Professional qualification of construction contractors

Competency profile

15.7 - Contractor – Residential ventilation

Régie du bâtiment Québec

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Introduction

Successful candidates may act as guarantors for construction work included in subclass 15.7 - Contractor – Residential 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

15.7 - Contractor – Residential 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 of single family dwellings, duplexes or town houses and private portions of multifamily buildings held in divided co-ownership.

It also authorizes, for buildings referred to in the first paragraph, 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, this subclass authorizes, for the same buildings, 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. Describe the main features of ventilation and air treatment systems
4. Perform basic calculations associated with ventilation and air treatment systems
5. Define concepts and terms related to heat transfer
6. Describe the main features of hot air distribution 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 causes, symptoms and effects of poor ventilation on buildings
	1.4. Explain the behaviour of the air stream (diffusion) in a given space
	1.5. 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 connected to a ventilation system
	2.6. Define ventilation system components and accessories
	2.7. Define ventilation types
	2.8. Define the components of an exhaust system

Elements of competency	Skills required
3. Describe the main features of ventilation and air treatment systems	3.1. Name the characteristics of the materials used for ventilation air ducts and their scope of application
	3.2. Describe the types of assembly (joints) of ventilation ductwork components and specify the context of their application
	3.3. Describe the types of support and specify the context of their application
	3.4. Explain the different modes of ventilation and air treatment systems
	3.5. Describe the different types of air exhaust systems
	3.6. Explain the impact of operating different types of air exhaust systems
	3.7. Describe the operation of different types of air distribution systems
	3.8. Describe the different types of ventilation and air treatment systems and their operation, and their effects on cooling and heating systems
	3.9. Describe the application and function of limit switches in ventilation and air treatment systems
	3.10. Describe control elements and their functions, and the various components and accessories used to control ventilation and air treatment systems
	3.11. Describe the characteristics of radon removal system components
	3.12. Interpret a ventilation control diagram
	3.13. Explain the effect of static pressure on the performance of different fan types

Elements of competency	Skills required
	3.14. Describe the elements likely to reduce and/or increase static pressure losses in an air distribution network
4. Perform basic calculations associated with ventilation and air treatment systems	4.1. Apply formulas specific to ventilation
	4.2. Convert units in both systems of measurement
	4.3. Perform calculations using trigonometric rules
	4.4. Calculate surface area, volume, speed, flow, pressure and power
	4.5. Perform heat load calculations
	4.6. Calculate air pressure drop using the equivalent length method
	4.7. Calculate thermal gains using simple methods
5. Define concepts and terms related to heat transfer	5.1. Define latent heat, sensible heat and total heat
	5.2. Define the thermal resistance to be included in head losses
	5.3. Define the main modes of heat transfer in buildings
	5.4. Define the relationship between condensation and water content (absolute humidity), relative humidity, dew point and condensation point
	5.5. Define the pressures exerted on a building by wind and stack effects, and their impact on heat load calculations for ventilation and air treatment systems
6. Describe the main features of hot air distribution systems	6.1. Describe the main components and accessories of hot air distribution systems
	6.2. Describe the operation of a hot air distribution system and the duct network

Module 2 – LEGISLATIVE, NORMATIVE AND REGULATORY FRAMEWORK

Elements of competency covered in this module:

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

Module 2 – LEGISLATIVE, NORMATIVE AND REGULATORY FRAMEWORK

Elements of competency	Skills required
7. Frame work relating to ventilation and air treatment systems (HVAC systems), in accordance with applicable laws, standards and regulations	7.1. Identify organizations that affix their seals to certify compliance of components of ventilation and air treatment systems and/or their installation
	7.2. Describe the application of *Chapter I – Building* of the *Québec Construction Code* (CCQ) in relation to work relating to ventilation and air treatment systems (parts 9, 10 and 11)
	7.3. Describe the application of *Chapter III – Plumbing* of the *Québec Construction Code* (CCQ) relating to work on ventilation and air distribution systems
	7.4. Understand the links between the various applicable codes, regulations and standards specific to work relating to ventilation and air treatment systems
	7.5. Understand the structure of the *Québec Construction Code* (R.S.Q. c. B -1.1, r.2)
	7.6. Explain the scope of *CAN/CSA-F326-M - Residential Mechanical Ventilation Systems*, as it applies to work involving the ventilation system installations in dwellings
	7.7. Explain the scope of current applicable standards relating to best practice in the installation of ventilation and air treatment systems, including: • ASHRAE standards and manuals • The HRAI Digest • *HVAC Duct Construction Standards (SMACNA*)

Elements of competency	Skills required
	7.8. Know the obligations concerning the implementation of HVAC systems for this class according to, among others, the application of the following reference documents among others: • *CSA-B149.1 - Natural Gas and Propane Installation Code (Québec amended)* • *CSA-B139 - Installation Code for Oil-Burning Equipment* • *CSA-B365 - Installation code for solid-fuel-burning appliances and equipment* • *CSA-F280 - Determining the required capacity of residential space heating and cooling appliances* • *CAN/CSA-C273.5 Installation of air source heat pumps and air conditioners* • ASHRAE standards and manuals
	7.9. Know the *Regulation respecting the professional qualification of contractors and owner-builders*, which concerns work relating to air distribution and treatment systems, the required licences and the limits of intervention
	7.10. Explain the roles and responsibilities of the team of professionals, general contractors, trade contractors and suppliers with regard to compliance with applicable codes, standards and regulations as demonstrated in plans and specifications
	7.11. Explain the scope of municipal regulations (noise level, clearance, location, visibility, etc.)
	7.12. Identify the main energy efficiency programs available in Quebec
	7.13. Understand the application of *Chapter I, Part I.1 – Building Energy Efficiency* of the *Québec Construction Code* (CCQ) in relation to work on air distribution and treatment systems

Elements of competency	Skills required
	7.14. Know the measures prescribed for work on underpinning depressurization systems: • *Radon Reduction Guide for Canadians* (Health Canada 2014) • *CAN/CGSB-149.11-2019: Radon control options for new construction in low-rise residential buildings*, from the Canadian General Standards Board

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 work and costs relating to 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. Locate on a plan the elements relating to the installation of ventilation and air treatment systems
	8.3. Interpret elements relating to the installation of ventilation and air treatment systems on a plan
	8.4. Refer to plans and specifications concerning the work of the various specialties on a construction project to ensure effective coordination between the various specialties
	8.5. Locate the various components of ventilation and air treatment systems on a plan
	8.6. Use plans and specifications to interpret information on the various responsibilities involved in ventilation and air treatment system work
	8.7. Understand the structure of specifications
	8.8. Interpret information and equipment specifications using plans and specifications
9. Estimate work and costs relating to 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 included in a ventilation and air treatment system

Elements of competency	Skills required
	9.5. Perform duct sizing calculations based on applications and locations
	9.6. Select equipment, accessories and materials based on calculations, requirements, applications and current regulations
	9.7. Select equipment and materials according to specific needs and uses
	9.8. Determine the quantities and dimensions of the various types of pipes and ducts, including the different types of materials used
	9.9. Count the quantities and dimensions of the different types of pipes and ducts, also according to the different types of materials
	9.10. Ensure compliance of proposed ventilation and air treatment systems with applicable codes, standards and regulations

Module 4 – STANDARDS AND EXECUTION OF WORK

Elements of competency covered in this module:

10. Plan and organize work relating to ventilation and air treatment systems
11. Produce shop drawings, manufacturing plans or installation diagrams for ventilation and air treatment systems
12. Ensure the installation and proper operation of equipment and all components and accessories for ventilation and air treatment systems
13. Test, check and maintain ventilation and air treatment systems
14. Install all components, equipment and accessories for ventilation and air treatment systems
15. Install air distribution and treatment system components
16. Install ductwork for air distribution systems
17. Carry out work relating to the installation of pulsed air and combustion air heating equipment in accordance with applicable standards
18. Manage the execution of work relating to supplying combustion air to heating equipment
19. Manage the execution of work to install special equipment
20. Implement sustainable development principles

Module 4 – STANDARDS AND EXECUTION OF WORK

Elements of competency	Skills required
10. Plan and organize work relating to 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. Ensure the installation and proper operation of equipment	12.1. Ensure proper installation and operation of exhaust air equipment, taking the necessary

Elements of competency	Skills required
and all components and accessories for ventilation and air treatment systems	precautions, particularly with regard to clearance from gas stoves
	12.2. Ensure installation and proper operation of air compensation equipment to counteract building depressurization
	12.3. Ensure installation and proper operation of all control system components and accessories, except heating controls
	12.4. Install and connect all ventilation and air treatment system components and accessories
	12.5. Install the system's finishing components (grille, diffuser, louvers, etc.)
	12.6. Install fresh air supply equipment in compliance with applicable codes, standards and regulations
	12.7. Ensure the installation of ducts while preserving the depressurization of the underpinning
13. Test, check and maintain ventilation and air treatment systems	13.1. Explain the requirements for testing ventilation and air treatment systems
	13.2. Establish procedures for starting up ventilation systems
	13.3. Explain procedures and requirements for balancing, equalization and leak testing of ventilation and air treatment systems
	13.4. Provide the owner or the owner's official representative with all documentation concerning the operation and maintenance of ventilation and air treatment systems
	13.5. Explain the operation and maintenance of ventilation and air treatment systems to the owner, the owner's official representative and/or the user

Elements of competency	Skills required
	13.6. Maintain and replace defective components, equipment and accessories
	13.7. Transmit a maintenance or repair report to the owner or the owner's official representative
	13.8. Start up ventilation and air treatment systems
14. Install all components, equipment and accessories for ventilation and air treatment systems	14.1. Identify the risks associated with work on and maintenance of ventilation and air treatment systems
	14.2. Explain the precautions to be taken when working on and maintaining ventilation and air treatment systems
	14.3. Explain the requirements for safe movement of all components and equipment of ventilation and air treatment systems
15. Install air distribution and treatment system components	15.1. Locate and mark areas for installation of air ducts, equipment and accessories
	15.2. Specify the means of securing air ducts, equipment and accessories to suit specific project conditions
	15.3. Install and secure ducts, taking into account project-specific conditions (suspension, vibration, etc.)
	15.4. Seal duct joints to minimize air leakage
	15.5. Ensure that work relating to ventilation and air treatment systems complies with applicable codes, standards and regulations
	15.6. Locate and mark all concealed components and accessories for ventilation and air treatment systems
	15.7. Ensure bonding on both sides of non-conductive elements of a metal duct network (flexible connections, etc.), so that contractors

Elements of competency	Skills required
	of the appropriate class can carry out grounding properly
	15.8. Explain how to install all components and accessories according to their requirements
	15.9. Ensure respect for structural and architectural integrity
	15.10. Ensure the presence and correct positioning of nameplates
	15.11. Ensure that bases, supports and anchors are adequate and compliant
	15.12. Ensure that work relating to ventilation and air treatment systems is coordinated with the work done by the project's various specialties
	15.13. Maintain the fire-rated integrity of architectural partitions with appropriate mechanical components installed in accordance with code requirements
16. Install ductwork for air distribution systems	16.1. Explain the requirements for installing and fabricating air ducts based on the combustibility or non-combustibility of materials
	16.2. Explain requirements and methods for insulating and lagging air ducts, vapour barriers, etc.
	16.3. Explain the requirements for protecting air duct materials from damage due to corrosion or other factors
	16.4. Ensure compliance with integrity rules based on Part 9 of the *Québec Construction Code* (CCQ) with respect to building incombustibility in the case of multi-unit dwellings
	17.1. Physical clearance and accessibility

Elements of competency	Skills required
17. Carry out work relating to the installation of pulsed air and combustion air heating equipment in accordance with applicable standards	• Explain physical clearance and accessibility requirements with respect to combustible materials • Explain the installation requirements for pulsed air heating equipment
	17.2. Air supply • Specify requirements
	17.3. Air supply • Ensure that installation work is carried out in accordance with the applicable standards in force for this class, including: ➢ *CSA-B149.1 - Natural Gas and Propane Installation Code (Québec amended)* ➢ *Québec Construction Code (CCQ), Chapter II – Gases* ➢ *CSA-B139 - Installation Code for Oil-Burning Equipment* ➢ *CSA-B365 - Installation code for solid-fuel-burning appliances and equipment*
18. Manage the execution of work relating to supplying combustion air to heating equipment	18.1. Determine for this class the dimensions and location of supply openings for bypass air, combustion air and ventilation air for combustion equipment
	18.2. Determine the location of air supply openings for this class, depending on the fuel
	18.3. Determine the characteristics of a mechanical air supply system for this class
	18.4. Specify requirements for air supply work
	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: • *CSA-B149.1 - Natural Gas and Propane Installation Code (Québec amended)* • *Québec Construction Code (CCQ), Chapter II – Gases* • *CSA-B139 - Installation Code for Oil-Burning Equipment*

Elements of competency	Skills required
	• *CSA-B365 - Installation code for solid-fuel-burning appliances and equipment*
19. Manage the execution of work to install special equipment	19.1. Ensure proper placement of equipment
20. Implement sustainable development principles	20.1. Explain best practices in sustainable development as they relate to residential ventilation
	20.2. Know the new energy efficiency regulations for small residential buildings
	20.3. Know residential ventilation systems that reduce greenhouse gas emissions