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Introduction

Successful candidates may act as guarantors for construction work included in subclass 15.8 - Contractor – Ventilation.

This competency profile is based on the scope of application of the *Building Act*, as well as on Section (21-22-23 or 24) of the *Regulation respecting the professional qualification of contractors and owner-builders*.

Subclass definition

15.8 - Contractor – Ventilation

This subclass authorizes construction work that is not reserved exclusively for master pipe-mechanics relating to air circulation or distribution systems related to ventilation, exhaust, air compensation and air conditioning.

It also authorizes construction work relating to the heating duct systems and the installation of the heating devices of a pulsed air heating system as well as construction work relating to the heating duct systems of a pulsed air heating and air conditioning system.

In addition, that subclass authorizes construction work relating to the heating and air conditioning devices of a pulsed air system provided that the contractor also holds the appropriate subclass 15.9 or 15.10.

Lastly, it authorizes similar or related construction work.

Module 1 – DEFINITIONS AND TYPES OF SYSTEMS

Elements of competency covered in this module:

1. Explain the importance of good indoor air quality ensured by ventilation and proper air treatment in buildings
2. Define concepts and terms relating to different ventilation and air treatment systems
3. Define concepts and terms related to the transmission of heat
4. Describe the main features of ventilation and air treatment systems
5. Describe the main characteristics of heating systems
6. Perform basic mathematical calculations associated with ventilation and air treatment systems



Module 1 – DEFINITIONS AND TYPES OF SYSTEMS

Elements of competency	Skills required
1. Explain the importance of good indoor air quality ensured by ventilation and proper air treatment in buildings	1.1. Explain the concept of comfort and the factors that affect it
	1.2. Explain the causes, symptoms and effects of poor ventilation on humans
	1.3. Explain the stack effect and the wind effect
	1.4. Explain the causes, symptoms and effects of poor ventilation on buildings
	1.5. Explain the behaviour of the air stream (diffusion) in a given space
	1.6. Explain the behaviour of radon and how it can get into living spaces
2. Define concepts and terms relating to different ventilation and air treatment systems	2.1. Distinguish between “mechanical ventilation” and “natural ventilation”
	2.2. Identify the units of measurement associated with ventilation
	2.3. Define the units of measurement associated with ventilation and air treatment system installations
	2.4. Define “minimum fresh air flow,” “exhaust air flow,” “supply air flow,” “depressurization,” “compensation,” “minimum fresh air capacity,” etc.
	2.5. Define the equipment to which an air distribution system can be connected
	2.6. Define the components of a ventilation system
	2.7. Define air types for ventilation systems (refer to B-149.1)

Elements of competency	Skills required
	2.8. Define the components of an exhaust system
3. Define concepts and terms related to the transmission of heat	3.1. Define the concepts of total heat, sensible heat and latent heat
	3.2. Define thermal resistance
	3.3. Define conduction, convection and radiation
	3.4. Define the concepts of humidity, condensation and dew point
	3.5. Specify the direction of heat exchange
4. Describe the main features of ventilation and air treatment systems	4.1. Name the characteristics of the materials used for ventilation air ducts and their scope of application
	4.2. Describe the types of assembly (joints) of ventilation ductwork components and specify the context of their application
	4.3. Describe the types of support systems and specify the context of their application
	4.4. Explain the different modes of ventilation and air treatment systems
	4.5. Describe the different types of air evacuation systems and the impact of their operation and influence on building or sub-work depressurization (radon)
	4.6. Describe the operation of different types of air distribution systems
	4.7. Describe the different types of ventilation and air treatment systems and their operation, and their effects on cooling and heating systems
	4.8. Describe the fields of application and operation of the components of limit switches in ventilation and air treatment systems

Elements of competency	Skills required
	<p>4.9. Describe ventilation control elements and their functions, and the various components and accessories used to control ventilation and air treatment systems</p> <p>4.10. Interpret a ventilation control and connection diagram</p> <p>4.11. Describe the characteristics of radon removal system components</p> <p>4.12. Describe the specifics of a cold air distribution system</p>
<p>5. Describe the main characteristics of heating systems</p>	<p>5.1. Describe the main components of the hot and cold air generator ventilation system</p> <p>5.2. Describe the specifics of ductwork for hot air distribution systems</p> <p>5.3. Explain a system effect</p>
<p>6. Perform basic mathematical calculations associated with ventilation and air treatment systems</p>	<p>6.1. Apply formulas specific to ventilation</p> <p>6.2. Convert units in both systems of measurement</p> <p>6.3. Perform calculations using trigonometric rules</p> <p>6.4. Calculate surface area, volume, velocity, flow rate, pressure, stack effect and wind effect</p> <p>6.5. Perform heat loss calculations</p> <p>6.6. Calculate air pressure drop using the equivalent length method or specialized software</p> <p>6.7. Perform diversity calculations leading to the depressurization fan flow rate for the grouping of additional extractors</p>

Module 2 – LEGISLATIVE, NORMATIVE AND REGULATORY FRAMEWORK

Elements of competency covered in this module:

7. Frame work relating to HVAC (heating, ventilation and air conditioning system) in accordance with applicable laws, standards and regulations

Module 2 – LEGISLATIVE, NORMATIVE AND REGULATORY FRAMEWORK

Elements of competency	Skills required
<p>7. Frame work relating to HVAC (heating, ventilation and air conditioning system) in accordance with applicable laws, standards and regulations</p>	<p>7.1. Identify organizations that affix their seals to certify compliance of components of ventilation and air treatment systems and/or their installation</p>
	<p>7.2. Describe the application of <i>Chapter I – Building</i> of the <i>Québec Construction Code (CCQ)</i> in relation to ventilation and air treatment systems (parts 3, 4, 6, 9, 10 and 11)</p>
	<p>7.3. Describe the application of <i>Chapter III – Plumbing</i> of the <i>Québec Construction Code (CCQ)</i> in relation to ventilation and air distribution systems</p>
	<p>7.4. Understand the links between the various applicable codes, regulations and standards specific to work relating to ventilation and air treatment systems</p>
	<p>7.5. Understand the organizational structure of the <i>Québec Construction Code (R.S.Q. c. B -1.1, r.2)</i></p>
	<p>7.6. Explain the scope of the standard applicable to work involving the installation of ventilation systems in dwellings (<i>CAN/CSA-F326-M - Residential Mechanical Ventilation Systems</i>)</p>
	<p>7.7. Explain the scope of current applicable standards relating to best practice in the installation of ventilation and air treatment systems, including:</p> <ul style="list-style-type: none"> • ASHRAE standards and manuals • The HRAI Digest • SMACNA (HVAC Duct Construction Standards)

Elements of competency	Skills required
	<ul style="list-style-type: none"> • The <i>Industrial Ventilation Manual</i>, published by ACGIH • NFPA standards relevant to the work • <i>Regulation respecting the quality of the work environment</i> (c. S -2.1, r.11) (CNESST) • <i>Chapter VIII – Building of the Safety Code</i> (NFC) • <i>Québec Construction Code (CCQ), Chapter 1.1 – Energy efficiency</i> • <i>Québec Construction Code (CCQ), Chapter 1 part 11</i>
	<p>7.8. Explain the scope of <i>CAN/CSA-Z317.2 - Special requirements for heating, ventilation, and air-conditioning (HVAC) systems in health care facilities</i></p>
	<p>7.9. Know the obligations concerning the installation of HVAC according to the following reference documents:</p> <ul style="list-style-type: none"> • ASHRAE standards and manuals • <i>CSA-B149.1 - Natural Gas and Propane Installation Code (Québec amended)</i> • <i>CSA-B139 - Installation Code for Oil-Burning Equipment</i> • <i>CSA-B365 - Installation code for solid-fuel-burning appliances and equipment</i> • <i>CSA-F280 - Determining the required capacity of residential space heating and cooling appliances</i> • <i>CAN/CSA-C273.5 Installation of air source heat pumps and air conditioners</i> • <i>Chapter II – Gases of the Québec Construction Code (CCQ)</i> • <i>Chapter V – Electricity of the Québec Construction Code (CCQ)</i> • <i>Chapter VIII – Installation of petroleum equipment of the Construction Code</i>

Elements of competency	Skills required
	7.10. Explain the scope of <i>NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations</i>
	7.11. Know the <i>Regulation respecting the professional qualification of contractors and owner-builders</i> concerning work relating to ventilation and air treatment systems, the required licences and the limits of intervention
	7.12. Explain the roles and responsibilities of the team of professionals, general contractors and trade contractors regarding compliance with plans, specifications and standards
	7.13. Explain when the <i>Building Act</i> (chapter B-1.1) and <i>Chapter I.1 – Energy efficiency of buildings</i> of the <i>Construction Code</i> (chapter B-1.1, r. 2) apply to ventilation and air treatment work
	7.14. Explain the scope of municipal regulations (noise level, clearance, location, visibility, etc.)
	7.15. Identify the main energy efficiency programs available in Quebec
	7.16. Explain how the <i>Radon Reduction Guide for Canadians</i> (Health Canada) applies in connection with work on an underfloor depressurization system
	7.17. Explain outdoor air quality issues

Module 3 – PLANS, SPECIFICATIONS AND ESTIMATES

Elements of competency covered in this module:

8. Read and interpret plans and specifications for ventilation and air treatment systems
9. Estimate the work and costs involved in installing ventilation and air treatment systems



Module 3 – PLANS, SPECIFICATIONS AND ESTIMATES

Elements of competency	Skills required
8. Read and interpret plans and specifications for ventilation and air treatment systems	8.1. List the types of plans issued for the various stages of the project
	8.2. Interpret elements relating to the installation of ventilation and air treatment systems on a plan
	8.3. Refer to plans and specifications concerning the work of the various specialties on a construction project to ensure effective coordination between the various specialties
	8.4. Locate the various components of ventilation and air treatment systems on a plan
	8.5. Determine whether seismic system requirements apply
	8.6. Using plans and specifications, read and interpret information on the various responsibilities involved in ventilation and air treatment system work
	8.7. Understand the structure of specifications
	8.8. Read and interpret information and equipment specifications using plans and specifications
	8.9. Locate where fire and/or smoke dampers are to be installed
9. Estimate the work and costs involved in installing ventilation and air treatment systems	9.1. Assess the capacity of an existing ventilation and air treatment system
	9.2. Make a diagnosis concerning the capacity of an existing ventilation and air treatment system
	9.3. Propose a solution for correcting the capacity of an existing ventilation and air treatment system
	9.4. Perform calculations to determine the characteristics of equipment forming an

Elements of competency	Skills required
	integral part of a ventilation and air treatment system
	9.5. Perform duct sizing calculations based on applications and locations
	9.6. Choose equipment and materials that comply with calculations and regulations
	9.7. Know how to choose equipment and materials according to specific needs and uses
	9.8. Measure quantities of materials required (pipes and ducts, number of components, etc.)
	9.9. Ensure that the work proposed complies with appropriate codes and standards
	9.10. Understand the concept of rated and current capacity

Module 4 – STANDARDS AND EXECUTION OF WORK

Elements of competency covered in this module:

10. Plan and organize work relating to the installation of ventilation and air treatment systems
11. Produce shop drawings, manufacturing plans or installation diagrams for ventilation and air treatment systems
12. Install ventilation and air treatment system components
13. Install air ventilation system ducts
14. Set up and operate ventilation and air treatment units and components
15. Test, check and maintain ventilation and air treatment systems
16. Ensure health and safety in connection with ventilation and air treatment work
17. Carry out work relating to the installation of pulsed air and combustion air heating appliances in compliance with applicable standards
18. Carry out work relating to the installation of devices for the supply of combustion air to heating equipment
19. Manage the execution of work to put special equipment in place
20. Implement sustainable development principles

Module 4 – STANDARDS AND EXECUTION OF WORK

Elements of competency	Skills required
10. Plan and organize work relating to the installation of ventilation and air treatment systems	10.1. Determine the scheduling of activities relating to ventilation and air treatment systems work
	10.2. Order and receive equipment and materials required for ventilation and air treatment work
	10.3. Assume the responsibilities applicable to their specialty with respect to project construction work
	10.4. Ensure effective coordination between stakeholders in different specialties
11. Produce shop drawings, manufacturing plans or installation diagrams for ventilation and air treatment systems	11.1. Determine quantities, dimensions and locations of various components and accessories for ventilation and air treatment systems
	11.2. Communicate the information required for the production of shop drawings, manufacturing plans or installation diagrams and send them in the correct form
	11.3. Plot all ventilation and air treatment system components on architectural and structural plans
	11.4. Produce installation diagrams for ventilation and air treatment systems on architectural and structural plans
	11.5. Ensure compliance of shop drawings, manufacturing plans and installation diagrams with applicable codes, standards and regulations
	11.6. Obtain approval of installation diagrams from the owner or the owner's official representative
12. Install ventilation and air treatment system components	12.1. Identify and mark where ducts and equipment are to be installed and specify how they are to be secured

Elements of competency	Skills required
	12.2. Install and secure ducts, taking into account project-specific conditions (suspension, vibration, seismic standards, etc.)
	12.3. Seal duct joints and connections to prevent air leakage
	12.4. Ensure that work complies with standards, plans and specifications
	12.5. Mark installation locations for system components
	12.6. Ensure that any maintenance is safe for workers
	12.7. Ensure bonding on both sides of non-conductive elements of a metal duct network (flexible connections, etc.) so that contractors of the appropriate class can carry out grounding properly
	12.8. Explain installation methods and the requirements for installing components for different uses and building types
	12.9. Explain fire protection requirements for ventilation in buildings
	12.10. Ensure respect for structural integrity
	12.11. Ensure that nameplates are present and properly positioned
	12.12. Ensure that unit seating or supports are adequate and compliant
	12.13. Ensure that work is carried out in accordance with the various specialties
	12.14. Ensure that ducts are in place to depressurize the substructure (radon)
	12.15. Explain installation requirements for fresh air supply units

Elements of competency	Skills required
	12.16. Understand the concept of operating pressure and the specific features of attached distribution network construction
	12.17. Master the special ventilation requirements associated with high-rise buildings
13. Install air ventilation system ducts	13.1. Explain the requirements for installing and fabricating ducts, depending on whether or not they are made of combustible materials
	13.2. Explain the requirements and methods for insulating ducts and installing vapour barriers
	13.3. Explain the requirements for protecting ducts against the risk of damage (corrosion, etc.)
	13.4. Ensure compliance with building non-combustibility rules
	13.5. Make sure there is no condensation on the air distribution ducts
14. Set up and operate ventilation and air treatment units and components	14.1. Ensure placement of the units
	14.2. Ensure the installation of air extraction equipment, in particular with respect to clearances from gas stoves
	14.3. Set up compensation equipment to counteract depressurization
	14.4. Install wiring and control system components, with the exception of electrical connections to heating systems
	14.5. Connect ductwork to system components
	14.6. Put finishing components in place
	14.7. Explain the installation requirements for fresh air supply units
	14.8. Ensure the installation of fire and/or smoke dampers to maintain the fire integrity of

Elements of competency	Skills required
	architectural elements through which air ducts pass
15. Test, check and maintain ventilation and air treatment systems	15.1. Explain the requirements for testing ventilation and air treatment systems
	15.2. Establish procedures for starting up ventilation systems
	15.3. Explain procedures and requirements for balancing, equalization and testing (tightness) of ventilation and air treatment systems
	15.4. Provide the owner or the owner's official representative with all documentation concerning the operation and maintenance of ventilation and air treatment systems
	15.5. Explain the operation and maintenance of ventilation and air treatment systems to the owner, the owner's official representative and/or the user
	15.6. Maintain and replace defective components, equipment and accessories
	15.7. Transmit a maintenance or repair report to the owner or the owner's official representative
	15.8. Start up ventilation and air treatment systems
16. Ensure health and safety in connection with ventilation and air treatment work	16.1. Identify the risks associated with the installation and maintenance of HVAC systems
	16.2. Explain the precautions to be taken when installing and maintaining an HVAC system
	16.3. Explain the requirements for safe movement of HVAC components or units
17. Carry out work relating to the installation of pulsed air and combustion air heating	17.1. Explain physical clearance and accessibility requirements with respect to combustible materials, when setting up and servicing appliances

Elements of competency	Skills required
<p>appliances in compliance with applicable standards</p>	<p>17.2. Explain physical clearance, accessibility and rooftop installation requirements for pulsed air heating equipment, when setting up the units</p>
<p>18. Carry out work relating to the installation of devices for the supply of combustion air to heating equipment</p>	<p>18.1. Determine for this class the dimensions and location of supply openings for bypass air, combustion air and ventilation air for combustion equipment</p>
	<p>18.2. Determine the location of air supply openings for this class, depending on the fuel</p>
	<p>18.3. Determine the characteristics of a mechanical air supply system for this class</p>
	<p>18.4. Know the requirements for air supply</p>
	<p>18.5. Ensure that air supply work is carried out according to the applicable standards in force for this class, based on, among other things:</p> <ul style="list-style-type: none"> • <i>CSA-B149.1 - Natural Gas and Propane Installation Code (Québec amended)</i> • <i>Québec Construction Code (CCQ), Chapter II – Gases</i> • <i>CSA-B139 - Installation Code for Oil-Burning Equipment</i> • <i>CSA-B365 - Installation code for solid-fuel-burning appliances and equipment</i>
<p>19. Manage the execution of work to put special equipment in place</p>	<p>19.1. Ensure proper placement of equipment components</p>
	<p>19.2. Explain the precautions to be taken when using special equipment</p>
	<p>19.3. Explain the requirements for safe movement of system components or units</p>
	<p>19.4. Explain the maintenance to be carried out on these specific items of equipment, excluding heaters</p>
<p>20. Implement sustainable development principles</p>	<p>20.1. Explain best practices in sustainable development in the ventilation sector</p>

Elements of competency	Skills required
	20.2. Understand the new energy-efficiency regulations for the construction industry
	20.3. Know which ventilation systems will help reduce greenhouse gas emissions