

COMPETENCY PROFILE

15.8 Contractor – ventilation



THE CONTENT MAY BE MODIFIED AT ANY TIME

We wish to thank the experts who participated in the validation of the following competency profile:

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In this document, the masculine is used without any discriminatory intent and solely for the purpose of streamlining the text.

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DEFINITION OF THE SUBCLASS

15.8 Contractor – ventilation

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

It also authorizes construction work concerning ducting and deployment of the heating devices of a pulsed air heating system and construction work concerning the ducting of a pulsed air heating and air conditioning system.

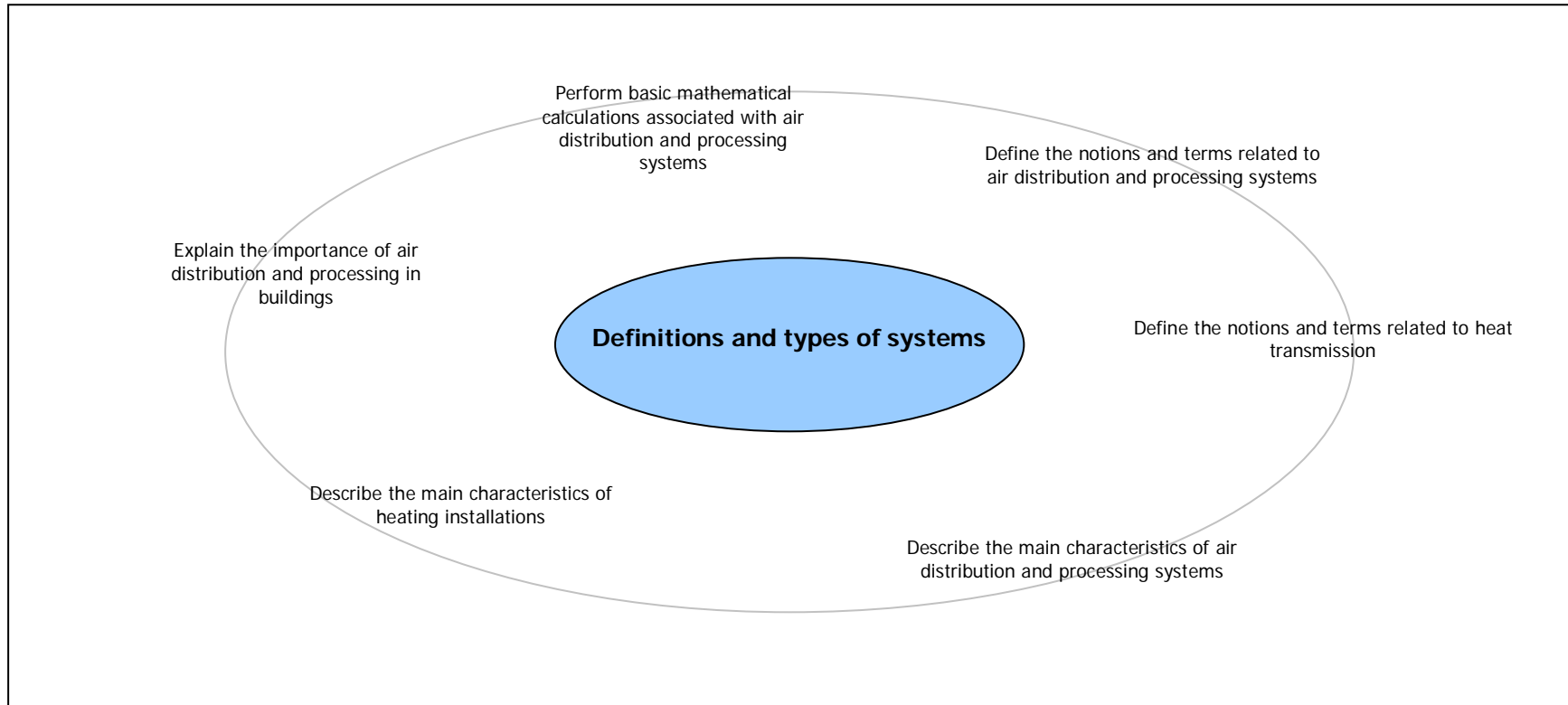
In addition, this subclass authorizes construction work concerning the heating and air conditioning devices of a pulsed air system, on condition that the contractor also holds the appropriate subclass 15.9 or 15.10.

Lastly, it authorizes similar or related construction work. ¹

¹ Source: *Regulation respecting the professional qualification of contractors and owner-builders* (RQPECP)

DEFINITIONS AND TYPES OF SYSTEMS

COMPETENCY COMPONENTS



DEFINITIONS AND TYPES OF SYSTEMS

| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|--------------------------------|---|--|
| Mastery of languages | <ul style="list-style-type: none"> Explain the importance of air distribution and processing in buildings | <ul style="list-style-type: none"> Explain the notion of comfort and the factors that affect it (noise level, humidity, temperature, air distribution, air velocity, indoor air quality, etc.) |
| | | <ul style="list-style-type: none"> Explain the causes, the symptoms and the effects of poor ventilation on people and buildings |
| | | <ul style="list-style-type: none"> Explain the behaviour of air (diffusion) in a given space, depending on the obstacles (Coanda effect) |
| Mastery of languages | <ul style="list-style-type: none"> Define the notions and terms related to air distribution and processing systems | <ul style="list-style-type: none"> Distinguish between the notions of "mechanical ventilation" and "natural ventilation". |
| | | <ul style="list-style-type: none"> Identify the units of measure associated with ventilation |
| | | <ul style="list-style-type: none"> Define the units of measure associated with the installation of air distribution and circulation systems (pcm, L/s, Pa, inch of water column, etc.) |
| | | <ul style="list-style-type: none"> Define the notions of "minimum fresh air capacity", "exhaust flow", "air supply volume", "depressurization", etc. |
| | | <ul style="list-style-type: none"> Define the devices to which an air distribution and circulation system may be connected: fan, air conditioning unit, heat exchanger, heat recovery ventilator, energy recovery ventilator, heating system, pulsed air generator, fan coils, etc. |
| | | <ul style="list-style-type: none"> Define the components of a ventilation system: fan, pipe or duct, air outlet and return air duct, external air intake, filter, grille, diffuser, flap, fire damper, etc. |
| | | <ul style="list-style-type: none"> Define the types of air related to the types of ventilation: make-up, fresh, combustion, return, supply, exhaust, recirculation, etc. (refer to B-149.1) |
| Mastery of languages | <ul style="list-style-type: none"> Define the notions and terms related to heat transmission | <ul style="list-style-type: none"> Define the notions of total heat, sensible heat and latent heat |
| | | <ul style="list-style-type: none"> Define the notion of thermal resistance |
| | | <ul style="list-style-type: none"> Define the notions of conduction, convection and radiation |
| Mastery of languages | | <ul style="list-style-type: none"> Define the notions of humidity and condensation rates |

DEFINITIONS AND TYPES OF SYSTEMS

| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|--------------------------------|--|--|
| | <ul style="list-style-type: none"> Define the notions and terms related to heat transmission (continued) | <ul style="list-style-type: none"> Specify the direction of the heat exchange (loss, gain, infiltration, chimney effect, wind effect, etc.) |
| Mastery of structures | <ul style="list-style-type: none"> Describe the main characteristics of air distribution and processing systems | <ul style="list-style-type: none"> Name the characteristics of the materials used for the ventilation ducts and their field of application (galvanized steel, black steel, stainless steel, composite materials, fibreglass, flexible conduit, etc.) |
| | | <ul style="list-style-type: none"> Describe the assembly types and welding types of components and ducts and specify their field of application |
| | | <ul style="list-style-type: none"> Describe the types of support systems (earthquake-resistant, etc.) |
| | | <ul style="list-style-type: none"> Explain the various air circulation modes (stop, low flow exchange, intermittent low flow exchange, variable flow, recirculation, heating, cooling, etc.) |
| | | <ul style="list-style-type: none"> Describe the types of exhaust systems, and explain their operation and their influence on depressurization of the building |
| | | <ul style="list-style-type: none"> Describe the operation of the different types of air circulation systems |
| | | <ul style="list-style-type: none"> Describe the types of processed air distribution systems (cooling and heating): single zone system, reheating coil system, multiple zone system, air flow control system, induction system, dual duct system, etc. |
| | | <ul style="list-style-type: none"> Describe the fields of application and the operation of limiter components (terminal reheat, variable air volume box, diffuser, etc.) |
| | | <ul style="list-style-type: none"> Describe the controls and their functions (detector, timer, gas detector, hygrometer, thermostat, etc.) |
| | | <ul style="list-style-type: none"> Interpret a control and connection schematic |
| Mastery of structures | <ul style="list-style-type: none"> Describe the main characteristics of heating installations | <ul style="list-style-type: none"> Describe the main components of the hot air generator |
| | | <ul style="list-style-type: none"> Describe the main components of the combustion air supply system |
| | | <ul style="list-style-type: none"> Describe the specificities of a hot air distribution system |

DEFINITIONS AND TYPES OF SYSTEMS

| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|--------------------------------|---|---|
| Mastery of procedures | <ul style="list-style-type: none">Perform basic mathematical calculations associated with air distribution and processing systems | <ul style="list-style-type: none">Apply the formulas specific to ventilation |
| | | <ul style="list-style-type: none">Convert the units into the two unit of measure systems |
| | | <ul style="list-style-type: none">Perform calculations using trigonometric rules |
| | | <ul style="list-style-type: none">Perform surface, volume, velocity, flow and pressure calculations |
| | | <ul style="list-style-type: none">Perform heat loss calculations |

NORMATIVE, REGULATORY AND LEGISLATIVE FRAMEWORK

COMPETENCY COMPONENTS

Situate the work pertaining to the air distribution and processing systems in relation to the legislative, normative and regulatory framework

Normative, regulatory and legislative framework

NORMATIVE, REGULATORY AND LEGISLATIVE FRAMEWORK

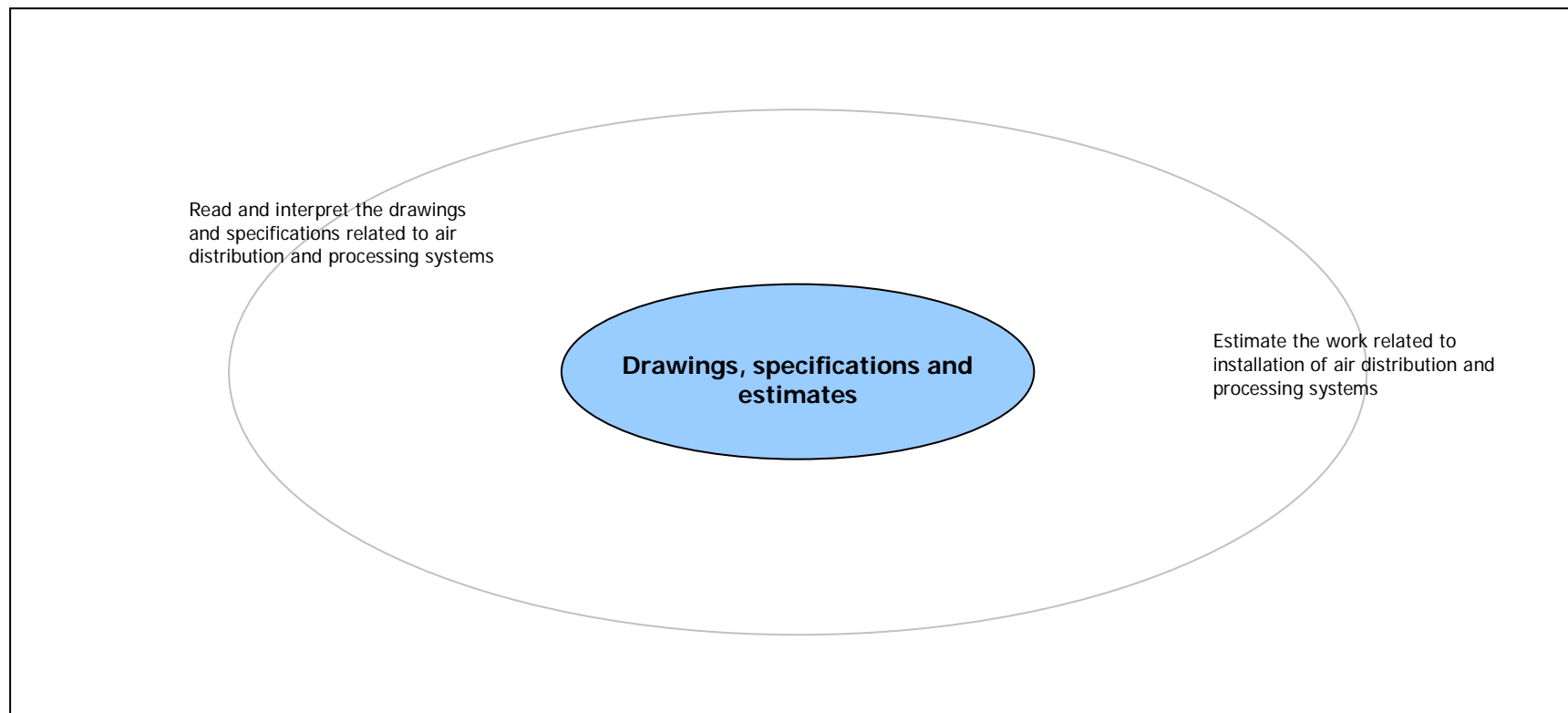
| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|---|---|--|
| <p style="text-align: center;">Mastery of structures</p> | <ul style="list-style-type: none"> • Situate the work pertaining to the air distribution and processing systems in relation to the legislative, normative and regulatory framework | <ul style="list-style-type: none"> • Identify the organizations (and their standards of conformity) that affix their logos on the components of air distribution and processing system installations for buildings (CSA, ULc, UL, etc.) |
| | | <ul style="list-style-type: none"> • Identify and define the application of the Québec Construction Code - Chapter I, Building in relation to work on air distribution and processing systems (Parts 3, 4, 6, 9, 10 and 11) |
| | | <ul style="list-style-type: none"> • Identify and define the application of the <i>Québec Construction Code</i> - Chapter III, Plumbing in relation to work on air distribution and processing systems (discharge to the plumbing system of devices producing condensation, etc.) |
| | | <ul style="list-style-type: none"> • Understand the links between the different codes and standards specific to installation of air distribution and processing |
| | | <ul style="list-style-type: none"> • Understand the structure of the Construction Code (R.S.Q. c. B-1.1, r.2) |
| | | <ul style="list-style-type: none"> • Explain the field of application of the standard applicable in the case of work related to installation of residential ventilation systems (<i>CAN/CSA-F326-M Residential Mechanical Ventilation Systems</i>) |
| | | <ul style="list-style-type: none"> • Explain the field of application of the standards applicable to installation of ventilation systems: <ul style="list-style-type: none"> ○ The ASHRAE standard and manuals ○ The HRAI Digest ○ HVAC Duct Construction Standards ○ The Industrial Ventilation Manual published by the ACGIH ○ The NFPA standards appropriate to the work ○ Regulation respecting the quality of the work environment (c. S-2.1, r.11) (CNESST) ○ Chapter VIII, Building, of the National Fire Code of Canada (NFC) |
| <ul style="list-style-type: none"> • Explain the field of <i>CAN/CSA-Z317.2 standard - Special requirements for heating, ventilation and air-conditioning (HVAC) systems in health care facilities</i> | | |

NORMATIVE, REGULATORY AND LEGISLATIVE FRAMEWORK

| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|--------------------------------|---|---|
| Mastery of structures | <ul style="list-style-type: none"> • Situate the work pertaining to the air distribution and processing systems in relation to the legislative, normative and regulatory framework (continued) | <ul style="list-style-type: none"> • Know the obligations for deployment of heating devices based on the application of the following codes: <ul style="list-style-type: none"> ○ CAN/CSA-C273.5 - Installation of air source heat pumps and air conditioners ○ Québec Construction Code, Chapter II, Gas ○ CSA-B149.1 - Natural gas and propane installation code (Amended Québec) (Québec Construction Code, Chapter II, Gas) ○ Québec Construction Code, Chapter VIII, Petroleum Equipment Installations ○ Québec Construction Code, Chapter V, Electricity ○ 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 ○ The ASHRAE standards and manuals |
| | | <ul style="list-style-type: none"> • Explain the field of application of <i>NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations</i> |
| | | <ul style="list-style-type: none"> • Know the Regulation respecting the professional qualification of contractors and owner-builders with regard the work relating to air distribution and processing installations (the licences required and the limits of intervention) |
| | | <ul style="list-style-type: none"> • Explain the roles and responsibilities of the designer, the general contractors and the specialized contractors concerning conformity to the drawings, specifications and standards |
| | | <ul style="list-style-type: none"> • Explain in which cases the Regulation respecting energy conservation in new buildings (R.S.Q., c. E-1.1, r.1) applies to air distribution and processing work. |
| | | <ul style="list-style-type: none"> • Explain the field of application of the municipal by-laws (noise level, clearance, location, visibility, etc.) |
| | | <ul style="list-style-type: none"> • Explain in which case the Act respecting the conservation of energy in buildings (E-1.1) and the Regulation respecting energy conservation in new buildings (E-1.1, r.1) apply to air distribution and processing work |
| | | <ul style="list-style-type: none"> • Name the main energy efficiency programs available in Québec (Novoclimat, LEED, Rénoclimat, Hydro-Québec and Gaz Métro programs, etc.) |

DRAWINGS, SPECIFICATIONS AND ESTIMATE

COMPETENCY COMPONENTS



"DRAWINGS, SPECIFICATIONS AND ESTIMATE"

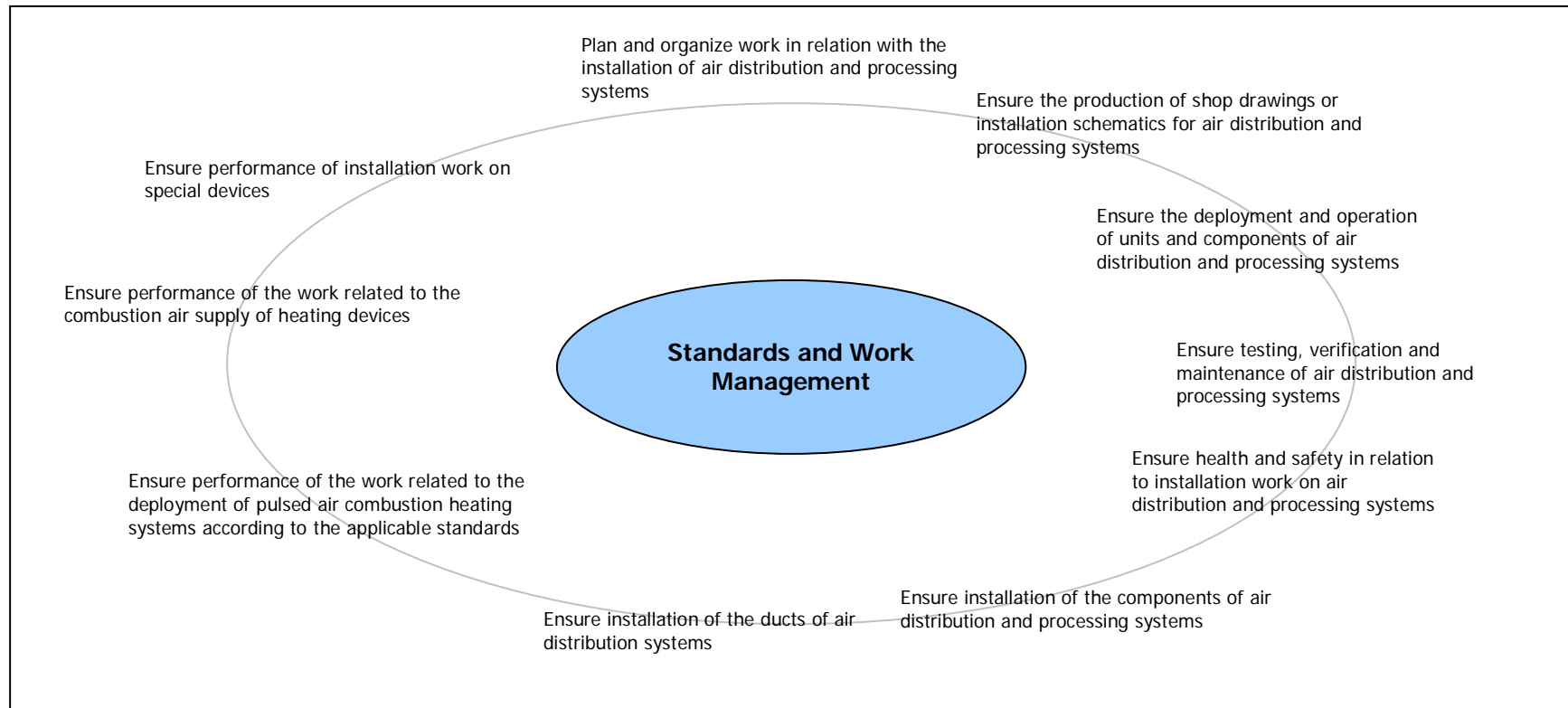
| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|--------------------------------|---|---|
| Mastery of procedures | <ul style="list-style-type: none"> Read and interpret the drawings and specifications related to air distribution and processing systems | <ul style="list-style-type: none"> Enumerate the types of drawings issued for the various stages of the project |
| | | <ul style="list-style-type: none"> Identify and interpret on a drawing the components (dimensions, annotations, notes, symbols) pertaining to the installation of air distribution and processing systems (surface area and volume of the rooms, etc.) |
| | | <ul style="list-style-type: none"> Refer to the drawings and specifications that concern the work of different specialties that may be in conflict (architecture, mechanical, structural, electrical) |
| | | <ul style="list-style-type: none"> Identify on a drawing the different components related to air distribution and processing installations |
| | | <ul style="list-style-type: none"> Determine whether the obligations for earthquake-resistant installations are applicable or not |
| | | <ul style="list-style-type: none"> Interpret the information pertaining to general and technical loads from specifications related to air distribution and processing systems |
| | | <ul style="list-style-type: none"> Understand the organizational structure of construction specifications |
| | | <ul style="list-style-type: none"> Interpret the information from specifications associated with different facilities |
| | <ul style="list-style-type: none"> Estimate the work related to installation of air distribution and processing systems | <ul style="list-style-type: none"> Evaluate the capacity of an existing air distribution and processing system and make a diagnosis concerning the change required |
| | | <ul style="list-style-type: none"> Ensure production of calculations that can determine the characteristics of the devices that are part of an air processing system (flow, pressure, power, etc.) |
| | | <ul style="list-style-type: none"> Ensure the production of calculations pertaining to the dimensions of air distribution ducts based on uses and air flows, pressures and velocities |
| | | <ul style="list-style-type: none"> Select devices and materials in conformity to the calculations and the regulations |
| | | <ul style="list-style-type: none"> Select devices and materials according to specific needs and uses (humidification, filtration, diffusion, etc.) |

"DRAWINGS, SPECIFICATIONS AND ESTIMATE"

| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|--------------------------------|--|---|
| Mastery of procedures | <ul style="list-style-type: none">Estimate the work related to installation of air distribution and processing systems (continued) | <ul style="list-style-type: none">Perform the calculation of required quantities of materials (Pipes and ducts, number of components, etc.) |
| | | <ul style="list-style-type: none">Ensure the conformity of the proposed work to the appropriate codes and standards |

STANDARDS AND WORK MANAGEMENT

COMPETENCY COMPONENTS



STANDARDS AND WORK MANAGEMENT

| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|--|--|---|
| Mastery of procedures and communication | <ul style="list-style-type: none"> Plan and organize the work related to installation of air distribution and processing systems | <ul style="list-style-type: none"> Determine the logical order of performance of systems installation work |
| | | <ul style="list-style-type: none"> Order and receive the materials required for systems installation |
| | | <ul style="list-style-type: none"> Explain the importance of properly coordinating the interface (common limits) between the various trades at the site |
| Mastery of procedures | <ul style="list-style-type: none"> Ensure the production of shop drawings or of an installation schematic for an air distribution and processing system | <ul style="list-style-type: none"> Calculate the details pertaining to a system (dimension, number and location of components) |
| | | <ul style="list-style-type: none"> Provide the information required for the production of shop drawings or manufacturing drawings |
| | | <ul style="list-style-type: none"> Cross refer to components on an architectural plan or produce an installation sketch |
| | | <ul style="list-style-type: none"> Ensure the conformity of the shop drawings and sketches to the standards, drawings and specifications |
| | | <ul style="list-style-type: none"> Have the owner or the owner's representative approve the installation schematic |
| | <ul style="list-style-type: none"> Ensure installation of the components of air distribution and processing systems | <ul style="list-style-type: none"> Locate and mark the locations where the ducts and equipment should be installed and the means of fastening them |
| | | <ul style="list-style-type: none"> Ensure placement of ducts and fasten them by accounting for the conditions specific to the project (suspension, vibration, earthquake-resistance standards, etc.) |
| | | <ul style="list-style-type: none"> Ensure the sealing of the joints and fittings of ducts in order to prevent air leaks |
| | | <ul style="list-style-type: none"> Ensure the conformity of the work to the standards, drawings and specifications |
| | | <ul style="list-style-type: none"> Locate and mark the location of installation of components of the ventilation system (including ensuring that any eventual maintenance is safe for the workers) |
| <ul style="list-style-type: none"> Ensure the grounding of the ducts (continuity of grounds) | | |
| <ul style="list-style-type: none"> Explain the methods of installation and the requirements pertaining to the installation of components based on the various uses and the types of buildings (commercial kitchens, industrial, etc.) | | |

STANDARDS AND WORK MANAGEMENT

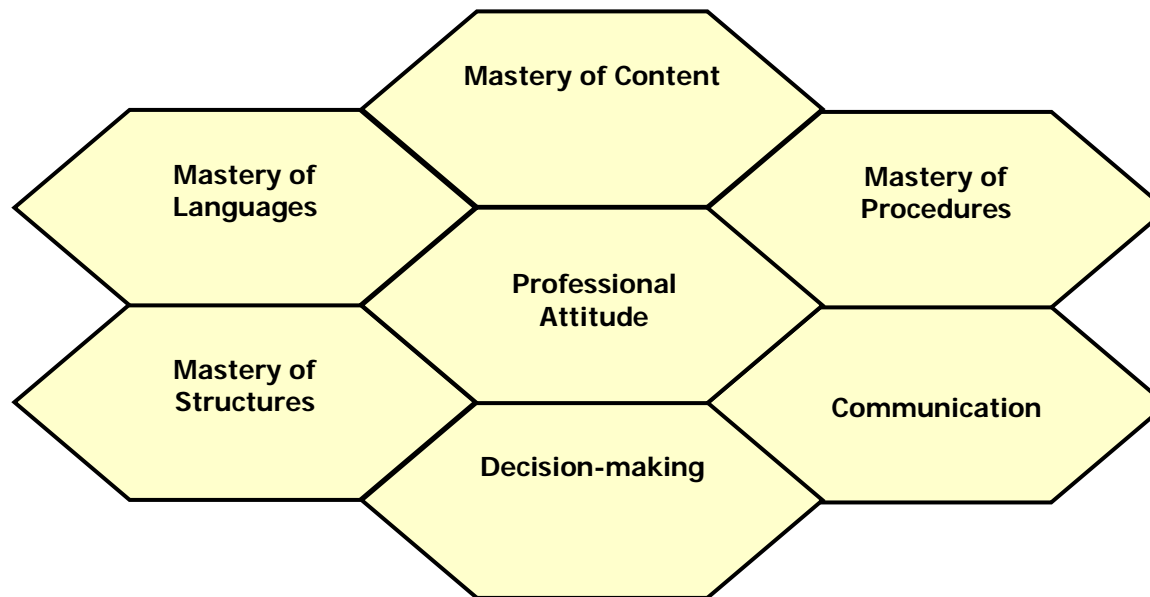
| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|---|--|--|
| | | <ul style="list-style-type: none"> Explain the requirements pertaining to fire protection in relation to ventilation in the buildings (air flow of systems, number of suites, number of floors) |
| | | <ul style="list-style-type: none"> Ensure the integrity of the structure is respected |
| | <ul style="list-style-type: none"> Ensure installation of the components of air distribution and processing systems (continued) | <ul style="list-style-type: none"> Ensure the presence and the adequate location of identification plates |
| | | <ul style="list-style-type: none"> Ensure that the supports or the bearing surfaces are adequate and in conformity |
| | | <ul style="list-style-type: none"> Ensure that the work is performed in accordance with the different specialties |
| | <ul style="list-style-type: none"> Ensure the installation of ducts of an air distribution system | <ul style="list-style-type: none"> Explain the requirements pertaining to the installation and manufacturing of the ducts based on the presence of combustible materials or not |
| | | <ul style="list-style-type: none"> Explain the requirements and the methods pertaining to the insulation of ducts and the installation of vapour barriers |
| | | <ul style="list-style-type: none"> Explain the requirements pertaining to the protection of ducts against the risk of damage (corrosion, etc.) |
| | | <ul style="list-style-type: none"> Ensure compliance with the building non-combustibility rules (integrity of compartmentalization, firewall system, smoke barrier, blocking device, etc.) |
| | Mastery of procedures | <ul style="list-style-type: none"> Ensure the deployment and operation of units and components of air distribution and processing systems |
| <ul style="list-style-type: none"> Ensure the installation of the air extraction devices (hood, etc.) | | |
| <ul style="list-style-type: none"> Ensure the deployment of compensation devices to counter depressurization | | |
| <ul style="list-style-type: none"> Ensure the installation of the wiring and the components of the control system (methods, authorized wiring, etc.) | | |
| <ul style="list-style-type: none"> Ensure the connection between the ducting and the components of the system | | |
| <ul style="list-style-type: none"> Ensure the installation of finishing components of the system (grille, diffuser, louver, etc.) | | |

STANDARDS AND WORK MANAGEMENT

| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|--|---|--|
| | | <ul style="list-style-type: none"> Explain the installation requirements for fresh air intake units |
| Mastery of procedures and professional attitude | <ul style="list-style-type: none"> Ensure testing, verification and maintenance of air distribution and processing systems | <ul style="list-style-type: none"> Explain the obligations in view of the verifications and the tests performed on the systems |
| | | <ul style="list-style-type: none"> Establish a procedure and start the system |
| | | <ul style="list-style-type: none"> Explain the procedures and requirements pertaining to balancing of the system and the different tests (tightness, etc.) |
| | | <ul style="list-style-type: none"> Transmit to the owner, or to the owner's representative, the documentation of operation and maintenance of the system |
| | | <ul style="list-style-type: none"> Explain the operation of the system to the owner or the user |
| | | <ul style="list-style-type: none"> Ensure the maintenance and replacement of defective components |
| | | <ul style="list-style-type: none"> Transmit a maintenance or repair report to the owner or to the owner's representative |
| Mastery of procedures and professional attitude | <ul style="list-style-type: none"> Ensure health and safety in relation to air distribution and processing work | <ul style="list-style-type: none"> Name the risks related to the installation and maintenance of the systems |
| | | <ul style="list-style-type: none"> Explain the precautions to be taken during the installation and maintenance of a system |
| | | <ul style="list-style-type: none"> Explain the requirements pertaining to the safe movement of components or units of systems |
| Mastery of procedures and professional attitude | <ul style="list-style-type: none"> Ensure performance of the work related to the deployment of pulsed air combustion heating systems according to the applicable standards | <p>CLEARANCE AND ACCESS</p> <ul style="list-style-type: none"> Explain the requirements for clearance in relation to combustible materials Explain the roof access requirements Explain the installation requirements for pulsed air heating units |

STANDARDS AND WORK MANAGEMENT

| COMPETENCIES OF THE CONTRACTOR | COMPETENCY COMPONENTS | MINIMUM SKILLS REQUIRED |
|--------------------------------|--|---|
| | | <p>AIR SUPPLY</p> <ul style="list-style-type: none"> • Ensure performance of the work according to the standards <ul style="list-style-type: none"> • CSA-B149.1 - Natural gas and propane installation code (Québec Construction Code, Chapter II) • CSA-B139 - Installation code for oil-burning equipment • CSA-B365 - Installation code for solid-fuel-burning appliances and equipment |
| Mastery of procedures | <ul style="list-style-type: none"> • Ensure performance of the work related to the combustion air supply of heating devices | <ul style="list-style-type: none"> • Determine the dimensions of the air supply openings (dilution, combustion, etc.) for combustion devices (gas, oil and solid fuel) |
| | | <ul style="list-style-type: none"> • Determine the location of the air supply openings, depending on the fuel |
| | | <ul style="list-style-type: none"> • Determine the characteristics of a mechanical air supply system |
| | | <ul style="list-style-type: none"> • Ensure performance of air supply work according to the standards <ul style="list-style-type: none"> • CSA-B149.1 - Natural gas and propane installation code (Amended Québec) • CSA-B139 - Installation code for oil-burning equipment • CSA-B365 - Installation code for solid-fuel-burning appliances and equipment |
| Mastery of procedures | <ul style="list-style-type: none"> • Ensure performance of installation work on special devices | <ul style="list-style-type: none"> • Ensure the installation of devices: fan, air conditioning unit, heat exchanger, heat recovery ventilator, energy recovery ventilator, heating system, pulsed air generator, fan coils, etc. |
| | | <ul style="list-style-type: none"> • Explain the precautions to be taken during the installation and maintenance of a system |
| | | <ul style="list-style-type: none"> • Explain the requirements pertaining to the safe movement of components or units of systems |

APPENDIX - COMPETENCY-BASED APPROACH (*MODEL USED*)**COMPETENCY PROFILE OF THE BUILDING CONTRACTOR**

COMPETENCIES (examples)

| | | | |
|-------------------------------|---|-------------------------------|---|
| Mastery of contents : | <ul style="list-style-type: none"> Know the information Know specific concepts Know general concepts | Professional attitude: | <ul style="list-style-type: none"> Be open Be critical Be united Be autonomous Be creative Be responsible |
| Mastery of languages : | <ul style="list-style-type: none"> Understand the symbols Understand the system of representation Understand the meanings Translate meanings | Communication: | <ul style="list-style-type: none"> Understand the role of the intervening parties Understand contexts Understand intentions Understand messages Formulate messages |
| Mastery of structures: | <ul style="list-style-type: none"> Classify elements Understand mechanisms Understand laws Understand systems Make inferences | Decision making: | <ul style="list-style-type: none"> Use the information Set objectives Make a plan Solve problems Complete projects |
| Mastery of procedures: | <ul style="list-style-type: none"> Know operations Know sequences of operations Know standards of execution Execute procedures Computerize the execution of procedures | | |

NOTE

The model used to establish the competency profile is based on the work of **DISCAS**, education consultants.