

Construction Electrician

2008

Trades and Apprenticeship Division

Division des métiers et de l'apprentissage

Workplace Partnerships Directorate

Direction des partenariats en milieu de travail

National Occupational Classification:

7241

Disponible en français sous le titre :

Électricien/électricienne (construction)

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this National Occupational Analysis as the national standard for the occupation of Construction Electrician.

Background

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to cooperate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. To this end, Human Resources and Social Development Canada sponsors a program, under the guidance of the CCDA, to develop a series of National Occupational Analyses (NOA).

The NOAs have the following objectives:

- to describe and group the tasks performed by skilled workers;
- to identify which tasks are performed in every province and territory;
- to develop instruments for use in the preparation of Interprovincial Red Seal Examinations and curricula for training leading to the certification of skilled workers;
- to facilitate the mobility of apprentices and skilled workers in Canada; and,
- to supply employers, employees, associations, industries, training institutions and governments with analyses of occupations.



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LIST OF PUBLISHED
NATIONAL OCCUPATIONAL ANALYSES
(Red Seal Trades)

TITLE	NOC* Code
Agricultural Equipment Technician (2007)	7312
Appliance Service Technician (2005)	7332
Automotive Painter (2005)	7322
Automotive Service Technician (2005)	7321
Baker (2006)	6252
Boilermaker (2008)	7262
Bricklayer (2007)	7281
Cabinetmaker (2007)	7272
Carpenter (2005)	7271
Concrete Finisher (2006)	7282
Construction Electrician (2008)	7241
Cook (2003)	6242
Electrical Rewind Mechanic (1999)	7333
Electronics Technician – Consumer Products (1997)	2242
Floorcovering Installer (2005)	7295
Glazier (2004)	7292
Hairstylist (2005)	6271
Heavy Duty Equipment Technician (2004)	7312
Industrial Electrician (2008)	7242
Industrial Mechanic (Millwright) (2007)	7311
Instrumentation and Control Technician (2007)	2243
Insulator (Heat and Frost) (2007)	7293
Ironworker (Generalist) (2006)	7264
Ironworker (Reinforcing) (2006)	7264
Ironworker (Structural/Ornamental) (2006)	7264
Lather (Interior Systems Mechanic) (2007)	7284
Machinist (2005)	7231
Metal Fabricator (Fitter) (2003)	7263
Mobile Crane Operator (2006)	7371

* National Occupational Classification

TITLE	NOC* Code
Motorcycle Mechanic (2006)	7334
Motor Vehicle Body Repairer (Metal and Paint) (2005)	7322
Oil Burner Mechanic (2006)	7331
Painter and Decorator (2007)	7294
Partsperson (2005)	1472
Plumber (2008)	7251
Powerline Technician (2004)	7244
Recreation Vehicle Service Technician (2006)	7383
Refrigeration and Air Conditioning Mechanic (2004)	7313
Rig Technician (2008)	8232
Roofer (2006)	7291
Sheet Metal Worker (2006)	7261
Sprinkler System Installer (2003)	7252
Steamfitter – Pipefitter (2007)	7252
Tilesetter (2004)	7283
Tool and Die Maker (2005)	7232
Transport Trailer Technician (2008)	7321
Truck and Transport Mechanic (2007)	7321
Welder (2004)	7265

Requests for printed copies of National Occupational Analyses may be forwarded to:

Trades and Apprenticeship Division
Workplace Partnership Directorate
Human Resources and Social Development Canada
140 Promenade du Portage, Phase IV, 5th Floor
Gatineau, Quebec K1A 0J9

These publications can be ordered or downloaded online at: www.red-seal.ca. Links to Essential Skills Profiles for some of these trades are also available on this website.

To facilitate understanding of the occupation, the work performed by tradespersons is divided into the following categories:

Blocks	the largest division within the analysis that is comprised of a distinct set of trade activities
Tasks	distinct actions that describe the activities within a block
Sub-Tasks	distinct actions that describe the activities within a task
Supporting Knowledge and Abilities	skills and knowledge that an individual must have to perform a sub-task

The analysis also provides the following information:

Trends	changes identified that impact or will impact the trade including work practices, technological advances, and new materials and equipment
Context	information to clarify the intent and meaning of tasks
Related Components	a list of products, items, materials and other elements relevant to the block
Tools and Equipment	categories of tools and equipment used to perform all tasks in the block; these tools and equipment are listed in Appendix A

The appendices located at the end of the analysis are described as follows:

Appendix A — Tools and Equipment	a non-exhaustive list of tools and equipment used in this trade
Appendix B — Glossary	definitions or explanations of selected technical terms used in the analysis
Appendix C — Acronyms	a list of acronyms used in the analysis with their full name
Appendix D — Block and Task Weighting	the block and task percentages submitted by each jurisdiction, and the national averages of these percentages; these national averages determine the number of questions for each block and task in the Interprovincial exam
Appendix E — Pie Chart	a graph which depicts the national percentages of exam questions assigned to blocks
Appendix F — Task Profile Chart	a chart which outlines graphically the blocks, tasks and sub-tasks of this analysis

Development of Analysis

A draft analysis is developed by a committee of industry experts in the field led by a team of facilitators from Human Resources and Social Development Canada. This draft analysis breaks down all the tasks performed in the occupation and describes the knowledge and abilities required for a tradesperson to demonstrate competence in the trade.

Draft Review

The National Occupational Analysis (NOA) development team then forwards a copy of the analysis and its translation to provincial and territorial authorities for a review of its content and structure. Their recommendations are assessed and incorporated into the analysis.

Validation and Weighting

The analysis is sent to all provinces and territories for validation and weighting. Participating jurisdictions consult with industry to validate and weight the document, examining the blocks, tasks and sub-tasks of the analysis as follows:

- BLOCKS** Each jurisdiction assigns a percentage of questions to each block for an examination that would cover the entire trade.

- TASKS** Each jurisdiction assigns a percentage of exam questions to each task within a block.

- SUB-TASKS** Each jurisdiction indicates, with a YES or NO, whether or not each sub-task is performed by skilled workers within the occupation in its jurisdiction.

The results of this exercise are submitted to the NOA development team who then analyzes the data and incorporates it into the document. The NOA provides the individual jurisdictional validation results as well as the national averages of all responses. The national averages for block and task weighting guide the Interprovincial Red Seal Examination plan for the trade.

This method for the validation of the NOA also identifies common core sub-tasks across Canada for the occupation. If at least 70% of the responding jurisdictions perform a sub-task, it shall be considered common core. Interprovincial Red Seal Examinations are based on the common core sub-tasks identified through this validation process.

Definitions for Validation and Weighting

YES	sub-task performed by qualified workers in the occupation in a specific jurisdiction
NO	sub-task not performed by qualified workers in the occupation in a specific jurisdiction
NV	analysis <u>N</u> ot <u>V</u> alidated by a province/territory
ND	trade <u>N</u> ot <u>D</u> esignated in a province/territory
NOT COMMON CORE (NCC)	sub-task, task or block performed by less than 70% of responding jurisdictions; these will not be tested by the Interprovincial Red Seal Examination for the trade
National Average %	average percentage of questions assigned to each block and task in Interprovincial Red Seal Examination for the trade

Provincial/Territorial Abbreviations

NL	Newfoundland and Labrador
NS	Nova Scotia
PE	Prince Edward Island
NB	New Brunswick
QC	Quebec
ON	Ontario
MB	Manitoba
SK	Saskatchewan
AB	Alberta
BC	British Columbia
NT	Northwest Territories
YT	Yukon Territory
NU	Nunavut

ANALYSIS

Safe working procedures and conditions, accident prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and work environments can be created by controlling the variables and behaviours that may contribute to accidents or injury.

It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe and accident-free work environment.

It is imperative to apply and be familiar with the Occupational Health and Safety (OH&S) Acts and Workplace Hazardous Materials Information System (WHMIS) Regulations. As well, it is essential to determine workplace hazards and take measures to protect oneself, co-workers, the public and the environment.

Safety education is an integral part of training in all jurisdictions. As safety is an imperative part of all trades, it is assumed and therefore it is not included as a qualifier of any activities. However, the technical safety tasks and sub-tasks specific to the trade are included in this analysis.

SCOPE OF THE CONSTRUCTION ELECTRICIAN TRADE

“Construction Electrician” is this trade’s official Red Seal occupational title approved by the Canadian Council of Directors of Apprenticeship (CCDA). This analysis covers tasks performed by a construction electrician whose occupational title has been identified by some provinces and territories of Canada under the following names:

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
Construction Electrician	✓	✓	✓	✓			✓					✓	
Electrician								✓	✓	✓	✓		✓
Electrician (Construction)					✓								
Electrician Construction and Maintenance						✓							

Work activities that make up this trade are the planning, assembly, installation, alteration, repair, inspection, verification, commissioning, maintenance and operation of electrical equipment, wiring, fixtures, control devices and related systems. Construction electricians work on electrical systems that provide heat, light, power and control in residential, commercial, institutional and industrial environments. They are employed by electrical contractors, utilities and maintenance departments of various facilities.

Construction electricians must read and interpret electrical, mechanical and architectural drawings, as well as electrical code specifications to complete electrical installations. They install, service and maintain lighting fixtures, electrical controls and distribution systems. They test electrical systems and continuity of circuits using test equipment to ensure system safety and compatibility.

Construction electricians require good communication skills to negotiate, coordinate and facilitate work with customers, co-workers and other trades. They also require strong analytical and problem-solving skills in order to read and interpret diagrams, drawings and specifications. They must have good mechanical aptitude to install, troubleshoot and repair equipment. They must also have good vision, the ability to distinguish colours and have a willingness to keep up with new developments in the trade.

Their work may be performed indoors or outdoors at variable heights and in confined spaces. There are inherent occupational hazards in this trade such as electrical shock, falling, heavy lifting, kneeling and using tools and equipment.

This analysis recognizes similarities or overlaps with the work of industrial electricians and powerline technicians. Construction electricians work with a wide variety of construction tradespeople, engineers and inspectors.

With experience, construction electricians may act as mentors and trainers to apprentices in the trade. They may also advance to positions such as foreman, superintendent, estimator or electrical inspector. Some electricians start their own contracting businesses. Many electricians specialize in specific types of installations such as high voltage, fiber optics and building controls.

There is an increase in the use of new technology in tools and equipment such as cordless tools, mechanical lifts and computerized benders. Innovative materials have become prevalent throughout the industry, requiring the construction electricians to upgrade skills and knowledge.

Communication advances have increased the efficiency of electricians' work, allowing better access to research material and information. These advances include Internet, e-mail and wireless communication.

As technology evolves and equipment becomes more efficient and accessible, as well as less cost prohibitive, the use of alternate energy sources is increasing. Whereas power generation was done exclusively by utility companies, in some areas consumers are now able to generate their own power and return it to the public grid.

Personal health and safety of construction electricians has improved due to the increased emphasis on safety in the workplace. In the workplace there is an increase in the awareness of hazardous materials and in their safe removal and disposal. More non-hazardous materials are being used.

All of these improvements and changes in the trade have led to a safer and more effective work environment.

Trends There is an increased demand for construction electricians to upgrade their occupational skills to meet and maintain industry standards. There are constant innovations in testing equipment, installation methods and safety procedures to which construction electricians must adapt.

Related Components All components apply.

Tools and Equipment See Appendix A.

Task 1

Uses and maintains tools and equipment.

Context Construction electricians must be able to use and maintain tools and equipment in a safe and effective manner relevant to the task being performed.

Sub-task

1.01 Maintains hand tools.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

- 1.01.01 knowledge of types of hand tools such as screwdrivers, pliers, wrenches and measuring tapes
- 1.01.02 knowledge of hand tool limitations
- 1.01.03 ability to organize and store hand tools
- 1.01.04 ability to clean and lubricate hand tools
- 1.01.05 ability to recognize worn, damaged and defective hand tools

Sub-task**1.02 Maintains power tools.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

1.02.01	knowledge of types of power tools such as drills and saws
1.02.02	knowledge of limitations of power tools
1.02.03	ability to clean power tools
1.02.04	ability to change power tool components such as chucks, bits and blades
1.02.05	ability to organize and store power tools
1.02.06	ability to lubricate power tool components
1.02.07	ability to recognize worn, damaged and defective power tools
1.02.08	ability to change cords and attachment plugs
1.02.09	ability to repair power tools to a limited degree

Sub-task**1.03 Maintains powder-actuated tools.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	no	yes	yes	no	yes	yes	yes	no	NV	NV

Supporting Knowledge & Abilities

1.03.01	knowledge of types of powder-actuated tools and their applications
1.03.02	knowledge of types of pins and shots
1.03.03	knowledge of certification requirements to operate powder-actuated tools
1.03.04	knowledge of manufacturers' operating and maintenance instructions
1.03.05	knowledge of powder-actuated tool components
1.03.06	ability to disassemble, clean and lubricate powder-actuated tools
1.03.07	ability to organize powder-actuated tools
1.03.08	ability to store powder-actuated tools and shots
1.03.09	ability to dispose of shots
1.03.10	ability to recognize worn, damaged and defective powder-actuated tools
1.03.11	ability to recognize hazards associated with powder-actuated tools

Sub-task**1.04 Maintains electrical measuring equipment.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

1.04.01	knowledge of types of electrical measuring equipment such as multimeters, voltage testers, non-contact voltage testers, insulation resistance meters and clamp ammeters
1.04.02	knowledge of applications of electrical measuring equipment
1.04.03	knowledge of limitations and ratings of electrical measuring equipment
1.04.04	knowledge of electrical measuring equipment components such as leads and batteries
1.04.05	knowledge of electrical measuring equipment accessories
1.04.06	knowledge of environmental factors that affect readings
1.04.07	knowledge of manufacturers' specifications
1.04.08	ability to recognize worn, damaged and defective electrical measuring equipment
1.04.09	ability to organize and store electrical measuring equipment

Sub-task**1.05 Maintains specialty tools.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

1.05.01	knowledge of types of specialty tools such as knock-out punches, compression tools, diagnostic tools, benders and cutters
1.05.02	knowledge of manufacturers' specifications
1.05.03	knowledge of specialty tool limitations
1.05.04	ability to assemble specialty tools
1.05.05	ability to clean specialty tools
1.05.06	ability to recognize worn, damaged and defective specialty tools
1.05.07	ability to organize and store specialty tools

Sub-task**1.06 Uses scaffolding and access equipment.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

1.06.01	knowledge of types of access equipment such as scissor lifts, lift tables and articulated boom lifts
1.06.02	knowledge of types of scaffolding such as baker, tubular and frame
1.06.03	knowledge of certification requirements for scaffolding and access equipment
1.06.04	knowledge of safe angles of ladders
1.06.05	knowledge of three-point contact rule
1.06.06	knowledge of regulations regarding the use of scaffolding and access equipment
1.06.07	knowledge of worksite surroundings
1.06.08	knowledge of limitations of scaffolding and access equipment
1.06.09	ability to set up step ladders and extension ladders
1.06.10	ability to work from access equipment
1.06.11	ability to erect various types of scaffolding
1.06.12	ability to recognize unsafe, worn, damaged and defective scaffolding and access equipment

Sub-task**1.07 Uses rigging, hoisting and lifting equipment.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

1.07.01	knowledge of certification requirements regarding rigging, hoisting and lifting equipment
1.07.02	knowledge of types of rigging, hoisting and lifting equipment
1.07.03	knowledge of limitations of rigging, hoisting and lifting equipment
1.07.04	knowledge of anchor points
1.07.05	knowledge of load ratings

- 1.07.06 ability to use and understand hand signals
- 1.07.07 ability to recognize worn, damaged and defective rigging, hoisting and lifting equipment
- 1.07.08 ability to select rigging, hoisting and lifting equipment according to application
- 1.07.09 ability to secure load
- 1.07.10 ability to move load to final position

Sub-task

1.08 Uses personal protective equipment (PPE) and safety equipment.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

- 1.08.01 knowledge of types of PPE such as hard hats, safety glasses, safety footwear, gloves, fall arrest equipment and respiratory protection equipment
- 1.08.02 knowledge of types of safety equipment such as first aid kits and eye wash stations
- 1.08.03 knowledge of certification and training requirements for PPE and safety equipment
- 1.08.04 knowledge of types and operation of fire extinguishing equipment
- 1.08.05 knowledge of location of PPE and safety equipment
- 1.08.06 knowledge of shelf life of PPE and safety equipment
- 1.08.07 knowledge of Occupational Health and Safety (OH&S) regulations
- 1.08.08 knowledge of arc flash ratings such as NFPA70E
- 1.08.09 ability to select PPE according to task
- 1.08.10 ability to apply Workplace Hazardous Material Information System (WHMIS) procedures
- 1.08.11 ability to recognize limitations of use of PPE and safety equipment
- 1.08.12 ability to organize and store PPE and safety equipment
- 1.08.13 ability to recognize worn, damaged and defective PPE and safety equipment
- 1.08.14 ability to locate PPE and safety equipment

Task 2**Organizes work.***Context*

Construction electricians organize their work in a safe and effective manner relevant to the task being performed. They must be aware of and follow the Canadian Electrical Code (CEC) and other relevant regulations. Communicating and planning skills are essential to this trade.

Sub-task**2.01****Interprets codes and regulations.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

2.01.01	knowledge of codes such as building codes, the Canadian Electrical Code (CEC) and jurisdictional codes
2.01.02	knowledge of OH&S regulations
2.01.03	knowledge of code and regulation updates
2.01.04	ability to access and apply codes and regulations

Sub-task**2.02****Interprets plans, drawings and specifications.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

2.02.01	knowledge of components of plans, drawings and specifications such as scale, legend, details and symbols
2.02.02	ability to cross-reference plans, drawings, specifications and contract documents
2.02.03	ability to locate information on plans, drawings, specifications and contract documents
2.02.04	ability to scale dimensions

- 2.02.05 ability to visualize finished product
- 2.02.06 ability to perform mathematical calculations

Sub-task

2.03 Uses documentation and reference material.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

- 2.03.01 knowledge of types of documents such as shop drawings and catalogues
- 2.03.02 knowledge of company policies and procedures
- 2.03.03 knowledge of OH&S regulations
- 2.03.04 knowledge of WHMIS symbols and Material Safety Data Sheets (MSDS)
- 2.03.05 ability to complete work-related documents such as as-built drawings, work orders, log books and time sheets
- 2.03.06 ability to fill out safety documentation such as hazard assessment and first aid logs

Sub-task

2.04 Communicates with others.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

- 2.04.01 knowledge of trade terminology
- 2.04.02 ability to communicate identified hazards
- 2.04.03 ability to communicate with supervisors
- 2.04.04 ability to communicate with co-workers
- 2.04.05 ability to coordinate work with other trades
- 2.04.06 ability to participate in safety and information meetings
- 2.04.07 ability to communicate with laypersons
- 2.04.08 ability to communicate with engineers and architects
- 2.04.09 ability to mentor apprentices

Sub-task**2.05 Compiles a list of materials and supplies.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

2.05.01	knowledge of project or task to be completed
2.05.02	knowledge of site conditions and restrictions
2.05.03	knowledge of available materials
2.05.04	ability to identify required materials and supplies according to plans and specifications
2.05.05	ability to perform mathematical calculations
2.05.06	ability to interpret site measurements and instructions
2.05.07	ability to do material take-off
2.05.08	ability to do inventory control

Sub-task**2.06 Plans project tasks and procedures.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

2.06.01	knowledge of other trades' work requirements
2.06.02	knowledge of delivery dates and availability of materials
2.06.03	knowledge of sequence of operations
2.06.04	knowledge of utility and specification requirements
2.06.05	ability to establish and maintain schedules
2.06.06	ability to determine labour and equipment requirements
2.06.07	ability to coordinate work with other trades such as shutdown requirements and installation sequencing
2.06.08	ability to apply specifications to contract documents
2.06.09	ability to draw and sketch layouts
2.06.10	ability to give and follow directions and instructions
2.06.11	ability to follow installation and operational sequences

Task 3**Performs routine trade activities.**

Context These tasks are performed across the trade. Construction electricians perform routine trade activities in a safe, efficient and effective manner.

Sub-task**3.01 Prepares work site.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

3.01.01	knowledge of work site location
3.01.02	knowledge of building codes and regulations
3.01.03	knowledge of building structures such as walls, ceilings and floors
3.01.04	knowledge of equipment such as panel boards, switchgear and motor control centres (MCC)
3.01.05	knowledge of work site hazards such as existing utilities, dust, temperature, chemicals and weather
3.01.06	ability to perform pre-job safety assessment
3.01.07	ability to control workplace access
3.01.08	ability to create openings and penetrations in structures and equipment
3.01.09	ability to lay out job materials and equipment

Sub-task**3.02 Performs lock-out and tagging procedures.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

3.02.01	knowledge of lock-out and tagging procedures
3.02.02	knowledge of legislation governing minimum standards for lock-out and tagging procedures
3.02.03	ability to coordinate lock-out and tagging requirements with appropriate authorities

3.02.04	ability to recognize equipment for tagging
3.02.05	ability to locate and de-energize appropriate equipment
3.02.06	ability to select approved equipment to ensure proper lock-out and tagging
3.02.07	ability to verify proper lock-out and tagging

Sub-task

3.03 Handles materials and supplies.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

3.03.01	knowledge of inventory systems
3.03.02	knowledge of storage requirements such as temperature, environmental conditions and stacking limitations
3.03.03	knowledge of safe work practices such as WHMIS
3.03.04	ability to store and organize materials and supplies
3.03.05	ability to locate materials and supplies
3.03.06	ability to verify shipments of materials and supplies
3.03.07	ability to load and unload materials and supplies
3.03.08	ability to coordinate the receiving of materials and supplies

Sub-task

3.04 Maintains safe work environment.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

3.04.01	knowledge of WHMIS
3.04.02	knowledge of workers' rights and responsibilities
3.04.03	knowledge of company safety policies and procedures
3.04.04	knowledge of site-specific fire safety and work permit procedures
3.04.05	knowledge of emergency procedures and location of on-site first aid stations and equipment

- 3.04.06 ability to locate and recognize safety documentation such as MSDS and WHMIS labels
- 3.04.07 ability to recognize and report potential hazards
- 3.04.08 ability to perform housekeeping practices

Sub-task

3.05 Installs seismic restraint systems. (NOT COMMON CORE)

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
no	no	yes	yes	no	yes	no	no	yes	yes	no	NV	NV

Supporting Knowledge & Abilities

- 3.05.01 knowledge of jurisdiction regulations regarding seismic restraint systems
- 3.05.02 ability to identify seismic design requirements
- 3.05.03 ability to interpret seismic design requirements
- 3.05.04 ability to select and use applicable methods to secure components

Sub-task

3.06 Conducts operational tests.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

- 3.06.01 knowledge of start-up and commissioning procedures such as rotational testing, voltage readings and current readings
- 3.06.02 knowledge of required documentation
- 3.06.03 knowledge of manufacturers' specifications
- 3.06.04 knowledge of sequence of operation of equipment
- 3.06.05 ability to select and use operational testing tools and equipment
- 3.06.06 ability to perform visual inspections
- 3.06.07 ability to adjust equipment to specifications such as motor overload protection, energy management systems and adjustable trip mechanism circuit breakers

Trends

Innovations in trade materials are happening continuously. Cables are being made from better alloys. There has been an improvement in cable insulation. More modern materials are coming into use including cold shrink materials. For example, there is an increase in the use of stress cone kits.

Electronic components in metering and control are becoming more common, resulting in smaller equipment.

Uninterruptible Power Supply (UPS) systems are becoming more applicable to the residential and commercial sectors.

Alternative power systems are more common.

Related Components (include, but not limited to)

Cables, panels, sub-panels, transformers, UPS equipment, switchgear, capacitors, motors, cathodic protection equipment, surge protection equipment, meters, generators, turbines, transfer switches, rectifiers, converters, temporary power equipment, conduit, solar panels, control panels, wind turbines, fences, towers, cabinets.

Tools and Equipment

See Appendix A.

Task 4

Installs service entrance and distribution equipment.

Context

The service entrance and distribution equipment provides power to the building for all electrical systems and equipment. Consumer services can provide normal, emergency and temporary power. This equipment allows for the safe utilization of electricity.

Sub-task

4.01

Installs supply services.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

4.01.01	knowledge of types of supply services such as underground and overhead
4.01.02	knowledge of supply service components such as conductors, insulators, meter sockets, conduit and panels
4.01.03	knowledge of installation conditions for supply services
4.01.04	knowledge of grounding requirements
4.01.05	knowledge of types of conductors such as triplex, TECK 90 and R90
4.01.06	knowledge of connection methods to consumer service
4.01.07	knowledge of types of wiring methods
4.01.08	knowledge of installation methods for underground application
4.01.09	ability to select and use tools and equipment such as threaders, torque wrenches and compression tools
4.01.10	ability to install and terminate conductors
4.01.11	ability to assemble and mount panels
4.01.12	ability to secure conduit and cable
4.01.13	ability to select and install mechanical protection for underground installations
4.01.14	ability to distinguish phase designations (colours)
4.01.15	ability to bend and install conduit

Sub-task

4.02 **Installs metering systems.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

4.02.01	knowledge of types of transformers such as current transformers (CTs) and potential transformers (PTs)
4.02.02	knowledge of types of meters such as digital and analog
4.02.03	knowledge of utility company requirements for placement and accessibility of meters
4.02.04	knowledge of types and locations of cabinet enclosures
4.02.05	ability to select and use tools such as benders, hole saws and torque wrenches
4.02.06	ability to install and terminate conductors

4.02.07	ability to install PTs and CTs
4.02.08	ability to install and secure conduit and fittings
4.02.09	ability to assemble and mount metering equipment
4.02.10	ability to coordinate installation of meters with utility company

Sub-task

4.03 Installs overcurrent protection.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

4.03.01	knowledge of types of fuses such as time delay and non-time delay
4.03.02	knowledge of types of circuit breakers such as mechanical and adjustable
4.03.03	knowledge of branch circuit loads and demand factors
4.03.04	knowledge of conductor sizes
4.03.05	knowledge of available fault current
4.03.06	knowledge of breaker and fuse ratings and interrupting capacity
4.03.07	ability to select and use tools such as hex wrenches, cable benders and mallets
4.03.08	ability to fasten and mount overcurrent protection devices using fasteners such as bolts, screws and fuse holders
4.03.09	ability to install and terminate conductors
4.03.10	ability to select and install breakers and fuses

Sub-task

4.04 Installs power distribution centres.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

4.04.01	knowledge of types of transformers such as step-up and step-down
4.04.02	knowledge of meter stack requirements

4.04.03	knowledge of types of power distribution centres such as single-phase panel, three-phase panel and MCC
4.04.04	knowledge of types of components such as transfer switches, overcurrent protection devices and fittings
4.04.05	knowledge of clearances of power distribution centres
4.04.06	ability to select and use tools and equipment
4.04.07	ability to install conduit and fittings
4.04.08	ability to install and terminate cables and bus ducts
4.04.09	ability to assemble and install cabinets and busbars
4.04.10	ability to identify and label components
4.04.11	ability to place and secure power distribution centres

Sub-task

4.05 **Installs temporary power.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

4.05.01	knowledge of power and distribution as per local CEC and local jurisdictional regulations
4.05.02	knowledge of load requirements
4.05.03	knowledge of types of temporary portable panels
4.05.04	knowledge of metering
4.05.05	knowledge of type of transformers such as indoor, outdoor, step-up and step-down
4.05.06	knowledge of temporary power uses such as for power tools, construction shack, lighting, welders and cranes
4.05.07	knowledge of types of cables and conductors used for temporary power
4.05.08	ability to select and use tools and equipment
4.05.09	ability to run cables and conductors from supply to temporary panel
4.05.10	ability to terminate conductors
4.05.11	ability to weatherproof temporary equipment such as panels, transformers and receptacle banks
4.05.12	ability to install masts and poles
4.05.13	ability to ground and bond equipment

Sub-task**4.06 Installs surge protection systems.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

4.06.01	knowledge of surge protection components such as lightning arresters, isolated ground panels and ground systems
4.06.02	knowledge of phase and voltage rating
4.06.03	knowledge of types of electrical equipment that require surge protection such as computers, electronic equipment and lighting
4.06.04	ability to install and connect surge protection equipment
4.06.05	ability to ground lightning arresters separate from system ground

Sub-task**4.07 Installs power conditioning devices.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

4.07.01	knowledge of types of power conditioning devices
4.07.02	knowledge of power factors and power factor corrections
4.07.03	knowledge of power conditioning installation procedures
4.07.04	ability to select and use tools and equipment
4.07.05	ability to mount power conditioning devices
4.07.06	ability to connect power conditioning devices

Sub-task**4.08 Installs uninterruptible power supply (UPS) systems.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

4.08.01	knowledge of requirements for battery bank installations
4.08.02	knowledge of types of UPS systems
4.08.03	knowledge of UPS components such as transfer switches, battery banks and generators
4.08.04	knowledge of uses and requirements of UPS systems such as lighting, computers and telephones
4.08.05	knowledge of specialty tools used for UPS installation such as insulated tools and torque wrenches
4.08.06	ability to select and use tools and equipment
4.08.07	ability to recognize hazards of battery bank installations such as explosions, burns and electrocutions
4.08.08	ability to install and connect transfer switches
4.08.09	ability to calculate demand factor
4.08.10	ability to assemble and mount battery banks, rectifiers and generators

Sub-task

4.09 Performs start-up and shut-down procedures.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

4.09.01	knowledge of single line diagrams, flow charts, and other documentation which details sequential process control
4.09.02	knowledge of sequential events during start up and shut-down operations
4.09.03	ability to follow start-up and shut-down procedures
4.09.04	ability to test cables for ground faults and phase identification
4.09.05	ability to check for phase rotation
4.09.06	ability to apply safety ground on shut-down
4.09.07	ability to remove safety ground on start-up
4.09.08	ability to verify busbar connections and torquing of bolts
4.09.09	ability to check for loose hardware and tools

Task 5**Installs sub-panels, feeders and transformers.***Context*

Construction electricians install sub-panels, feeders and transformers to supply required power. Sub-panels are used to provide additional capacity, to avoid voltage drop, for economical reasons and to meet location requirements for consumer needs.

Sub-task**5.01 Installs sub-panels.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

5.01.01	knowledge of types of sub-panels by application
5.01.02	knowledge of components such as breakers and lugs
5.01.03	knowledge of sub-panel ratings such as current, voltage and capacity
5.01.04	knowledge of location and clearances of sub-panels
5.01.05	knowledge of applications that require sub-panels
5.01.06	ability to select and use tools and equipment
5.01.07	ability to mount sub-panel components
5.01.08	ability to mount breakers and fuses in sub-panel
5.01.09	ability to prepare sub-panel for conduit and cables

Sub-task**5.02 Installs feeders to sub-panels.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

5.02.01	knowledge of types and sizes of cable, conduit and conductors
5.02.02	knowledge of parallel conductors
5.02.03	knowledge of types of fittings and connectors
5.02.04	knowledge of the effect of induction

5.02.05	knowledge of environment such as dry or wet, and above or below ground
5.02.06	knowledge of installation and support of cables and raceways
5.02.07	ability to select and use tools and equipment
5.02.08	ability to select type of conductor for application
5.02.09	ability to pull cables and conductors
5.02.10	ability to install and secure cables and conduit
5.02.11	ability to terminate conductors and torque the lugs
5.02.12	ability to build and install racks
5.02.13	ability to install trays
5.02.14	ability to install bus ducts

Sub-task

5.03 Installs low voltage transformers.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

5.03.01	knowledge of types and sizes of transformers such as dry, oil-filled and single-phase
5.03.02	knowledge of low voltage transformer installation procedures and locations
5.03.03	knowledge of tap settings
5.03.04	knowledge of purpose of transformers such as step-up, step-down and isolation
5.03.05	knowledge of transformer clearances
5.03.06	knowledge of transformer winding configuration
5.03.07	knowledge of purpose of transformer grounding
5.03.08	ability to select and use tools and equipment
5.03.09	ability to raise, mount and secure transformers
5.03.10	ability to install raceway systems
5.03.11	ability to terminate cables and conductors

Task 6**Installs bonding, grounding and cathodic protection systems.**

Context Bonding and grounding systems are used to protect life and equipment from transient and fault current.

 Ground fault protection systems are used to protect against electric shock.

 Cathodic protection systems introduce a current onto a tank, pipe or structure to limit corrosion and oxidization.

Sub-task**6.01 Installs grounding grids.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

6.01.01 knowledge of grounding equipment such as rods, plates, electrodes, wire and crimps

6.01.02 knowledge of grounding requirements

6.01.03 knowledge of step potential

6.01.04 knowledge of types of grounding wire such as bare, multi-stranded and insulated

6.01.05 ability to select and use tools and equipment

6.01.06 ability to thermit weld

6.01.07 ability to pull and fasten ground wire

Sub-task**6.02 Installs bonding conductors.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

6.02.01 knowledge of bonding equipment such as lugs, wire and crimps

6.02.02 knowledge of continuity

6.02.03 knowledge of bonding requirements

6.02.04	ability to select and use tools and equipment
6.02.05	ability to bond equipment such as lights, plugs, sub-panels, trays and bus ducts
6.02.06	ability to terminate conductors, conduit and cables

Sub-task

6.03 Installs ground fault protection systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

6.03.01	knowledge of ground fault equipment such as relays and CTs
6.03.02	knowledge of applications for ground fault protection systems such as pools, shipyards, kitchens and bathrooms
6.03.03	knowledge of installation methods
6.03.04	knowledge of location, clearance and access for ground fault protection systems
6.03.05	ability to select and use tools and equipment
6.03.06	ability to mount equipment
6.03.07	ability to terminate conductors
6.03.08	ability to adjust ground fault protection systems

Sub-task

6.04 Installs lightning arresters.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	no	yes	yes	no	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

6.04.01	knowledge of types of lightning arresters
6.04.02	knowledge of use of extra stranded cable
6.04.03	knowledge of purpose of lightning arresters
6.04.04	knowledge of installation procedures
6.04.05	ability to select and use tools and equipment

6.04.06	ability to pull, fasten and terminate conductors
6.04.07	ability to mount lightning arrester equipment
6.04.08	ability to attach wire to lightning arresters and ground electrode

Sub-task

6.05 Installs cathodic protection systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
no	yes	yes	no	yes	yes	yes	yes	yes	yes	no	NV	NV

Supporting Knowledge & Abilities

6.05.01	knowledge of components of cathodic protection systems such as controllers and sensors
6.05.02	knowledge of purposes of cathodic protection systems
6.05.03	knowledge of hazards of working on cathodic protection systems
6.05.04	knowledge of a rectifier circuit
6.05.05	ability to select and use tools and equipment
6.05.06	ability to connect components of cathodic protection systems
6.05.07	ability to follow manufacturers' instructions

Task 7

Installs power generation systems.

Context Generators and alternative power supplies can be used when power from the utility is unavailable or the building is isolated from the power grid. Some forms of alternative power can also feed energy back to the power grid.

Sub-task

7.01 Installs generators and transfer switches.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

7.01.01	knowledge of types of generators
7.01.02	knowledge of types of transfer switches such as manual and automatic
7.01.03	knowledge of load requirements
7.01.04	knowledge of generator requirements such as clearances, access, ventilation and fuel systems
7.01.05	knowledge of operation of transfer switches and generators
7.01.06	knowledge of control circuits and alarms for transfer switches and generators
7.01.07	ability to select and use tools and equipment
7.01.08	ability to place and secure generator
7.01.09	ability to ground and bond generator
7.01.10	ability to terminate conductors and install raceways to transfer switches and generators
7.01.11	ability to program the generator controls for start-up and shut-down sequences

Sub-task

7.02 Installs alternative power systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

7.02.01	knowledge of types of alternative power systems such as photovoltaic, tidal and wind
7.02.02	knowledge of utility company requirements and regulations regarding alternative power systems
7.02.03	knowledge of operation of alternative power systems
7.02.04	knowledge of location requirements for maximum efficiency
7.02.05	ability to select and use tools and equipment
7.02.06	ability to mount components such as solar panels, control panels and wind turbines
7.02.07	ability to connect conductors to power supply

Task 8**Installs high voltage systems.***Context*

Construction electricians assemble, install, erect and connect equipment and cables for high voltage applications such as switch yards, sub-stations and electrical vaults. In these applications, they use specific equipment, tests and procedures to ensure safety.

It is extremely important to perform this work properly and safely due to the inherent hazards in working with high voltage systems that can cause serious injury or death.

Sub-task**8.01 Installs high voltage equipment.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

8.01.01	knowledge of types of high voltage equipment such as switchgear, cabinets, load regulators, transformers, insulators, poles and towers
8.01.02	knowledge of grounding and step potential
8.01.03	knowledge of the effect of inductance
8.01.04	knowledge of limits of approach for various voltages and equipment
8.01.05	knowledge of installation specifications
8.01.06	knowledge of locations of high voltage equipment such as underground and at heights
8.01.07	knowledge of guarding requirements and methods
8.01.08	ability to select and use tools and equipment
8.01.09	ability to assemble high voltage equipment such as capacitor banks, rectifiers and transformers
8.01.10	ability to mount, support and secure large components
8.01.11	ability to locate transformers and equipment
8.01.12	ability to ground and bond all metallic components such as fences, towers and cabinets

Sub-task**8.02 Installs high voltage cables.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

8.02.01	knowledge of bending radius of high voltage cables
8.02.02	knowledge of high voltage principles and practices
8.02.03	knowledge of direct burial requirements
8.02.04	knowledge of types of cables such as armoured and concentric
8.02.05	knowledge of types of conductors such as aluminium and copper
8.02.06	knowledge of configurations, spacing and barriers
8.02.07	knowledge of marking requirements and practices
8.02.08	knowledge of installation materials such as insulators and supports
8.02.09	ability to select and use tools and equipment such as tuggers, cranes, jack stands and ropes
8.02.10	ability to calculate pulling tolerances and tension requirements
8.02.11	ability to install pulleys and sheaves
8.02.12	ability to rig pulls
8.02.13	ability to install supports
8.02.14	ability to pull high voltage cables

Sub-task**8.03 Terminates high voltage cables.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

8.03.01	knowledge of principles of high voltage such as corona effect and induction
8.03.02	knowledge of high voltage termination techniques
8.03.03	knowledge of types of connections for high voltage cables
8.03.04	knowledge of bonding and grounding for high voltage installation
8.03.05	ability to select and use tools and equipment

- 8.03.06 ability to secure and support cables
- 8.03.07 ability to select and use lugs, pin connectors and stress cone kits

Sub-task

8.04 Tests high voltage systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

- 8.04.01 knowledge of types of tests such as high pot test and inductor test
- 8.04.02 knowledge of purpose of tests such as detecting leakage current, phase identification and ensuring insulation integrity
- 8.04.03 knowledge of test requirements
- 8.04.04 ability to select and use test equipment
- 8.04.05 ability to isolate conductors
- 8.04.06 ability to bleed capacitor banks
- 8.04.07 ability to bleed cables
- 8.04.08 ability to interpret test data

<i>Trends</i>	New technologies have improved lighting and power efficiencies. Power savings have been realized by the use of compact fluorescent, LED and T5 lighting, programmable thermostats and lighting controls. New types of breakers are being used to improve public safety and protection. The use of T12 lighting and magnetic ballast has decreased.
<i>Related Components (include, but not limited to)</i>	Conduit, cables, boxes, straps, fittings, raceways, devices, luminaires, conductors, splitters, cabinets, electric heaters, heating cables, overcurrent devices, batteries, lighting and mechanical control devices.
<i>Tools and Equipment</i>	See Appendix A.

Task 9

Installs raceways and cables.

<i>Context</i>	Construction electricians install raceways and cables to support and protect the power conductors from one point to another. Boxes and cabinets are used to access the raceway, to facilitate the pulling, and to terminate conductors at various points. Some raceways and cables may also be installed underground.
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Sub-task

9.01 Installs raceways.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

9.01.01	knowledge of types of raceways such as conduit, tray, floor duct and cellular floors
9.01.02	knowledge of raceway sizes
9.01.03	knowledge of types of fittings such as couplings and connectors

9.01.04	knowledge of installation requirements such as number of bends, support spacing and types of supports
9.01.05	ability to select and use tools and equipment
9.01.06	ability to select and install raceway according to the environment
9.01.07	ability to select fitting according to the installation environment such as weathertight, dust-tight and raintight fittings

Sub-task

9.02 Installs cables.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

9.02.01	knowledge of cable types and applications
9.02.02	knowledge of installation environment
9.02.03	knowledge of types of cable supports and fasteners such as staples and straps
9.02.04	knowledge of termination requirements such as connectors, anti-oxidants and bushings
9.02.05	knowledge of pulling tension when using power pullers for cable installation in raceways
9.02.06	knowledge of cable spacing and supports
9.02.07	ability to select and use tools and equipment
9.02.08	ability to construct support systems
9.02.09	ability to fasten cable supports

Sub-task

9.03 Installs underground wiring.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

9.03.01	knowledge of types of underground conduit and cable
9.03.02	knowledge of conductor protection, marking and spacing

9.03.03	knowledge of underground wiring techniques
9.03.04	ability to select and use tools and equipment
9.03.05	ability to locate utility services and wires
9.03.06	ability to place cable and conduit in trenches
9.03.07	ability to mark and backfill trenches

Sub-task

9.04 Installs enclosures.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

9.04.01	knowledge of types of enclosures such as boxes and cabinets
9.04.02	knowledge of installation environment
9.04.03	knowledge of clearances and accessibility
9.04.04	knowledge of types of fasteners
9.04.05	knowledge of sizing requirements for enclosures
9.04.06	ability to select and use tools and equipment
9.04.07	ability to secure and support enclosures
9.04.08	ability to create openings and knockouts in enclosures

Sub-task

9.05 Installs conductors in raceways.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

9.05.01	knowledge of types of conductors
9.05.02	knowledge of size, number and types of conductors
9.05.03	knowledge of lubricants
9.05.04	knowledge of fishing techniques and related hazards
9.05.05	knowledge of sizing requirements for enclosures
9.05.06	ability to select and use tools and equipment

9.05.07	ability to tag and pull conductors
9.05.08	ability to calculate raceway capacity
9.05.09	ability to strip and splice conductors

Task 10

Installs power and lighting systems.

Context

Various devices and fixtures are installed by construction electricians to meet the power and lighting requirements of the end users. They are installed in a manner which makes the power safe and convenient to use. Lighting systems are used to properly illuminate specified areas according to consumer needs. Lighting controls adjust lighting levels and save power.

Sub-task

10.01

Installs luminaires.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

10.01.01	knowledge of types, functions and applications of luminaires
10.01.02	knowledge of types of fasteners
10.01.03	knowledge of structure surfaces such as T-bar, concrete and steel
10.01.04	knowledge of environment and classification
10.01.05	knowledge of types of supports such as chain, cable and box
10.01.06	knowledge of support and protection requirements
10.01.07	ability to select and use tools and equipment
10.01.08	ability to determine circuitry and demand loading
10.01.09	ability to assemble luminaires
10.01.10	ability to connect luminaires
10.01.11	ability to install lamps
10.01.12	ability to mount support to structure

Sub-task**10.02 Installs devices (switches and receptacles).**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

10.02.01	knowledge of types of devices
10.02.02	knowledge of types of fasteners
10.02.03	knowledge of environment and classification
10.02.04	knowledge of installation procedures
10.02.05	ability to select and use tools and equipment
10.02.06	ability to determine device configuration and ratings
10.02.07	ability to connect and mount devices
10.02.08	ability to select and install faceplates and covers

Sub-task**10.03 Installs lighting controls.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

10.03.01	knowledge of types of lighting controls such as relays, dimming systems, photocells, motion sensors and timers
10.03.02	knowledge of types of fasteners
10.03.03	knowledge of environment and classification
10.03.04	knowledge of operation of lighting control systems
10.03.05	ability to select and use tools and equipment
10.03.06	ability to determine circuitry and demand loading
10.03.07	ability to assemble control components
10.03.08	ability to mount lighting controls to structure
10.03.09	ability to connect and program lighting controls

Sub-task**10.04 Installs light posts.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

10.04.01	knowledge of types of light posts such as street lights, traffic lights, bollard lights and parking lights
10.04.02	knowledge of types of fasteners
10.04.03	knowledge of light post installation procedures
10.04.04	knowledge of uses and requirements of light posts
10.04.05	ability to select and use tools and equipment
10.04.06	ability to fabricate bases fitted with sleeves or conduit, anchoring bolts or studs and breakaways
10.04.07	ability to mount, fasten and shim for level
10.04.08	ability to connect and ground light post
10.04.09	ability to adjust and aim luminaires and photocells

Sub-task**10.05 Installs branch circuit protection.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

10.05.01	knowledge of types of branch circuit protection such as circuit breakers, fuses and fault protection
10.05.02	knowledge of conductor sizes and ampacity
10.05.03	knowledge of available fault current
10.05.04	knowledge of branch circuit protection installation procedures
10.05.05	ability to select and use tools and equipment
10.05.06	ability to calculate demand load
10.05.07	ability to mount branch circuit protection devices

Task 11**Installs heating, ventilation and cooling (HVAC) systems.**

Context Due to variation in environments, buildings require HVAC systems. Construction electricians install and connect electric heating systems. Cooling, ventilation and some heating systems are installed by other trades but are connected by construction electricians. Construction electricians may also be responsible for the installation and wiring of control devices.

Sub-task**11.01 Installs electric heating systems.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

11.01.01	knowledge of types of electric heating systems
11.01.02	knowledge of types of fasteners
11.01.03	knowledge of environment and classification
11.01.04	knowledge of electric heating installation procedures
11.01.05	knowledge of heat loss and heat requirement calculations
11.01.06	ability to select and use tools and equipment
11.01.07	ability to assemble, mount and connect electric heating
11.01.08	ability to calculate demand load
11.01.09	ability to determine wire size, overcurrent protection and disconnect means

Sub-task**11.02 Connects ventilation and cooling systems.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

11.02.01	knowledge of types of cooling systems such as refrigeration and air conditioning
11.02.02	knowledge of environment and classification

11.02.03	knowledge of connection procedures
11.02.04	ability to select and use tools and equipment
11.02.05	ability to calculate demand load
11.02.06	ability to determine wire size, overcurrent protection and disconnect means
11.02.07	ability to make electrical connections

Sub-task

11.03 Installs HVAC control systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

11.03.01	knowledge of HVAC system operational requirements
11.03.02	knowledge of electrical control devices such as thermostats, sensors and timers
11.03.03	knowledge of mechanical control devices such as solenoid valves, dampers and relays
11.03.04	knowledge of installation procedures
11.03.05	knowledge of control device location and accessibility requirements
11.03.06	ability to select and use tools and equipment
11.03.07	ability to mount electrical control devices
11.03.08	ability to connect control components
11.03.09	ability to calibrate and program control devices

Task 12

Installs emergency lighting systems.

Context Emergency lighting systems are used to facilitate safe egress in buildings during emergency situations. The size and location of the lighting systems are determined by building codes. These systems can be powered by batteries or generators.

Sub-task**12.01 Installs exit lighting.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

12.01.01	knowledge of types of exit lighting such as self-powered and remote-powered
12.01.02	knowledge of building code requirements for spacing and location
12.01.03	knowledge of AC and DC circuit requirements
12.01.04	knowledge of types of fasteners
12.01.05	knowledge of environment and classification
12.01.06	knowledge of types of emergency power supplies such as batteries and generators
12.01.07	ability to select and use tools and equipment
12.01.08	ability to integrate exit lighting and emergency lighting
12.01.09	ability to calculate emergency current supply
12.01.10	ability to mount and connect exit light

Sub-task**12.02 Installs battery-operated lighting.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

12.02.01	knowledge of types of battery-operated lighting
12.02.02	knowledge of building code requirements for spacing and location
12.02.03	knowledge of AC and DC circuit requirements
12.02.04	knowledge of types of fasteners
12.02.05	knowledge of environment and classification
12.02.06	knowledge of battery types and sizing
12.02.07	ability to select and use tools and equipment
12.02.08	ability to integrate exit lighting and emergency lighting

- 12.02.09 ability to calculate battery demand load
- 12.02.10 ability to mount and connect emergency light systems

BLOCK D

MOTORS AND CONTROL SYSTEMS

<i>Trends</i>	Control technology is evolving to create smaller, more efficient, intelligent and cost-effective applications.
<i>Related Components (include, but not limited to)</i>	AC and DC motors, starters, overload relays, control devices, push button stations, probes and sensors, actuators, shims, Programmable Logic Controllers (PLCs), variable frequency drives (VFDs), computers, software.
<i>Tools and Equipment</i>	See Appendix A.

Task 13

Installs motor controls.

<i>Context</i>	Motors drive equipment that needs to be controlled. This control can be as simple as a switch, or as complex as a PLC. Motors also need to be protected from adverse conditions that affect their performance and longevity. Construction electricians select and install control and protection devices in the motor circuits.
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Sub-task

13.01

Installs starters.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

13.01.01	knowledge of types of starters such as full voltage, reduced voltage, manual and magnetic starters
13.01.02	knowledge of requirements of motor and operation
13.01.03	knowledge of manufacturers' specifications
13.01.04	knowledge of types of enclosures such as dry, wet and hazardous
13.01.05	ability to select and use tools and equipment
13.01.06	ability to select starter size

13.01.07	ability to adjust starters
13.01.08	ability to assemble components
13.01.09	ability to mount and connect starter assembly
13.01.10	ability to calculate feeder requirements

Sub-task

13.02 Installs variable frequency drives (VFD).

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

13.02.01	knowledge of types of VFD
13.02.02	knowledge of types and sizes of enclosures such as wet, dry and hazardous
13.02.03	knowledge of motor specifications
13.02.04	knowledge of line and load conditioning
13.02.05	knowledge of harmonics
13.02.06	ability to select and use tools and equipment
13.02.07	ability to select drive size and voltage
13.02.08	ability to calculate feeder requirements for special conditions such as shielding requirements and length of cable
13.02.09	ability to determine location of drive
13.02.10	ability to connect drives
13.02.11	ability to calibrate and program drives

Sub-task

13.03 Installs overload protection.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

13.03.01	knowledge of types of overloads
13.03.02	knowledge of motor sizes, types and characteristics
13.03.03	ability to select and use tools and equipment

13.03.04	ability to calculate overload requirements
13.03.05	ability to determine the size of overload protection
13.03.06	ability to mount and connect overload protection

Sub-task

13.04 Installs motor controls.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

13.04.01	knowledge of types of motor controls
13.04.02	knowledge of system requirements and applications
13.04.03	knowledge of control devices such as float and interlock switches
13.04.04	knowledge of multiple voltage systems
13.04.05	ability to select and use tools and equipment
13.04.06	ability to select and install relays, contactors and control transformers
13.04.07	ability to determine location of devices
13.04.08	ability to terminate motor controls
13.04.09	ability to adjust control devices

Sub-task

13.05 Installs Programmable Logic Controls (PLCs).

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

13.05.01	knowledge of PLCs
13.05.02	knowledge of interface requirements
13.05.03	ability to select and use tools and equipment
13.05.04	ability to determine system requirements
13.05.05	ability to write and verify basic PLC programs
13.05.06	ability to program a PLC
13.05.07	ability to plan and install interface

Task 14**Installs motors.**

Context Construction electricians install motors to convert electrical energy to mechanical energy.

Sub-task**14.01 Installs AC and DC motors.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

14.01.01	knowledge of types of motors such as single-phase, three-phase and DC
14.01.02	knowledge of motor applications
14.01.03	knowledge of power, starting and duty requirements
14.01.04	knowledge of environment and classification
14.01.05	knowledge of system requirements
14.01.06	ability to select and use tools and equipment
14.01.07	ability to apply nameplate data
14.01.08	ability to mount and align motors
14.01.09	ability to terminate motors

Sub-task**14.02 Installs motor overcurrent protection.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

14.02.01	knowledge of types of motors
14.02.02	knowledge of types and sizes of fuses and breakers
14.02.03	knowledge of motor applications
14.02.04	knowledge of types of motor starters
14.02.05	knowledge of types of conductors
14.02.06	ability to select and use tools and equipment

- 14.02.07 ability to interpret motor nameplate data
- 14.02.08 ability to calculate overcurrent requirements
- 14.02.09 ability to select overcurrent devices
- 14.02.10 ability to select enclosures
- 14.02.11 ability to determine size of conductors
- 14.02.12 ability to terminate conductors

BLOCK E

SIGNALLING AND COMMUNICATION SYSTEMS

Trends

The technology in the signalling and communication industry is constantly evolving, creating a need for construction electricians to upgrade their skills and knowledge. Construction electricians may need to work on projects such as smart technology (smart houses), computer labs, call centers and energy management systems for buildings. With the increased focus on security and communication demands, there is a need to upgrade existing building wiring to keep up with today's systems.

Related Components (include, but limited to)

Conductors, cable, raceways, racks, panels, enclosures.

Tools and Equipment

See Appendix A.

Task 15

Installs signalling systems.

Context

Construction electricians install signalling systems and their components which allow for the protection and management of people, assets and property. These types of systems may be low voltage power circuit, extra low voltage power circuit or low energy power circuit. While the work on these types of systems is considered to be specialized, the basic installation method of these systems follows the practices and principles of the construction electrician trade.

Sub-task

15.01

Installs fire alarm systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

15.01.01	knowledge of codes and regulations applying to fire alarm system installation
15.01.02	knowledge of types of fire alarm systems
15.01.03	knowledge of components of fire alarm systems
15.01.04	knowledge of wiring methods
15.01.05	knowledge of manufacturers' specifications
15.01.06	knowledge of ancillary devices and circuits such as fan shut down, elevator recall and door release
15.01.07	ability to select and use installation tools and equipment such as wire and cable strippers and mineral-insulated cable tools
15.01.08	ability to follow installation procedures

Sub-task

15.02 Installs nurse call systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

15.02.01	knowledge of types of nurse call systems
15.02.02	knowledge of components of nurse call systems
15.02.03	knowledge of operating principles of nurse call systems
15.02.04	ability to select and use tools and equipment
15.02.05	ability to follow manufacturers' specifications
15.02.06	ability to follow installation procedures

Sub-task

15.03 Installs security and surveillance systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

15.03.01	knowledge of types of security systems such as card access, door access and intrusion
15.03.02	knowledge of types of surveillance systems such as video, motion and heat
15.03.03	knowledge of manufacturers' specifications
15.03.04	knowledge of operating principles
15.03.05	ability to select and use tools and equipment
15.03.06	ability to locate and mount system components
15.03.07	ability to follow installation procedures
15.03.08	ability to confirm operation of security and surveillance systems

Task 16

Installs communication systems.

Context Communication systems allow information to be transmitted from one point to another, using different methods and materials such as copper, fiber optic and coaxial cables. These types of systems may be low voltage power circuit, extra low voltage power circuit or low energy power circuit. While the work on these types of systems is considered to be specialized, the basic installation method of these systems follows the practices and principles of the construction electrician trade.

Sub-task

16.01 Installs voice/data systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

16.01.01	knowledge of types of cables such as copper, fiber optic and coaxial
16.01.02	knowledge of installation standards
16.01.03	knowledge of manufacturers' specifications such as bend radius, jacket stripping and splicing
16.01.04	knowledge of types of lines such as analog and digital
16.01.05	ability to select appropriate cable type according to specifications

16.01.06	ability to follow installation procedures
16.01.07	ability to confirm operation of the voice/data systems

Sub-task

16.02 Installs public address (PA) systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

16.02.01	knowledge of types of PA systems
16.02.02	knowledge of installation standards
16.02.03	knowledge of manufacturers' specifications
16.02.04	ability to select and use tools and equipment
16.02.05	ability to select appropriate cable type according to specifications
16.02.06	ability to follow installation procedures
16.02.07	ability to confirm operation of PA systems

Sub-task

16.03 Installs community antenna distribution and radio and television systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

16.03.01	knowledge of community antenna distribution and radio and television equipment as defined by the CEC
16.03.02	knowledge of types of cables such as RG 59, RG 6, Category 5e and 6
16.03.03	knowledge of manufacturers' specifications
16.03.04	ability to select and use tools and equipment
16.03.05	ability to select appropriate cable type according to specifications
16.03.06	ability to follow installation procedures
16.03.07	ability to confirm operation of the systems

Sub-task**16.04 Installs building automation systems.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

16.04.01	knowledge of types of building automation systems such as energy management systems, integrated building systems and smart buildings
16.04.02	knowledge of components of building automation systems such as cables and sensors
16.04.03	knowledge of manufacturers' specifications
16.04.04	ability to select and use tools and equipment
16.04.05	ability to select components such as occupancy sensors, sail switches and dusk-to-dawn controls
16.04.06	ability to follow installation procedures
16.04.07	ability to confirm operation of systems

BLOCK F

UPGRADING, MAINTENANCE AND REPAIR

<i>Trends</i>	<p>Today's technology provides construction electricians with a greater variety of challenges. This requires them to upgrade their skills and training to perform necessary repairs.</p> <p>Construction electricians are required to upgrade systems to comply with changes in codes and specifications (both jurisdictional and equipment) as well as customer demands.</p> <p>Maintenance programs continue to be important in order to maintain operation of existing systems.</p>
<i>Related Components</i>	All components apply.
<i>Tools and Equipment</i>	See Appendix A.

Task 17

Upgrades electrical systems.

<i>Context</i>	Construction electricians are required to be familiar with electrical systems and the options that are available to upgrade and improve to meet the customer's requirements.
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Sub-task

17.01 Evaluates existing electrical systems.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

17.01.01	knowledge of system components such as MCCs, transformers, panel boards and splitters
17.01.02	knowledge of types of systems by voltage and use
17.01.03	knowledge of system operation by sequence
17.01.04	knowledge of calculation and demand factors

17.01.05	knowledge of current code rules and jurisdictional regulations
17.01.06	ability to select and use tools and equipment
17.01.07	ability to calculate demand factors and loads
17.01.08	ability to determine upgrades to meet current code regulations

Sub-task

17.02 Replaces electrical systems and equipment.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

17.02.01	knowledge of types of electrical systems and equipment
17.02.02	knowledge of system operation
17.02.03	knowledge of types of system components such as breakers, fuses and overcurrent and overload devices, panel boards, relays, capacitors, timers and terminal blocks
17.02.04	knowledge of removal and disposal procedures
17.02.05	ability to select and use tools and equipment
17.02.06	ability to perform shut-down procedures
17.02.07	ability to select corresponding replacement parts according to their rating

Task 18

Maintains electrical systems.

Context

Maintaining electrical systems requires construction electricians to recognize the needs for comprehensive maintenance programs. They inspect systems or take an existing maintenance program and apply it, or suggest necessary changes. They troubleshoot, repair and replace defective components in order to maintain operation of the systems. Construction electricians also need to return equipment to operation in a timely manner.

Sub-task**18.01 Troubleshoots electrical systems.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

18.01.01	knowledge of types of electrical systems
18.01.02	knowledge of electrical system concept and operation
18.01.03	knowledge of troubleshooting techniques
18.01.04	ability to select and use tools and equipment
18.01.05	ability to apply troubleshooting techniques
18.01.06	ability to recognize defective electrical components

Sub-task**18.02 Replaces electrical components.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

18.02.01	knowledge of types of electrical systems
18.02.02	knowledge of electrical system operation
18.02.03	ability to select and use tools and equipment
18.02.04	ability to recognize defective electrical systems
18.02.05	ability to select equivalent replacement parts
18.02.06	ability to install replacement parts
18.02.07	ability to integrate new components into existing systems
18.02.08	ability to verify operation of replacement components

Sub-task**18.03 Repairs electrical components.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	NV	NV

Supporting Knowledge & Abilities

18.03.01	knowledge of types of electrical systems
18.03.02	knowledge of electrical system operation
18.03.03	ability to select and use tools and equipment
18.03.04	ability to select approved materials
18.03.05	ability to recognize defective electrical components
18.03.06	ability to integrate new components into existing systems
18.03.07	ability to verify operation of repaired components

Task 19

Performs preventative maintenance.

Context Preventative maintenance requires the construction electrician to establish and follow a system that anticipates and prevents potential failures.

Sub-task

19.01 Tests system operation.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

19.01.01	knowledge of system design
19.01.02	knowledge of system sequence
19.01.03	ability to select and use tools and equipment
19.01.04	ability to use evaluation techniques
19.01.05	ability to recognize potential system operation problems

Sub-task

19.02 Cleans components.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

19.02.01	knowledge of cleaners
19.02.02	knowledge of operation of equipment
19.02.03	ability to select and apply cleaners
19.02.04	ability to follow maintenance schedule

Sub-task

19.03 Lubricates components.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

19.03.01	knowledge of lubricants
19.03.02	knowledge of operation of equipment
19.03.03	ability to select and apply lubricants
19.03.04	ability to follow maintenance schedule

Sub-task

19.04 Establishes maintenance schedule.

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	NV	NV

Supporting Knowledge & Abilities

19.04.01	knowledge of equipment being maintained
19.04.02	knowledge of manufacturers' specifications
19.04.03	knowledge of customer requirements
19.04.04	knowledge of environmental conditions
19.04.05	ability to create maintenance schedules

Sub-task**19.05****Implements maintenance schedule.**

<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	NV

Supporting Knowledge & Abilities

19.05.01	knowledge of equipment being maintained
19.05.02	knowledge of manufacturers' specifications
19.05.03	knowledge of customer requirements
19.05.04	knowledge of environmental conditions
19.05.05	ability to execute maintenance schedules
19.05.06	ability to record maintenance data

APPENDICES

Standard Tools

adjustable wrench	needle nose pliers
awl	nut drivers
cable cutter	pipe benders
centre punch	pipe cutters
chalk line	pipe threader
cold chisel	pipe wrench
combination square	reamers
combination wrench set	screwdrivers: Robertson, Phillips, torx, flat,
crimping pliers	tamper-proof
crowbar	side/diagonal cutters
drill bits	slip joint pliers
files	socket set
fish tape	speed wrench
flashlight	tap and die set
fuse puller	tin snips
hack saw	tool belt
hammers	tool bucket
hex key set	torpedo level
keyhole saw	triple tap
knives	trouble light
knockout cutter	wire strippers
lineman pliers	wood chisel
measuring tape	

Personal Protective Equipment (PPE) and Safety Equipment

barricades	first aid equipment
confined space equipment	fume and toxic gas detector
coveralls (fire retardant)	gloves
ear plugs and muffs	goggles
eye wash facilities	grounding straps
face shield	hard hat
fall arresters	insulated gloves
fire blanket	knee pads
fire extinguisher	lanyard (retractable and soft pack)

Personal Protective Equipment (PPE) and Safety Equipment (continued)

life line	safety boots
lock-out kit	safety glasses
portable light	safety harness
pylons	safety vest
respirator	self contained breathing apparatus
restraint device	signage
rope grab	ventilation equipment
safety belt	warning tape

Scaffolding and Access Equipment

aluminium planks	lift table
articulated boom lift	scaffolds (rolling, mechanical, stationary, ladder jack)
boatswain's chair	scissor lift
boom lifts	swing stage
construction elevator	
ladders (extension, fixed, step)	

Power Tools and Equipment

band saws	magnetic drill
battery/rechargeable drill	pneumatic hammer drill
bench grinder	power drill
chop saw	power pipe bender
circular saw	power pipe cutters
core drill	power pipe threader
drill press	power puller
grinder	power reel lift
hammer drill	PVC bender
heat gun	reciprocating saw
hole saw kit	sump pump
hydraulic bender	tugger
hydraulic crimper	vacuum
jig saw	

Specialty Tools and Equipment

chain falls	creepers and crawlers
come-along	extension cords
communication devices (intrinsically safe, cellphones and 2-way radio)	grip hoist
	hot stick

Specialty Tools and Equipment (continued)

inverters	shovels
knock-out punch	sledgehammer
manual hoist	slings
picks	soldering apparatus
pneumatic hoist	spud wrench
portable generator	strain relief grips
powder-actuated tools	thermit (thermal) welder
reel jacks	torque wrench
rope	wire rack
shackles	

Measuring Equipment

ammeter	megohmmeter (insulation tester)
cable locator	motor rotation meter
clamp ammeter	multimeter
fault locator	ohmmeter
frequency meter	oscilloscope
ground megohmmeter	phase rotation meter
hi-pot tester (dielectric tester)	recording meter (watts, volts and amps)
inductive voltage detector	tachometer
insulation resistance meter	thermometer (infra red and electronic)
jumpers	voltage tester
LAN meter (cable analyser)	voltmeter
light meter	watt meter

ancillary	functions performed by the fire alarm system as an output of the fire alarm system, controlled by a relay or similar device, for example, elevator recall, fan shut down and door release
bonding	a low impedance path obtained by permanently joining all non-current-carrying metal parts to assure electrical continuity and having the capacity to conduct safely any current likely to be imposed on it
cathodic protection	technique to control the corrosion of a metal surface by making that surface the cathode of an electrochemical cell
extra low voltage	any voltage up to and including 30 volts
grounding	a permanent and continuous conductive path to the earth with sufficient ampacity to carry any fault current liable to be imposed on it, and of a sufficiently low impedance to limit the voltage rise above ground and to facilitate the operation of the protective devices in the circuit
intrinsically safe	that any spark or thermal effect that may occur in normal use, or under conditions of fault likely to occur in practice, is incapable of causing an ignition of the prescribed flammable gas, vapour, or dust
low energy power circuit	a circuit where the power is limited to $100/V$ Amperes where V is the open circuit voltage
luminaires	a complete lighting unit designed to accommodate the lamp(s) and to connect the lamp(s) to circuit conductors, for example, florescent, High Intensity Discharge (HID) and incandescent
raceway	any channel designed for holding wires, cables, or busbars, and, unless otherwise qualified by rules of the CEC, the term includes conduit (rigid, flexible, metal, non-metallic) electrical, metallic and nonmetallic underfloor raceway, cellular floors, surface raceways, wireways, cable trays, busways, and auxiliary gutters
troubleshoot	diagnosing problems
voltage system, low	any voltage from 31 to 750 volts
voltage systems, high	any voltage above 750 volts

AC	Alternating Current
CEC	Canadian Electrical Code
CT	Current Transformer
DC	Direct Current
HID	High Intensity Discharge
HVAC	Heating, Ventilation and Cooling
LED	Light Emitting Diode
MCC	Motor Control Center
MSDS	Material Safety Data Sheet
OH&S	Occupational Health and Safety
PA	Public Address
PLC	Programmable Logic Controller
PPE	Personal Protective Equipment
PT	Potential Transformer
UPS	Uninterruptible Power Supply
VFD	Variable Frequency Drive
WHMIS	Workplace Hazardous Materials Information System

APPENDIX D

BLOCK AND TASK WEIGHTING

BLOCK A OCCUPATIONAL SKILLS

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	National Average
%	17	10	20	10	10	20	10	8	13	5	15	NV	NV	12%

Task 1 Uses and maintains tools and equipment.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	30%
%	30	40	30	30	30	29	40	15	33	28	20	NV	NV	

Task 2 Organizes work.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	36%
%	40	20	30	40	40	33	40	35	33	47	40	NV	NV	

Task 3 Performs routine trade activities.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	34%
%	30	40	40	30	30	38	20	50	34	25	40	NV	NV	

BLOCK B SYSTEMS, DISTRIBUTION AND SERVICES

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	National Average
%	23	30	20	20	28	20	30	26	23	25	25	NV	NV	25%

Task 4 Installs service entrance and distribution equipment.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	%
%	25	50	30	30	29	24	30	30	25	25	30	NV	NV	

Task 5 Installs sub-panels, feeders and transformers.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	27%
%	23	30	20	30	25	20	30	30	25	30	30	NV	NV	

Task 6 Installs bonding, grounding and cathodic protection systems.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	23	10	30	20	18	21	33	20	25	25	20	NV	NV	22%

Task 7 Installs power generation systems.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	17	6	10	10	14	20	4	10	15	10	15	NV	NV	12%

Task 8 Installs high voltage systems.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	12	4	10	10	14	15	3	10	10	10	5	NV	NV	9%

BLOCK C BRANCH CIRCUIT WIRING

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	National Average
%	23	35	20	35	15	20	25	32	23	30	25	NV	NV	26%

Task 9 Installs raceways and cables.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	22	40	30	30	33	26	32	38	30	45	40	NV	NV	33%

Task 10 Installs power and lighting systems.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	30	35	30	30	27	34	36	32	30	30	35	NV	NV	32%

Task 11 Installs heating, ventilation and cooling (HVAC) systems.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	28	15	20	20	20	21	16	20	20	17	10	NV	NV	19%

Task 12 Installs emergency lighting systems.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	20	10	20	20	20	19	16	10	20	8	15	NV	NV	16%

BLOCK D MOTORS AND CONTROL SYSTEMS

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	National Average
%	15	15	20	20	30	15	20	21	18	20	25	NV	NV	20%

Task 13 Installs motor controls.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	63%
%	50	70	50	80	60	65	40	70	60	60	90	NV	NV	

Task 14 Installs motors.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	37%
%	50	30	50	20	40	35	60	30	40	40	10	NV	NV	

BLOCK E SIGNALLING AND COMMUNICATION SYSTEMS

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	National Average
%	12	3	10	10	5	10	10	8	10	15	5	NV	NV	9%

Task 15 Installs signalling systems.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	59%
%	55	30	50	60	80	65	50	60	65	60	70	NV	NV	

Task 16 Installs communication systems.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	41%
%	45	70	50	40	20	35	50	40	35	40	30	NV	NV	

BLOCK F HYDRONIC HEATING AND COOLING SYSTEMS

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	National Average
%	10	7	10	5	12	15	5	5	13	5	5	NV	NV	8%

Task 17 Upgrades electrical systems.

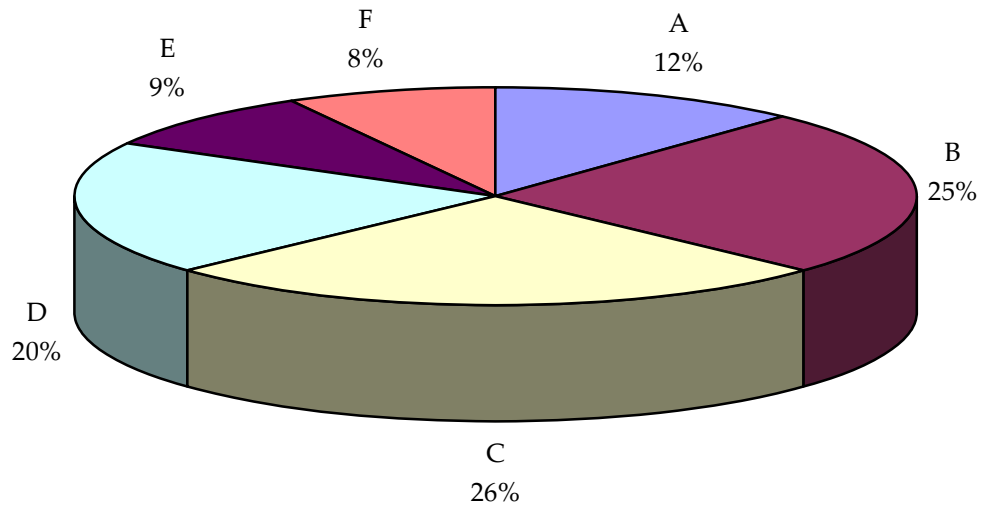
	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	38	45	40	33	17	35	60	40	50	45	30	NV	NV	39%

Task 18 Maintains electrical systems.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	35	45	30	34	25	35	20	40	30	35	55	NV	NV	35%

Task 19 Performs preventative maintenance.

	<u>NL</u>	<u>NS</u>	<u>PE</u>	<u>NB</u>	<u>QC</u>	<u>ON</u>	<u>MB</u>	<u>SK</u>	<u>AB</u>	<u>BC</u>	<u>NT</u>	<u>YT</u>	<u>NU</u>	
%	27	10	30	33	58	30	20	20	20	20	15	NV	NV	26%



TITLES OF BLOCKS

BLOCK A	Occupational Skills	BLOCK D	Motors and Control Systems
BLOCK B	Systems, Distribution and Services	BLOCK E	Signalling and Communication Systems
BLOCK C	Branch Circuit Wiring	BLOCK F	Upgrading, Maintenance and Repair

*Average percentage of the total number of questions on an interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada. Interprovincial examinations typically have from 100 to 150 multiple-choice questions.

APPENDIX F

TASK PROFILE CHART — Construction Electrician

BLOCKS	TASKS	SUB-TASKS				
A OCCUPATIONAL SKILLS	1. Uses and maintains tools and equipment.	1.01 Maintains hand tools.	1.02 Maintains power tools.	1.03 Maintains powder-actuated tools.	1.04 Maintains electrical measuring equipment.	1.05 Maintains specialty tools.
		1.06 Uses scaffolding and access equipment.	1.07 Uses rigging, hoisting and lifting equipment.	1.08 Uses personal protective equipment (PPE) and safety equipment.		
	2. Organizes work.	2.01 Interprets codes and regulations.	2.02 Interprets plans, drawings and specifications.	2.03 Uses documentation and reference material.	2.04 Communicates with others.	2.05 Compiles a list of materials and supplies.
		2.06 Plans project tasks and procedures.				
	3. Performs routine trade activities.	3.01 Prepares work site.	3.02 Performs lock-out and tagging procedures.	3.03 Handles materials and supplies.	3.04 Maintains safe work environment.	3.05 Installs seismic restraint systems. (NOT COMMON CORE)
		3.06 Conducts operational tests.				
B SYSTEMS, DISTRIBUTION AND SERVICES	4. Installs service entrance and distribution equipment.	4.01 Installs supply services.	4.02 Installs metering systems.	4.03 Installs overcurrent protection.	4.04 Installs power distribution centres.	4.05 Installs temporary power.
		4.06 Installs surge protection systems.	4.07 Installs power conditioning devices.	4.08 Installs uninterruptible power supply (UPS) systems.	4.09 Performs start-up and shut-down procedures.	
	5. Installs sub-panels, feeders and transformers.	5.01 Installs sub-panels.	5.02 Installs feeders to sub-panels.	5.03 Installs low voltage transformers.		

BLOCKS		TASKS	SUB-TASKS					
C	BRANCH CIRCUIT WIRING	6. Installs bonding, grounding and cathodic protection systems.	6.01 Installs grounding grids.	6.02 Installs bonding conductors.	6.03 Installs ground fault protection systems.	6.04 Installs lightning arresters.	6.05 Installs cathodic protection systems.	
		7. Installs power generation systems.	7.01 Installs generators and transfer switches.	7.02 Installs alternative power systems.				
		8. Installs high voltage systems.	8.01 Installs high voltage equipment.	8.02 Installs high voltage cables.	8.03 Terminates high voltage cables.	8.04 Tests high voltage systems.		
		9. Installs raceways and cables.	9.01 Installs raceways.	9.02 Installs cables.	9.03 Installs underground wiring.	9.04 Installs enclosures.	9.05 Installs conductors in raceways.	
		10. Installs power and lighting systems.	10.01 Installs luminaires.	10.02 Installs devices (switches and receptacles).	10.03 Installs lighting controls.	10.04 Installs light posts.	10.05 Installs branch circuit protection.	
D	MOTORS AND CONTROL SYSTEMS	11. Installs heating, ventilation and cooling (HVAC) systems.	11.01 Installs electric heating systems.	11.02 Connects ventilation and cooling systems.	11.03 Installs HVAC control systems.			
		12. Installs emergency lighting systems.	12.01 Installs exit lighting.	12.02 Installs battery-operated lighting.				
		13. Installs motor controls.	13.01 Installs starters.	13.02 Installs variable frequency drives (VFD).	13.03 Installs overload protection.	13.04 Installs motor controls.	13.05 Installs Programmable Logic Controls (PLCs).	
E	SIGNALLING AND COMMUNICATION SYSTEMS	14. Installs motors.	14.01 Installs AC and DC motors.	14.02 Installs motor overcurrent protection.				
		15. Installs signalling systems.	15.01 Installs fire alarm systems.	15.02 Installs nurse call systems.	15.03 Installs security and surveillance systems.			

BLOCKS	TASKS	SUB-TASKS				
F UPGRADING, MAINTENANCE AND REPAIR	16. Installs communication systems.	16.01 Installs voice/data systems.	16.02 Installs public address (PA) systems.	16.03 Installs community antenna distribution and radio and television systems.	16.04 Installs building automation systems.	
	17. Upgrades electrical systems.	17.01 Evaluates existing electrical systems.	17.02 Replaces electrical systems and equipment.			
	18. Maintains electrical systems.	18.01 Troubleshoots electrical systems.	18.02 Replaces electrical components.	18.03 Repairs electrical components.		
	19. Performs preventative maintenance.	19.01 Tests system operation.	19.02 Cleans components.	19.03 Lubricates components.	19.04 Establishes maintenance schedule.	19.05 Implements maintenance schedule.