electronic, and automated control systems; checking and adjusting air flow, water, and glycol levels; verifying charging and operating parameters of system; commissioning system; completing installation and start-up documentation.

PERFORMANCE OBJECTIVES

SKILLS

6240.01 **Inspect AC and HP at site** by following required procedures including (not limited to) removing packaging, inspecting unit for damage, and, checking equipment design parameters, to ensure that the AC and HP conforms to the work order and manufacturer's specifications.

Date Completed

Apprentice

Supervisor/Trainer

**6240.00 INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP)
...cont'd**

6240.02 **Perform a site evaluation** by following required procedures including (not limited to): visually inspecting site for obstructions; measuring equipment parameters; placing equipment to layout; evaluating effectiveness and reliability of installation site design; checking that required utilities are installed and available; determining mechanical chase ways; and, discussing with client the scope of the installation; so that the installation plan is verified and coincides with the scope of work and design parameters, in accordance with client requirements, work order, industry standards, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6240.03 **Prepare work site** by following required procedures including (not limited to): setting up and arranging installation tools and equipment; checking that power or gas source is available; recovering refrigerant; removing and disposing of existing equipment including air handling equipment, heat pump, evaporator coils, condensing unit, or refrigerant piping; removing obstacles and debris from work area; placing equipment to layout design; preparing mechanical chaseways; and, using drop sheets, hand and power tools or material handling equipment; so that the work site is prepared and ready for the installation of the AC and HP system, in accordance with work orders, company standards/policies, client requirements, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6240.00 INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP)
 ...cont'd

6240.04 **Prepare site for installation** by following required procedures including (not limited to): visually checking site; checking job site conditions against the layout documentation; locating equipment; and, placing equipment on required mounts or supports including slabs, curbs, brackets, sleepers, pads, and hangers; so that the mounts or supports are located, positioned, and aligned, in accordance with installation plan, work order, customer requirements, industry standards, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6240.05 **Assemble and install AC and HP components and accessories** by following required procedures including (not limited to): assembling air handler and filtering equipment, condensing unit, evaporator coil, heat pump, refrigerant, refrigerant accessories, piping, insulation, controls, drain line, condensate pump, indoor air quality equipment, humidifiers/dehumidifiers, system accessories, Heat Recovery Ventilator (HRV), Energy Recovery Ventilator (ERV), mechanical chase ways, and mechanical ventilation; tying in condensate line to open drain; cutting pathway for piping, wiring, and duct work; measuring and checking installation; lifting and moving using material handling equipment; placing equipment against the layout design; and, using required hand and power tools; ensuring that system is installed in accordance with work order, industry and company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6240.00 **INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP)**
 ...cont'd

6240.06 **Braze and solder AC and HP piping** by following required procedures including (not limited to): setting up oxygen, acetylene, propane, nitrogen, soldering devices, hoses, regulators, torch accessories and fire extinguishers; inspecting and cleaning piping; purging nitrogen; brazing and soldering piping using flux, filler rods, brazing alloy, and solder; preparing piping chase ways; forming piping joints; and, cleaning, storing, and adjusting brazing or soldering equipment; so that leak-proof joints are formed and piping is installed, in accordance with work orders, industry and company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6240.07 **Check AC and HP system for leaks** by following required procedures including (not limited to): visually inspecting; performing various leak tests; pressurizing the system; and, using nitrogen, gauges, soap solutions, electronic leak detectors, or dry air; in order to verify that there are no leaks and that the system integrity conforms with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6240.08 **Evacuate and dehydrate system** by following required procedures including (not limited to): releasing nitrogen from system; evacuating system; and, using hand tools, manifold gauges, vacuum pumps, micron gauges, or thermistors; so that all moisture and non-condensables are removed from system and equipment is cleaned and ready for use, in compliance with work order, design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6240.00 **INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP)**
...cont'd

6240.09 **Wire-in AC and HP** by following required procedures including (not limited to): reading and interpreting electrical diagrams, schematics, and IOM specifications; preparing wiring chaseway; using hand or power tools, measuring instruments or electrical measuring instruments; and, visually inspecting wiring; so that the system wiring is correctly installed in accordance with work order, design parameters, IOM specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6240.10 **Charge AC and HP system with refrigerant** by following required procedures including (not limited to): reading and interpreting rating and IOM specifications; using hand tools, manifold gauges, hoses, weigh scales, and charging cylinders; and, putting refrigerant into system following correct charging procedures; ensuring that the system is charged in accordance with manufacturer's specifications, IOM specifications, design parameters, applicable Acts, Regulations, Legislation, and Codes, and company standards/policies.

Date Completed

Apprentice

Supervisor/Trainer

**6240.00 INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP)
...cont'd**

6240.11 **Set and verify AC and HP electrical, electronic, and automated control systems** by following required procedures including (not limited to): turning power on; checking primary and secondary voltage delivery, motor rotation, and oil levels; setting controls; adjusting hi/low pressure controls; testing defrost controls on heat pumps; checking crankcase heaters, fan cycling accessories, off cycle timers, electronic or manual thermostat operations, zone control functions, and air quality accessory controls; and, using hand tools, specialty tools, gauges, temperature measuring instruments, electrical measuring instruments, simulators, and analyzers; so that all control parameters are set to preset operational parameters, in accordance with manufacturer's specifications, IOM specifications, design parameters, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6240.12 **Check and adjust air flow, water, and glycol levels** using hand tools, flow meters, gauges, and hydrometers to ensure that the system is operational and functioning at the specified parameters, in accordance with manufacturer's specifications, IOM specifications, codes, design parameters, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6240.13 **Verify charging of AC and HP system** by following required procedures including (not limited to): reading and interpreting superheat and sub-cooling charts; checking refrigerant charge and oil levels; making necessary adjustments; using hand tools, manifold gauges, thermometers, psychometer, weigh scales, and reclaimers; and, documenting adjustments to refrigerants; so that the pressures, temperatures, flows, and levels are operating at the specified parameters, in accordance with manufacturer's specifications, IOM specifications, design parameters, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6240.00 INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP)
 ...cont'd

6240.14 **Verify AC and HP system operating parameters** including pressures, temperatures, flow rate, voltages, amperage, fluid levels, and speeds by checking using hand tools, pressure gauges, temperature measuring instruments, flow measuring instruments, electrical measuring instruments, level indicators, simulators, and tachometers, and by documenting results, so that the operating parameters are documented in accordance with design parameters, manufacturer's specifications, job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6240.15 **Commission AC and HP system** by following required procedures including (not limited to): verifying that all sub-trade work has been inspected and certified; verifying that all gas operations have been checked and certified; turning on power and starting up system; setting limit, operating, and safety controls; testing system parameters including pressures, temperatures, flow rate, voltage, amperage, fluid levels, and speeds; making required adjustments; and, using hand or power tools, pressure gauges, temperature measuring instruments, flow measuring instruments, electrical measuring devices, or tachometers; so that the total system is verified to be operational and functioning in accordance with design parameters, IOM specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6240.00 **INSTALL AND START UP AIR COOLING (AC) AND HEAT PUMP (HP)**
...cont'd

6240.16 **Complete AC and HP installation and start-up documentation** by recording operational parameters on manufacturer's or company check lists and completing warranty forms, ensuring that installation data is completed in a clear, concise, and legible manner, in accordance with job specifications and company standards/policies.

Date Completed

Apprentice

Supervisor/Trainer

Sponsor/Employer Name

Sponsor/Employer Signature

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)

GENERAL PERFORMANCE OBJECTIVE

Service or maintain AC and HP system by: troubleshooting, replacing, or repair system accessories and components; replacing or repairing zoning components, operating and safety controls, refrigerant flow and metering devices, piping, condensate drains, air side of equipment, air handler, fans, and motors; cleaning or replacing electrical components, actuator and damper/zone controls, heat transfer devices, coils, and heat exchangers, and filter system; testing or replacing electronic components, electrical heater, HRV/ERV, and electronic air cleaners; rewiring and repair wiring; adjusting and replacing heat transfer medium; replacing air cooling compressor; checking for leakage; checking operations and functions of total system; completing service and maintenance records; and cleaning up work site.

PERFORMANCE OBJECTIVES

SKILLS

6241.01 **Troubleshoot AC and HP accessories and components** by following required procedures including (not limited to): discussing with client to determine nature of service call; performing an inspection and diagnostic check; checking mechanical and electrical system; reading and interpreting IOM charts; determining corrective actions or options; estimating cost of service; writing up a work sheet; and, using metres, gauges, hand or power tools, and price lists; so that the scope of the work is determined and documented in accordance with company standards/policies, client requirements, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
...cont'd

6241.02 **Replace or repair AC and HP accessories and components** by following required procedures including (not limited to): visually inspecting liquid/moisture indicators, accumulators, HRV/ERV, humidifier, pressure controls and other direct related components; replacing or repairing defective components and accessories; adjusting controls; and, documenting results; so that the system accessories are operational and functioning to design parameters in accordance with work orders and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6241.03 **Replace or repair system zoning components** by following required procedures including (not limited to): discussing with client to determine the nature of problem; inspecting bearings, linkages, dampers, actuators and wiring; lubricating moving parts; replacing or repairing defective components; adjusting controls; using required hand tools, PCs, software, and lubricants; and, documenting results; so that the zoning components are operational and functioning in accordance with work orders, client requirements, design parameters, manufacturer's specifications, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
 ...cont'd

6241.04 **Repair or replace AC and HP operating and safety controls** by following required procedures including (not limited to): checking and testing temperature, pressure, humidity, voltage, and amperage; visually checking for damaged or defective controls; checking integrity of controls and wiring; repairing or replacing defective components; simulating conditions to check functions of controls; using thermometers, pressure gauges, hygrometers, psychrometers, multimeters, ammeters, voltmeters, ohmmeters, and manometers; and, documenting results; so that all controls are verified to be operational and functioning, in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.05 **Clean or replace AC and HP electrical components** by following required procedures including (not limited to): checking for oil leakage, defects, and discolouration; testing operation of components; cleaning components; replacing defective components such as capacitors, transformers, relays, terminal blocks, fuse blocks, contactors, coils, circuit breakers, thermal overloads, fuses, fuseable links, connectors, wiring, or switches; using hand tools, electrical measuring instruments, specialty tools, and cleaning solvents; and, documenting results; so that the electrical system integrity is restored to meet design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
 ...cont'd

6241.06 **Test or replace AC and HP electronic components** by following required procedures including (not limited to): inspecting for defects, discolouration, odour, corrosion, and moisture; checking operation and functions of components; performing an operational test; verifying grounding components; checking operational sequences and set up; replacing batteries in thermostat; modifying program; using hand or power tools, multimeters, simulators, and battery testers; and, documenting results; so that the electronic components are functioning to restore equipment integrity to meet design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.07 **Rewire and repair AC and HP system wiring** by following required procedures including (not limited to): inspecting for defects, discolouration, odours, and defective supports; re-wiring systems; inspecting and tightening all connections; checking for required wire size and wire supports; checking wiring chaseways; checking integrity of the exterior or interior system wiring; using hand or power tools, wire gauge, and electrical measuring equipment; and, documenting results; so that the wiring integrity is restored to meet design parameters, company standards/policies, manufacturer's specifications, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
 ...cont'd

6241.08 **Clean or replace actuator and damper/zone controls** by following required procedures including (not limited to): checking and replacing electric and electronic actuators; checking and replacing solid state devices or transducers; cleaning and lubricating damper bearings; checking and replacing defective controls; checking and replacing dampers; using hand tool or power tools, solvents, lubricants, multimeters, simulators, and speciality tools; and, documenting results; so that the controls are operating to restore the equipment integrity to meet design parameters, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.09 **Repair or replace AC and HP refrigerant flow and metering devices** by following required procedures including (not limited to): visually inspecting external piping and insulation; checking all operating components, piping integrity, supports, liquid moisture indicator, filter driers, hermetic compressor, and metering devices; replacing driers, capacity controls, pressure regulators, and compressors; repairing defective piping, insulation, and supports; recharging system; using multimeters, pressure/temperature gauges, hand or power tools, recovery equipment, charging cylinder, electronic scales and brazing or soldering equipment; and, documenting results; so that the devices are restored and the system performance conforms to design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
 ...cont'd

6241.10 **Clean and replace heat transfer devices, coils, and heat exchangers** by following required procedures including (not limited to): determining gas technician licence requirements; coordinating sub-trades if required; inspecting heat transfer mediums; visually inspecting components; conducting pressure and temperature differential tests; determining required pressures, flows, and velocities; adjusting air flow, fluid flows, filter media, pressures, or system components; replacing cracked or defective components; cleaning obstructed coils; using required hand tools, pressure gauges, thermometers, brushes, voltmeters, chemical solutions, vacuum, and power washers; and, documenting results; so that the heat exchanger is operational and functioning in accordance with work order, design parameters, manufacturer's specifications, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.11 **Adjust and replace heat transfer medium** by following required procedures including (not limited to): visually checking air and fluid levels; checking air volumes, water, glycol strength, and refrigerant charge; adjusting levels; replacing mediums; and, using required hand tools, gauges, psychrometers, thermometers, pressure gauges, hydrometers, and chemicals; so that the quality and quantity of the transfer medium is maintained in accordance with manufacturer's specifications, system performance data, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
...cont'd

6241.12 **Test or replace AC and HP electrical heaters, HRV/ERV and electronic air cleaners** by following required procedures including (not limited to): visually inspecting for discolouration, odours, moisture, and corrosion; checking terminal connectors; performing resistance measurements; checking and repairing sequencers; checking operational sequencers; using hand or power tools, speciality tools, and multimeters; and, documenting results; so that the equipment is working to design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6241.13 **Replace or repair system piping** by following required procedures including (not limited to): reading and interpreting job documentation; checking pumps, strainers, valves, gauges, insulation, supports, and piping; repairing or replacing defective piping, parts, or components; checking piping chaseaway; brazing, soldering, or welding piping; using required hand and power tools, multimeter, flow meter, pressure gauge, and brazing, soldering, or welding equipment; and, documenting results; so that the piping system is restored and functioning according to design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6241.14 **Replace or repair AC and HP condensate drains and accessory components** by following required procedures including (not limited to): visually inspecting drain piping, drain pans, humidifiers, and condensate pumps; checking operation, condition, and integrity of the components; replacing defective or worn parts; repairing pumps and defective wiring; using hand tools, chemical solutions, brushes, and psychrometer; and, documenting results; so that the condensate components are operational and functioning in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
 ...cont'd

6241.15 **Check system for leakage** by following required procedures including (not limited to): checking gas and power sources, checking water, lubricants, and refrigerants; visually inspecting duct work; making necessary adjustments; and, using required hand tools, pressure gauges, and detectors; so that the system is leak free and is functioning to design parameters in accordance manufacturer's specifications, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.16 **Replace air cooling compressor** by following required procedures including (not limited to): visually inspecting compressor; determining cause of compressor failure; performing acid test; replacing defective compressor; recharging system; performing start up of compressor; cleaning up work area; using hand or power tools, multimeters, compound gauges, recovery equipment, vacuum pump, and brazing equipment; and, documenting start-up parameters; so that the restored system performance meets design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.17 **Clean or replace AC and HP filter system and components** by following required procedures including (not limited to): inspecting air filters; measuring pressure differentials; checking temperature differentials; checking filter drier; cleaning or replacing filters; and, using hand tools, gauges, cleaning solutions, and thermometers; ensuring that the filter system is maintained and functioning to design parameters, in accordance with manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

**6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
...cont'd**

6241.18 **Replace or repair the air side of AC and HP equipment** by following required procedures including (not limited to): discussing with client problems such as high humidity, moulds, allergies, temperature swings, or general comfort levels; checking humidifiers, exhaust fans, HRV/ERV, dehumidifiers, and filtration equipment; replacing damaged or dirty media; cleaning coils, components, and condensate drain system; repairing dampers, actuators, or controls; performing test run; using hand or power tools, brazing, soldering, or welding equipment, electrical metres, pressure gauges, and psychrometers; and, documenting results; so that the air quality is restored to design parameters, in accordance with manufacturer's specifications, company standards/policies, customer requirements, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6241.19 **Replace or repair air handler components** by following required procedures including (not limited to): visually inspecting filters, coils, fans, motors, bearings, belt and pulleys; checking amperage of motors; checking air volume; cleaning and lubricating parts; replacing worn belts and bearings; replacing motors and bearings; repairing or replacing damaged coil by brazing, soldering, or re-piping; using required hand or power tools, ammeters, multimeters, flow meters, pressure gauges, and brazing or soldering equipment; so that the air handler is restored to design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Codes, Legislation and Regulations.

Date Completed

Apprentice

Supervisor/Trainer

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
 ...cont'd

6241.20 **Replace or repair AC and HP fans and motors** by following required procedures including (not limited to): visually inspecting fan assembly, motors, bearings, pulleys, and belts; checking vibrations and running amperage; replacing or repairing defective components; lubricating bearings; cleaning fan and associated components; documenting results; and, using hand or power tools, measuring devices, gauges, thermometers, speciality tools, lubricants, and cleaning chemicals; so that the performance of the fans and motors is restored to design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.21 **Check operations and functions of total AC and HP system** by following required procedures including (not limited to): discussing with client to determine air quality and to define problems; inspecting and checking operation and integrity of system; calibrating and making adjustments; using hand tools, pressure gauges, thermometers, and psychrometers; and, documenting results; so that the system is maintained to maximize performance and to prevent damage, in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.22 **Complete AC and HP service and maintenance records** by recording system operational parameters on manufacturer's or company check lists and warranty forms, ensuring that the documents are completed in a clear, concise, and legible manner in accordance with company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

 Date Completed

 Apprentice

 Supervisor/Trainer

6241.00 SERVICE OR MAINTAIN AIR COOLING (AC) AND HEAT PUMP (HP)
...cont'd

6241.23 **Clean-up work site** by: cleaning up liquids, broken pieces, and debris; replacing structures; removing all construction waste; and, using brooms or wet/dry vac, so that the work area is clean and clear of obstructions, tools or equipment are stored, and hazardous products are disposed of in compliance with environmental protocols, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

Sponsor/Employer Name

Sponsor/Employer Signature

**6242.00 INSTALL AND COMMISSION REFRIGERATION AND AIR
CONDITIONING (R&AC) SYSTEM**

GENERAL PERFORMANCE OBJECTIVE

Install and commission refrigeration and air conditioning (R&AC) system by: reading and interpreting installation and start-up documentation; inspecting system, accessories, and components at work site; performing a site evaluation; preparing work site; coordinating permits, inspection, and sub-trades; preparing site for installation; assembling and installing system, accessories, and components; assembling, joining, and installing piping; checking refrigerant and component piping for leaks; assembling and installing electrical system accessories and components; evacuating and dehydrating system; commissioning system; completing installation and commissioning records; and cleaning up work site.

PERFORMANCE OBJECTIVES

SKILLS

6242.01 **Read and interpret R&AC installation and start up documentation** including (not limited to) Installation Operation and Maintenance Instructions (IOM), manufacturer's specifications, architectural and mechanical engineering drawings, wiring diagrams, job specifications, and applicable Acts, Regulations, Legislation, and Codes to identify: type, size, and manufacture of equipment; required permits; legislative requirements; required sub-trades; installation sequence and procedures; parts and accessories; material handling equipment; locations; required tools; equipment and materials; work schedules; and, any information needed to plan the completion of the installation.

Date Completed

Apprentice

Supervisor/Trainer

6242.00 INSTALL AND COMMISSION REFRIGERATION AND AIR CONDITIONING SYSTEM (R&AC) ...cont'd

6242.02 **Inspect the R&AC system, accessories, and components at work site** by following required procedures including (not limited to): removing packaging; inspecting unit for damage; and, checking equipment design parameters; to ensure that the system parameters conform to work order, architectural and mechanical engineering drawings, manufacturer's specifications, and company standards/policies.

Date Completed

Apprentice

Supervisor/Trainer

6242.03 **Perform a work site evaluation** by following required procedures including (not limited to): visually inspecting site for obstructions; measuring equipment parameters; evaluating effectiveness and viability of installation site design; checking that required power and gas utilities are available; checking that equipment complies with job documentation; laying out mechanical chaseways; and, discussing with client the scope of the installation; so that the installation plan is checked and coincides with the scope of work and design parameters, client requirements, industry and company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.04 **Prepare work site** by following required procedures including (not limited to): setting up and arranging installation tools and equipment; checking that utilities are available; recovering, reusing, or deposing of refrigerant; removing and disposing of existing equipment and packaging materials; removing obstacles and debris from work area; placing system accessories and components to layout; and, using hand or power tools and material handling equipment; so that the work site is prepared and ready for the installation of the system in accordance with layout design, company standards/policies, client requirements, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.00 INSTALL AND COMMISSION REFRIGERATION AND AIR CONDITIONING SYSTEM (R&AC) ...cont'd

6242.05 **Coordinate permits, inspections, and sub-trades** to ensure that all permits and inspections have been arranged prior to installation and that sub-trades have been contacted and scheduled, in compliance with industry or company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.06 **Prepare site for installation** by following required procedures including (not limited to): visually checking site; preparing job site conditions to the layout design; locating equipment to layout design; and, mounting on required supports including (not limited to) stanchions, columns, slabs, curbs, welded brackets, sleepers, pads, and hangers; so that the R&AC unit and components are located, positioned, and aligned in accordance with installation plan, work order, customer requirements, industry and company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.07 **Assemble and install R&AC system, accessories, and components** by following required procedures including (not limited to): coordinating sub-trades; preparing mechanical chaseways; coordinating installation of utilities; lifting and moving the R&AC components and equipment; connecting all components; checking that all accessories or components are complete; levelling system; welding, anchoring or fastening system components; and, using shims, fasteners, required tools, welding equipment, instruments, and material handling equipment; ensuring that the system is installed in accordance with installation plan, layout design, work order, customer requirements, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.00 INSTALL AND COMMISSION REFRIGERATION AND AIR CONDITIONING SYSTEM (R&AC) ...cont'd

6242.08 **Assemble R&AC piping and components** including (not limited to) condensate and water lines, secondary refrigerant lines, water regulating valves, pressure valves, strainers, chemical feeders, hangers, and floats, by following required procedures including (not limited to): coordinating gas trades; soldering; threading; cutting; brazing; welding; and, using torches, brazing, soldering, welding, and cutting equipment, threaders, reamers, vise, wrenches, groovers, flaring tools, pipe cutters, oil, and compounds; so that the piping and components are assembled in accordance with manufacturer's specifications, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.09 **Join and install R&AC piping** by following required procedures including (not limited to): setting up oxygen, acetylene, propane, soldering devices, hoses, regulators, and torch accessories; inspecting and cleaning piping; brazing, soldering, welding, and cutting piping; preparing mechanical chaseways; purging the piping; using safety equipment and fire extinguishers, sil-fos™, soft and hard solders, and nitrogen; and, cleaning, storing, and adjusting brazing, soldering, welding, or cutting equipment; so that the piping is joined and installed in compliance to manufacturer's specifications, applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.10 **Check refrigerant piping for leaks** by following required procedures including (not limited to): visually inspecting piping; performing various leak tests using gauges, soap solutions, ultrasonic leak detectors, micron gauge, and nitrogen; and, evacuating system; in order to verify that there are no leaks and that the system integrity conforms to design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

6242.00 INSTALL AND COMMISSION REFRIGERATION AND AIR CONDITIONING SYSTEM (R&AC) ...cont'd

6242.11 **Check component piping for leaks** by following required procedures including (not limited to): visually inspecting piping; pressurizing lines; performing various leak tests using gauges, soap solutions, or time-pressure test; and, using compressed dry air, nitrogen, and gauges; in order to verify that there are no leaks and that the system integrity conforms to design parameters, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.12 **Assemble and install R&AC electrical system accessories and components** by following required procedures including (not limited to): inspecting fuses, internal unit power wiring, system control wiring, and controls; reading and interpreting electrical diagrams, schematics, and IOM specifications; coordinating required sub-trades; checking permits; checking power capacity and voltage; checking system control wiring and controls; installing valves, controls, switches, wiring, and motors; and, using required hand or power tools, measuring devices, and electrical measuring devices; so that the unit electrical system is assembled and installed for system operation in accordance with design parameters, IOM specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.13 **Evacuate and dehydrate R&AC system** by following required procedures including (not limited to): releasing nitrogen from system; evacuating system; and, using hand tools, manifold gauges, vacuum pumps, micron gauges, or thermistor; so that all moisture and non-condensables are removed from system and the equipment is cleaned and ready for operation, in accordance with work order, design parameters, IOM specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

**6242.00 INSTALL AND COMMISSION REFRIGERATION AND AIR
CONDITIONING SYSTEM (R&AC) ...cont'd**

6242.14 **Commission R&AC system** by following required procedures including (not limited to): verifying that all sub-trade work has been inspected and certified; verifying that all gas operations have been checked and certified; turning on power and starting up system; setting limit, operating, and safety controls; testing system parameters including pressure, temperatures, flow rate, voltage, amperage, fluid levels, and speeds; making required adjustments; balancing the system oil charge; using hand or power tools, pressure gauges, temperature measuring instruments, flow measuring instruments, electrical measuring devices, level indicators, simulators, or tachometers; and, documenting results; so that the total system is verified to be operational and functioning in accordance with design parameters, IOM specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6242.15 **Complete the installation and commissioning records** by recording system operational parameters on manufacturer's or company check lists and warranty forms, ensuring that the documentation is completed in a clear, concise, legible, and accurate manner in accordance with design parameters, IOM specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

**6242.00 INSTALL AND COMMISSION REFRIGERATION AND AIR
CONDITIONING SYSTEM (R&AC) ...cont'd**

6242.16 **Clean-up work site** by: cleaning up liquids, broken pieces, and debris; replacing structures; removing all construction waste; and, using brooms or wet/dry vac; so that the work area is clean and clear of obstructions, tools or equipment are stored, and hazardous products are disposed of in compliance with environmental protocols, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

Sponsor/Employer Name

Sponsor/Employer Signature

6243.00 MAINTAIN REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM

GENERAL PERFORMANCE OBJECTIVE

Maintain refrigeration and air conditioning (R&AC) system by: troubleshooting system; cleaning and maintaining filter, condenser, evaporator, humidifier, and electrical components; checking operation and functions of total system; cleaning up work site; completing maintenance documents.

PERFORMANCE OBJECTIVES

SKILLS

6243.01 **Troubleshoot R&AC systems and components** by following required procedures including (not limited to): discussing with client to determine nature of call; performing an inspection and diagnostic check; reading and interpreting IOM charts; determining corrective actions or options; estimating cost of work; writing up a work sheet; and, using metres, gauges, and price lists; so that the extent of maintenance is determined and documented in accordance with company standards/policies, client requirements, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6243.02 **Clean and maintain R&AC filters and components** by following required procedures including (not limited to): visually inspecting controls, rack, frames, filter, filter media, drive mechanisms, and air-flow sensors; checking filter loading; testing air flow; performing shut down and lock out procedures; replacing defective parts and filter media; cleaning filter and components; using required tools and equipment; and, documenting results; so that the air flow parameters are restored to design parameters, in accordance with manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6243.00 MAINTAIN REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6243.03 **Clean and maintain R&AC condenser, evaporator, and accessory components** by following required procedures including (not limited to): inspecting receivers, cooling tower, heat exchangers, pumps, drain pan, nozzles, motors, coils, fans, dampers, baffles/fills, floats, and drive mechanisms; checking temperatures, leaks, flow rates, pressure relief valve, vibration, noise, lime build-up, dirt, bleed rates, water colour, odour, and levels; performing shut down and lock out procedures; performing defrosting procedures; cleaning components by scraping, flushing, washing, and brushing; blowing out with compressed air; applying chemical treatments; replacing defective components; using required chemicals, tools and equipment; and, documenting results; so that the water flow and air flow are restored to design parameters, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6243.04 **Clean and maintain R&AC humidifier and components** by following required procedures including (not limited to): checking water level, flow feeds, condensate, controls, safeties, media, electrical devices, reservoir, dirt, and scaling; performing shut down and lock out procedures; cleaning by scraping, brushing, flushing contaminants, and vacuuming; chemically treating the unit; lubricating moving parts; replacing defective components, media, cylinders, controls, safeties, valves, floats, pans, lights, elements, and strainers; and, using required chemicals, lubricants, tools, and equipment; so that the level of humidification is restored to set points, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6243.00 MAINTAIN REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6243.05 **Clean or replace R&AC electrical components** by following required procedures including (not limited to): inspecting contactors, relays, heaters, solenoids, wiring, switches, and controls; checking discolouration, temperatures, pitting, voltage or amperage, resistance, wiring, and insulation; performing shut down and lock out procedures; applying chemical cleaners; brushing; vacuuming; replacing defective components; and, using required chemicals, tools, and equipment; so that all the electrical components are operational and functioning to design parameters, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6243.06 **Check operation and functions of total R&AC system** by following required procedures including (not limited to): discussing with client to determine air quality and to define problems; inspecting and checking operation and integrity of system; calibrating and making adjustments; documenting results; and, using hand tools, pressure gauges, thermometers, and psychrometers; so that the system is maintained to maximize performance and to prevent damage, in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6243.07 **Clean up work site** by: cleaning up liquids, broken pieces, and debris; replacing structures; removing all parts that have been replaced; and, using brooms or wet/dry vac; so that the work area is clean and clear of obstructions, tools or equipment are stored, and hazardous products are disposed of, in compliance with company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

**6243.00 MAINTAIN REFRIGERATION AND AIR CONDITIONING (R&AC)
SYSTEM ...cont'd**

6243.08 **Complete R&AC maintenance documentation** by recording system operational parameters on manufacturer's or company maintenance and servicing check lists or warranty forms, ensuring that all documentation is completed in a clear, concise, and legible manner, in accordance with company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

Sponsor/Employer Name

Sponsor/Employer Signature

6244.00 SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM

GENERAL PERFORMANCE OBJECTIVE

Service refrigeration and air conditioning (R&AC) system by: checking R&AC system; replacing or repairing mechanical components, condensate components, piping, refrigerant system, open, semi-hermetic, or hermetic compressors, fans, pneumatics, controls and switches, Variable Air Volume components, metering devices, and electrical and electronic system; decommissioning packaged and split-system equipment to be salvaged; decommissioning equipment for demolition; cleaning up worksite; completing servicing documentation.

PERFORMANCE OBJECTIVES

SKILLS

6244.01 **Check R&AC system accessories and components** by following required procedures including (not limited to): discussing with client to determine the nature of call; performing an inspection and diagnostic check; reading and interpreting IOM charts; determining corrective actions or options; estimating cost of job; writing up work sheet; and, using metres, gauges, and price lists; so that the extent of required service work is determined and documented, in accordance with company standards/policies, client requirements, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.00 SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6244.02 **Replace or repair R&AC mechanical components** by following required procedures including (not limited to): inspecting belts, drives, bearings, linkage, dampers, and switches; testing clearances, operations, alignment, flows, pressures, temperatures, voltage, and amperage; checking for wear, cracks, mismatches, shredding, tension, slippage, grooving, noise, and vibration; performing shut down and lock out procedures; making adjustments and repairs; replacing defective parts; using required testing devices, tools and equipment; and, documenting results; so that all the mechanical components are operational and functioning to design parameters, in accordance with manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.03 **Repair or replace R&AC condensate components** by following required procedures including (not limited to): inspecting pumps, drain pan, piping, and switches; checking for pressures, algae, dirt, leaks, and odours; performing shut down and lock out procedures; repairing defective drain pan and piping; cleaning components by scraping, flushing, and vacuuming; blowing out unit with compressed air; chemically treating the unit; using required chemicals, tools, and equipment; and, documenting results; to ensure the purity and flow of water and that the condensate equipment is operational and functioning, in accordance with design parameters, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.00 SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6244.04 **Repair or replace R&AC piping, accessories, and components** by following required procedures including (not limited to): checking leaks, cracks, wear, rust, bulges, insulation, heat tracing, supports, flow, and pressures; performing shut down and lock out procedures; replacing defective piping, components, and supports; restoring defective insulation; repairing defective components by cutting, fitting, brazing, soldering, welding, gluing, flaring, and swaging; using required piping, materials, tools, and equipment; and, documenting results; so that the flow of fluids is maintained to design parameters, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.05 **Repair or replace R&AC refrigerant system, components, and accessories** by following required procedures including (not limited to): checking fluid and refrigerant levels, pressures, temperatures, concentration, and leaks; performing pressure and leak tests; performing shut down and lock out procedures; repairing pump-down system; brazing; soldering; welding, gluing; fitting; cutting; evacuating system; cleaning components; replacing defective parts; recharging with refrigerant; and, using required refrigerants, tools, testing devices, or equipment; so that the charge (secondary and primary refrigerants) are restored to the specified levels, temperatures, and pressures, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.00 SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6244.06 **Repair or replace R&AC open, semi-hermetic, or hermetic compressor** by following required procedures including (not limited to): checking and testing amperage draw, operating pressures, temperatures, motor winding resistance, capacity controls, vibration, clearances, oil levels, lubrication, safeties, and motors; performing shut down and lock out procedures; isolating compressor from system; pumping down refrigerant; replacing oil pumps, heads, valve plates, gaskets, mounts/supports, filters, switches, safeties, electrical connectors, and lubricants; and, using required lubricants, chemicals, testing devices, tools, and equipment; so that the efficiency of the compressor is restored to design parameters, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.07 **Repair or replace R&AC fans and components** by following required procedures including (not limited to): checking noise, vibration, dirt, air flow, alignments, balance, drive mechanism, and bearings; performing shut down and lock out procedures; cleaning by vacuuming, brushing, and power washing; replacing defective bearings, bushings, pulleys, belts, blowers, housings, shafts, and motors; and, using required tools and equipment; so that the air flow is restored to design parameters, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.00 SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6244.08 **Repair or replace R&AC pneumatics** by following required procedures including (not limited to): checking or testing pressures, filters, auto drains, motors, compressors, belts, pulleys, oil levels, driers, controls, safety devices, solenoids, calibration, piping, air leaks, and supports; performing shut down procedures; cleaning components; repairing by soldering and swaging; calibrating pneumatics; replacing defective components; and, using required tools and equipment; so that the pneumatic control pressure is maintained, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.09 **Replace R&AC controls and switches** by following required procedures including (not limited to): checking or testing operations, resistance, voltage, and safety devices; performing shut down procedures; cleaning components; making required adjustments; calibrating set points; replacing defective parts; and, using required testing devices, tools, and equipment; so that all the controls and switches are operational and functioning, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.10 **Repair or replace Variable Air Volume (VAV) components** by following required procedures (not limited to): checking or testing open or close motions, modulation variables, calibration, travel, and pressures; cleaning; sealing; tightening; soldering; making required adjustments; calibrating set points; replacing defective components including damper motors, linkages, dampers, sensors, controls, or safety devices; and, using required testing devices, tools, and equipment; so that the air flow volumes are maintained to design parameters, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.00 SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6244.11 **Repair or replace R&AC metering devices** by following required procedures (not limited to): checking or testing pressures, temperatures, voltages, fluid levels, leaks, and insulations; adjusting valves; brazing; soldering; cleaning; tightening; calibrating; replacing insulation, supports, gaskets, cages, valves, and screens; and, using required testing devices, tools, and equipment; so that all the devices are operational and functioning to design parameters, in accordance with manufacturer's and job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.12 **Replace or repair R&AC electrical and electronic system and components** by following required procedures including (not limited to): inspecting unit panel, fuses, internal unit power wiring, systems control wiring and controls, switches, and safety devices; reading and interpreting electrical diagrams, schematics, and IOM specifications; coordinating required sub-trades; checking permits; checking power capacity and voltage; checking control wiring and controls; replacing defective system wiring; checking and replacing valves, controls, switches, actuators, transducers, electronic components, electronic air cleaners, electronic and logic controllers, heaters, and motors; and, using required hand or power tools, measuring instruments, or electrical measuring devices; so that the electrical system is restored to design parameters, in accordance with IOM specifications, manufacturer's specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.00 SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6244.13 **Decommission packaged R&AC equipment** to be salvaged for resale, renovation, or mothballing by following required procedures including (not limited to): discussing with client to determine what is happening with the system after decommissioning; checking that utilities connected to the system have been shut off and locked out; disconnecting system and accessories; removing fluids subject to freezing; packing system in required containers; using required hand or power tools, material handling equipment, and safety equipment; and, completing documentation; so that the packaged system is ready for transportation, in accordance with work order, industry standards, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.14 **Decommission split-system R&AC equipment** to be salvaged for resale, renovation, or mothballing by following required procedures including (not limited to): discussing with client which system is to be decommissioned; checking that utilities connected to the system have been shut off and locked out; disconnecting system and accessories; pumping down system to reclaim refrigerant; removing fluids subject to freezing; sealing system; using required hand or power tools, material handling equipment, and safety equipment; and, completing documentation; so that the split system is sealed and ready for transportation, in accordance with work order, industry standards, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.00 SERVICE REFRIGERATION AND AIR CONDITIONING (R&AC) SYSTEM ...cont'd

6244.15 **Decommission R&AC equipment for demolition** by following required procedures including (not limited to): discussing with client which system is being demolished; checking that utilities connected to the system have been shut off and locked out; disconnecting system and accessories; pumping down system to reclaim/recover fluids including refrigerants, oils, secondary refrigerants, brines, and glycol solutions; placing tags indicating that system has been decommissioned; using required hand or power tools, fluid containers, and safety equipment; and, completing documentation; so that all fluids are reclaimed for storage or disposal and the R&AC system is ready for demolition, in accordance with work order, industry standards, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.16 **Clean up work site** by: cleaning up liquids, broken pieces, and debris; replacing structures; removing all parts that have been replaced; and, using brooms or wet/dry vac; so that the work area is clean and clear of obstructions, tools or equipment are stored, and hazardous products are disposed of, in compliance with company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6244.17 **Complete servicing documentation** by recording system operational parameters on manufacturer's or company servicing check lists and warranty forms, ensuring that all documentation is completed in a clear, concise, and legible manner in accordance with company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

Sponsor/Employer Name

Sponsor/Employer Signature

6245.00 PERFORM CUSTOMER SERVICE

GENERAL PERFORMANCE OBJECTIVE

Perform customer service by: determining nature of service or maintenance call; conducting a site evaluation; performing a diagnostic inspection; estimating costs of service or maintenance; completing a servicing and/or maintenance schedule; completing job work order; and, instructing clients.

PERFORMANCE OBJECTIVES

SKILLS

6245.01 **Determine nature of service or maintenance call** by discussing problems with client, asking clear and concise questions, listening, and repeating back what is heard, so that the client's concerns are clearly identified and understood before proceeding with a diagnostic check.

Date Completed

Apprentice

Supervisor/Trainer

6245.02 **Conduct a site evaluation** by checking the general condition of the system, equipment, and surrounding environment or facilities, in order to assist in determining the nature and scope of the service or maintenance request, ensuring that the evaluation is carried out in accordance with job specifications, company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6245.00 PERFORM CUSTOMER SERVICE ...cont'd

6245.03 **Perform a diagnostic inspection** by following required procedures including (not limited to): reading and interpreting IOM documentation, work order, manufacturer's specifications, architectural and mechanical engineering drawings, and applicable Acts, Regulations, Legislation, and Codes; identifying the type, size, and capacity of equipment, system components, and parts; inspecting and checking operation and integrity of system; performing tests and checks of all parts of the system; determining set-points of each part of the system; and, checking efficiency outputs and parameters of the system; so that the system defects or faults are identified for further servicing or maintenance.

Date Completed

Apprentice

Supervisor/Trainer

6245.04 **Estimate costs of service or maintenance call** by: determining corrective actions or options for repair or replacement; calculating time frames, labour, parts, or equipment costs; using work orders, costing lists, manuals, and other documentation; communicating with employer or shop personnel to confirm the estimates; completing estimation sheet and bill of materials; going over quote with client; and, obtaining client's signature of approval; so that the estimation sheets are completed and approved prior to undertaking service or maintenance work in accordance with company standards/policies.

Date Completed

Apprentice

Supervisor/Trainer

6245.05 **Complete service or maintenance schedule** which includes (not limited to): servicing or maintenance parameters and procedures, parts, labour and inspection personnel, equipment, sub-trades, material handling equipment, permits, hand tools, power tools, location and layout of system, dates and times, and, work orders, ensuring that the service or maintenance schedule is approved by employer and client.

Date Completed

Apprentice

Supervisor/Trainer

6245.00 PERFORM CUSTOMER SERVICE ...cont'd

6245.06 **Complete job work order** after service or maintenance work has been completed to identify: parts and components used; labour costs; nature and scope of service or maintenance work; time taken; unit identification; warranty coverage and obligations; tools and equipment used; completion dates; and, system operation parameters; by recording information on manufacturer's or company servicing or maintenance check lists and warranty forms, ensuring that all information is clear, legible, and concise in accordance with company standards/policies, and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

6245.07 **Instruct clients** on equipment operation, routine maintenance or servicing procedures and location of controls or safety devices, by using verbal communication, written job specifications, and manufacturer's specifications, ensuring that all instructions are given in a clear, concise, and precise manner and that the client has signed off on the work order, in accordance with company standards/policies and applicable Acts, Regulations, Legislation, and Codes.

Date Completed

Apprentice

Supervisor/Trainer

Sponsor/Employer Name

Sponsor/Employer Signature

APPRENTICE RECORD

APPRENTICE NAME (Print):

SPONSOR/EMPLOYER INFORMATION	
Training Agreement #	
Name	
Address	
Telephone	
E-mail Address	

SUMMARY OF TRAINING	
Employment Start Date	
Employment End Date	
Total hours of training & instruction between dates of employment	

Date Completed

Apprentice

Supervisor/Trainer

APPRENTICE RECORD

APPRENTICE NAME (Print):

SPONSOR/EMPLOYER INFORMATION	
Training Agreement #	
Name	
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Telephone	
E-mail Address	

SUMMARY OF TRAINING	
Employment Start Date	
Employment End Date	
Total hours of training & instruction between dates of employment	

Date Completed

Apprentice

Supervisor/Trainer

APPRENTICE RECORD

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Address	
Telephone	
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SUMMARY OF TRAINING	
Employment Start Date	
Employment End Date	
Total hours of training & instruction between dates of employment	

Date Completed

Apprentice

Supervisor/Trainer

APPRENTICE COMPLETION FORM

APPRENTICE NAME	
Print	
Signature	
Social Insurance Number	

Skill Sets when completed should be signed by the Supervisor/Trainer and presented with this completion form to your local Apprenticeship Client Services Office. Any supporting documentation should also be attached.

In-School Completed (Proof to Be Provided) Yes () No () Not applicable ()

Hours completed as per Contract: Yes () No () Not applicable ()

SPONSOR/EMPLOYER INFORMATION	
Name	
Address	
Telephone	
E-mail Address	
Signature of Signing Authority	

You will be required to disclose this signed form to the Ministry of Training, Colleges and Universities in order to complete your program. The Ministry will use your personal information to administer and finance Ontario's apprenticeship training system. For further information please see the notice/declaration for collection of personal information that is referenced in the table of contents of this training standard.