Professional qualification of construction contractors

Competency profile

13.1 - Contractor – Lightning protection

Régie du bâtiment Québec

This document was produced with the collaboration of the team of competency assessment advisors (Direction de la qualification) of the Régie du bâtiment du Québec.

In this document, the masculine gender is used without discrimination and solely for the sake of brevity.

Changes to the content may be made at any time.

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Introduction

Successful candidates may act as guarantors for construction work included in subclass 13.1 - Contractor – Lightning protection.

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

13.1 - Contractor – Lightning protection

This subclass authorizes construction work that is not exclusively reserved for electrical contractors relating to lightning protection installations, and similar or related construction work.

Module 1 – DEFINITIONS AND TYPES OF SYSTEMS

Elements of competency covered in this module:

1. Define concepts and terms related to lightning protection installations
2. Describe the characteristics of the various lightning protection installations and their components

Module 1 – DEFINITIONS AND TYPES OF SYSTEMS

Elements of competency	Skills required
1. Define concepts and terms related to lightning protection installations	1.1. Define “lightning protection system” and “protected volume”
	1.2. Define “material conductivity,” “corrosion” and “galvanization”
	1.3. Define the classes of buildings that can be protected against lightning (I, II, III, IV, V)
	1.4. Define “air terminal,” “air terminal conductor,” “belt conductor,” “connection,” “tripod,” “down,” “disconnect switch” and “grounding”
	1.5. Define the units of measurement associated with lightning protection systems
	1.6. Explain the difference between a lightning conductor and a lightning arrester
2. Describe the characteristics of the various lightning protection installations and their components	2.1. Name the metals used in lightning protection systems and their main characteristics, e.g. compatibility (copper, aluminum, alloyed or unalloyed, galvanized steel, copper-clad steel, etc.)
	2.2. Describe the types of lightning conductors, how they work and the types of buildings in which they can be installed (early streamer emission, meshed cage, taut wire)
	2.3. Describe the components of a lightning conductor (connector, conductor, terminal, grounding, etc.) and specify their fields of application (performance, where to install them, etc.)
	2.4. Describe the impact of different building roof shapes and architectural materials on the types of lightning protection installations

Elements of competency	Skills required
	2.5. Explain the types of damage that can affect lightning conductor components (galvanization, corrosion, temperature, mechanical damage) and how to protect against them
	2.6. Identify the parts of a building most likely to be struck by lightning
	2.7. Explain the behaviour and impact of lightning striking a building, civil engineering structure or site (e.g., the phenomenon of polarization)

Module 2 – LEGISLATIVE, NORMATIVE AND REGULATORY FRAMEWORK

Elements of competency covered in this module:

3. Situate work related to lightning protection installations in relation to the various codes and standards in force

Module 2 – LEGISLATIVE, NORMATIVE AND REGULATORY FRAMEWORK

Elements of competency	Skills required
3. Situate work related to lightning protection installations in relation to the various codes and standards in force	3.1. Identify the organizations (and their compliance standards) that affix their marks to lightning protection installation components (CSA, etc.)
	3.2. Identify and define the scope of the *Québec Construction Code, Chapter I: Building*, and the *National Building Code of Canada: 1995* (amended) (NRC) in relation to lightning protection work
	3.3. Explain the scope of the standard applicable to work in relation to lightning protection installations (*CSA B-72-M87)*

Module 3 – PLANS AND SPECIFICATIONS

Elements of competency covered in this module:

4. Read and interpret plans and drawings relating to lightning protection installations
5. Read and interpret the divisions of specifications relating to lightning protection installations
6. Adapt drawings and plans to reflect as-built work

Module 3 – PLANS AND SPECIFICATIONS

Elements of competency	Skills required
4. Read and interpret plans and drawings relating to lightning protection installations	4.1. List the types of plans that concern lightning protection installations
	4.2. Locate the area to be protected and the components of a lightning protection system on a plan
	4.3. Interpret the symbols used for lightning protection installations
	4.4. Locate, read and interpret the main dimensions and annotations associated with lightning protection installations
	4.5. Locate, read and interpret cross-sections and details associated with lightning protection installations
	4.6. Read and interpret general notes and tables associated with lightning protection installations
5. Read and interpret the divisions of specifications relating to lightning protection installations	5.1. Define the divisions and sections of specifications relating to lightning protection installations
	5.2. Interpret information relating to lightning protection installations in the general terms of specifications
	5.3. Interpret information relating to lightning protection installations in the special terms of specifications (including the geotechnical report)
6. Adapt drawings and plans to reflect as-built work	6.1. Identify the information required in an as-built drawing or plan
	6.2. Adapt basic drawings and plans to reflect as-built work
	6.3. Explain the approval process for as-built plans and drawings
	6.4. Ensure that as-built plans and drawings comply with appropriate standards

Module 4 – DESIGN AND ESTIMATE

Elements of competency covered in this module:

7. Design and estimate the work required on an existing building or structure and propose a technical solution (without drawings and specifications)
8. Estimate work based on plans and specifications issued for tender and propose a technical solution
9. Produce shop drawings, if required, from plans and specifications issued for construction

Module 4 – DESIGN AND ESTIMATE

Elements of competency	Skills required
7. Design and estimate the work required on an existing building or structure and propose a technical solution (without drawings and specifications)	7.1. Make a brief diagnosis of lightning strike risks associated with a building element, structure or site
	7.2. Explain the factors to be considered when designing a lightning conductor (assessment of surroundings, topography, etc.)
	7.3. Calculate the protected volume of a lightning protection installation
	7.4. Select materials and components for a lightning protection system according to the area to be protected and the building class
	7.5. Propose a technical solution (types of lightning conductors, locations, materials, etc.)
	7.6. Determine required resources (labour, equipment, materials), their availability and productivity rate (daily production per crew)
	7.7. Ensure that the work proposed complies with appropriate standards
8. Estimate work based on plans and specifications issued for tender and propose a technical solution	8.1. Carry out a site visit to assess the impact of the work and validate compliance with the plans and specifications
	8.2. Prepare the quantity survey[1] (number and quantity of components)
	8.3. Validate or establish the technical solution (lightning conductor types, locations, materials, etc.)
	8.4. Determine required resources (labour, equipment, materials), their availability and the productivity rate (daily production per crew)
	9.1. Explain the shop drawing approval process

[1] Prepare the quantity survey: measure the structure and calculate the quantities of materials required.

Elements of competency	Skills required
9. Produce shop drawings, if required, from plans and specifications issued for construction	9.2. Ensure that shop drawings comply with plans and specifications
	9.3. Ensure that shop drawings comply with appropriate standards

Module 5 – STANDARDS AND EXECUTION OF WORK

Elements of competency covered in this module:

10. Plan and organize work in relation to lightning conductor installation
11. Ensure the installation of grounding
12. Install down conductors
13. Install terminals and air terminal conductors
14. Inspect and maintain lightning protection systems
15. Ensure health and safety in connection with lightning conductor installation and maintenance work

Module 5 – STANDARDS AND EXECUTION OF WORK

Elements of competency	Skills required
10. Plan and organize work in relation to lightning conductor installation	10.1. Determine the logical order of execution of lightning conductor installation and maintenance work
	10.2. Order and receive materials required for lightning protection installations
	10.3. Ensure that the declaration of work required for the installation of a lightning conductor is filed
	10.4. Verify the location of existing buried and overhead services
11. Ensure the installation of grounding	11.1. Identify the type of connection and the context in which the grounding is installed (proximity to other elements, etc.)
	11.2. Determine where to place grounding electrodes
	11.3. Prepare the ground (e.g. ensure that excavation work is carried out)
	11.4. Install grounding rods or grounding loops, if required (rock)
	11.5. Connect grounding rods to down conductors and grounding belt as required
	11.6. Explain grounding requirements for different types of soil (rock, etc.)
	11.7. Ensure that materials and locations comply with standards, plans and specifications
12. Install down conductors	12.1. Identify where down conductors are to be installed and specify how they are to be secured
	12.2. Place down conductors along walls and secure them (methods, concrete, etc.)
	12.3. Install disconnect switches and protection systems for down conductors

Elements of competency	Skills required
	12.4. Explain the requirements for down conductors, depending on the height difference and building class
	12.5. Explain the requirements for the installation of down conductors in cases where a tree in the vicinity of the installations to be protected is taller than the lightning conductor installations
	12.6. Ensure that materials and locations comply with standards, plans and specifications
13. Install air terminals and air terminal conductors	13.1. Determine locations for installation of terminals and air terminal conductors
	13.2. Attach terminals and air terminal conductors to the belt
	13.3. Connect terminals and air terminal conductors to ensure safe distribution of electrical loads (to each other, to architectural and mechanical metal roof elements)
	13.4. Explain how to install terminals and air terminal conductors for each class of building and type of roof and equipment (sealing, materials, etc.)
	13.5. Ensure that materials and locations comply with standards (fasteners, maximum overhang, etc.), plans and specifications
14. Inspect and maintain lightning protection systems	14.1. Identify the types of personnel authorized to inspect and maintain a lightning conductor
	14.2. Explain lightning conductor inspection and testing obligations
	14.3. Describe how to perform tests associated with lightning conductors (visual, resistance, etc.)
	14.4. Explain the methods used to measure the minimum resistance of the grounding and the minimum resistive values
	14.5. Replace defective components as required

Elements of competency	Skills required
15. Ensure health and safety in connection with lightning conductor installation and maintenance work	15.1. Identify the risks associated with the installation and maintenance of lightning conductors
	15.2. Explain the precautions to be taken when installing and maintaining a lightning conductor
	15.3. List fall-arresting devices and require their use by workers, where applicable *(Safety Code for the Construction Industry*, R.S.Q., c. S.2-1, r.6, ss. 2.9, 2.10.12 and 3.8)