

FISHERIES AND OCEANS CANADA
RECONSTRUCTION OF CARLETON-SUR-MER'S WHARF

TECHNICAL SPECIFICATIONS FOR TENDER CALL
ELECTRICITY
OCTOBER 2018

By : _____
Daniel Siméon, Eng., P. Eng.

PART 1 – GENERAL**1.1 Related requirements**

- .1 This section includes requirements common to the various section of the Electrical specifications
- .2 The list given in this document is not limited and all devices or accessories needed to complete installation must be provided and installed by the contractor even if they are not specifically described.
- .3 In case of disagreement or inconsistency between documents, the most restrictive clause will be given priority.

1.2 References

- .1 Unless otherwise stated, wherever there is mention of a code or standard of the tender documents, use the latest edition at the moment more recent to amendments
- .2 Provincial Labor Standards codes and regulations.
- .3 Building regulations, zoning and provincial codes.
- .4 Applicable regulations for Environmental Protection Services of the Ministry of Municipal Affairs.
- .5 Perform all the installation according to the Quebec Construction code – Chapter V – Standards of Electricity and Hydro Québec
- .6 All equipment, installation and testing must comply with standards, codes or regulations of the Federal, Municipal and Provincial Government.
- .7 All equipment, testing and quality assurance must comply with standards and codes of the following associations:

Canadian Standards Association (CSA International)

- .1 CSA C22.1, Canadian Electrical Code, Part 1 (current Edition), Safety Standard for Electrical Installations.
- .2 CSA C22.2.
- .3 CAN/CSA-C22.3 no.1 Overhead Systems.
- .4 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .5 CSA C22.10-10, Québec Construction Code Chapter V-Electricity.
- .6 CSA-B651-04, Accessible design for the built environment.

And all Québec Regulations and Recommendations

AMEEC: Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

EEMAC 2Y-1, Light Gray Colour for Indoor Switch Gear.

ANSI: American Electrical Manufacturer's Association

IEEE: Institute of Electrical and Electronics (IEEE) /National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms

ICEA: insulated Power Cable Engineers Association.

1.3 Definitions

.1 Specific terms:

A verb in the infinitive form, beginning a sentence or a proposition to imply words (contractor shall provide, install and connect...) ex: provide and install or provide and place... means (contractor shall provide, install and connect all material.

« **ELECTRICITY** » in the header for plans and specs relates to the field of « Electricity ».

« **PROVIDE** » means to supply install and connect.

« **ACCORDING TO INSTRUCTIONS** » means indicated on the plans and specifications as part of the contract.

« **SPECIFICATIONS** » means collectively all the latest revisions attached to this specification and the revised or additional drawings that will be provided later.

« **IN THIS SPECIFICATION** » means the contents or a section or division in which this term appears.

The terms « **CONTRACTOR** » or « **CURRENT CONTRACTOR** » or «**SPECIALIZED CONTRACTOR**», mentioned in different sections of the specs and plans in the Electrical section, means the contractor in charge of or responsible for the specs and plans in which they appear.

.2 Electric and Electronic Terms:

Unless otherwise indicated, the terminology used in the section of the specs and plans is based on that defined in the standard IEEE SP1122.

1.4 Review of plans, specifications and locations

- .1 The bidder shall carefully study the plans and specifications for structural, architectural and other specialties to ensure that the work of this contract may be executed in a satisfactory manner, as shown on the plans. Before starting work, review the work of other specialties and report to the Departmental Representative of any defects or impede the execution of the work described in this specification or affecting the security required.
- .2 These reviews by the Contractor shall be made in order to coordinate the execution of its work. The Contractor shall interpret the documents in line with the strictest requirements.
- .3 No allowance will be granted to the contractor for the consequences of his failure to make such examinations.

1.5 Plans and specifications

- .1 All contract documents complement each other and any instructions found in one of them is enforceable as if it is found in all documents.
- .2 The plans serve only to guide the contractor and subcontractors on the number and approximate location of the conduits, receptacles, lighting or other.
- .3 For purposes of enforcement in the event and an obstacle to overcome, the location of pipes, cables, lighting fixture or other equipment can be moved within (3) meters from the location indicated without additional charge.

1.6 Design, requirements

- .1 The operating voltages shall conform to CAN3-C235
- .2 Motors, electric heaters, devices command / control / regulation and distribution must operate in a satisfactory manner at a frequency of 60 Hz and within the limits established in this standard.
 - .1 Equipment must be able to operate without sustaining damage under extreme conditions identified in this standard.
- .3 All electrical equipment must also operate within the conditions of supply of electricity from the power company.
- .4 In any event, the equipment must operate normally with minimal variation of voltages 15% and 10% of the nominal voltage of equipment.
- .5 Operating language and display: provide identification and display of signs and tags in French for control devices / control.
- .6 All electrical equipment located in an electrical equipment room, protected by sprinklers, must conform to with Article 26-008 "Apparatus protected by sprinklers" of the Quebec Construction Code, Chapter V - Electricity.

List limited to major appliances covered by this article:

- Connection Center.
- Distribution Panel.
- Transformers.
- Motor Control Centers.
- Main distribution centers (substation).
- Control Relay.
- Isolating switches.
- Starter motors and variable frequency drive.

- Two control.
- Centre for power factor correction.
- Generator and transfer switch.

1.7 Material requirements for establishments

- .1 To maintain consistency, use only products from one manufacturer when it comes of material or equipment of the same type or class and, unless otherwise indicated.
- .2 Follow manufacturer's recommendations in regard to security, opportunities, access, maintenance and repairs.
- .3 Ensure maintenance and dismounting can be done without injury to the elements of the building or other facilities.
- .4 Provide means to access the hardware, for maintenance purposes.
- .5 Where possible, align the edges of pieces of equipment with the building walls.

1.8 Responsibility for the trial testing

- .1 Protect the work against loss or damage until its acceptance.
- .2 During the temporary use, the warranty period will not be affected.
- .3 The owner can use the facilities and equipment for testing before they have accepted. Provide labor, equipment and instruments required for testing.
- .4 Clean and refurbish and leave in good working the facilities and equipment used before their acceptance and isolate equipment that could be damaged.
- .5 Prevent dust, dirt and other foreign matter from entering openings of facilities and equipment during installation and temporary use.

1.9 Concealed work

- .1 No work shall be concealed without approval.
- .2 In the event that the specialty contractor breaches this clause, this one may be forced to discover the concealed work. The costs incurred will be the responsibility of offender, that the work is well executed or not.

1.10 Documents and samples

- .1 Submit documents and samples in accordance with this section and section 01 33 00 – Submittal Procedures.
- .2 Submit material safety data sheets required, consistent with the Information System Hazardous Materials (WHMIS), under Section 02 88 01 - Hazardous Materials.

COMMON WORK RESULTS FOR ELECTRICAL

October 2018

Page 5 of 23

- .3 Submit, for review, the single line diagrams framed under glass or Plexiglas, and place in areas below:
 - .1 Electrical Distribution network: at the main electrical installations.
 - .2 Network production and distribution of electricity: in the local generators.
- .4 Provide, for review, a vertical distribution plan of the fire alarm system that show plan and zoning of the building, framed under glass or Plexiglas, and place it near the control panel and fire alarm annunciation panel.
- .5 Shop drawings
 - .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data that must be provided to show in detail a portion of the work
 - .2 The drawings submitted, where required, must be signed by an authorized qualified Departmental Representative or entitled to practice in Canada, in the province of Quebec.
 - .3 The Contractor shall make the necessary steps for the preparation of shop drawings as required by the contract documents or the Departmental Representative may reasonably request. These drawings must, show only the devices, materials, systems, etc., Project-specific. Drawings should be arranged to release a minimum clearance of 75 mm x 75 mm (3 in. x 3 in.) to allow the Departmental Representative to affix the stamp of review.
 - .4 Wiring diagrams and installation details of equipment must indicate the location, layout, capacity, weight, route and proposed layout, control panels, accessories, piping, ducts, details of stands, brackets, bolts and all other elements that must be displayed to ensure that we can achieve a coordinated installation.
 - .5 Wiring diagrams shall indicate the circuit terminals, the internal wiring of each unit as well as interconnections between devices, and structures within other disciplines.
 - .6 The drawings shall indicate clearances required for the operation, maintenance and replacement of equipment.
 - .7 Before placing orders for materials, submit to the Departmental Representative, for verification, one (1) electronic copy (PDF file) of the shop drawing of the equipment chosen. An electronic copy will be returned to the contractor. Other copies required will be prepared and distributed by the Contractor from the copy reviewed by the Departmental Representative.
 - .8 Do not undertake work until you receive written notice from the Departmental Representative certifying the review of the submitted drawings.
 - .9 Include all drawings of any chart, graph, detail, description, sample (if required by the Departmental Representative), to check the appearance, quality, performance, durability of the equipment chosen.

COMMON WORK RESULTS FOR ELECTRICAL

October 2018

Page 6 of 23

- .10 The drawings submitted must be identified for this specific project. They must indicate the project name, the name of Departmental Representative, contractor, date and refer to an item number of the specs or a detail in the plans.
- .11 Check in advance these drawings prior to submission to the Departmental Representative. Check dimensions on site. Ensure the installation criteria and catalogue numbers. If changes are required, inform the Departmental Representative before they are made.
- .12 The review of Departmental Representative is limited to monitoring compliance with shop drawings and conceptual studies the general layout. This review does not absolve the Contractor from responsibility for errors or omissions in shop drawings or his responsibility to comply with all requirements of contract documents and site conditions, unless exemption clearly indicated on shop drawings have been approved in writing by the Departmental Representative.
- .13 The Contractor shall provide shop drawings with all corrections and modifications as the Departmental Representative requires in accordance with the Contract Documents and resubmit unless a Departmental Representative in the exemption.

When re-submitting shop drawings, the contractor must inform the Departmental Representative in writing revisions, other than those requested by the Departmental Representative, which have been made.
- .14 Do not distribute copies of the drawings submitted until receipt of written notice of revision from the Departmental Representative.
- .15 The study of coordination, where required, must be issued simultaneously with shop drawings. Any issue will delay even more the review of drawings by the Departmental Representative.
- .16 Shop drawings must be in French.
- .6 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide equipment and materials that are CSA approved.
 - .2 In cases where we can get equipment and materials CSA certified, submit the proposed equipment and materials to the competent authority and the inspection authorities, for approval, before delivering them to the site and to defray costs.
 - .3 Submit the test results of electrical systems and instruments installed in the form of a written report.
 - .4 Permits and fees: under the general conditions of contract, and this section.
 - .5 Once completed, submit a report of load balancing in accordance with article "Quality control on site" in Part 3 of this section.
 - .6 Once completed, submit to the Departmental Representative the certificate of approval issued by the competent authority.
 - .7 Molded Case Circuit Breakers

COMMON WORK RESULTS FOR ELECTRICAL

October 2018

Page 7 of 23

- .1 The contractor, electrical subcontractor must deliver to the Departmental Representative a certification of the authenticity of all molded case circuit breakers used in the project and before any installation thereof to the site.
- .2 The certificate must indicate at least the following information:
 - Name of the electrical contractor
 - Project identification and address of site installation
 - The brand, the electrical characteristics of circuit breakers for circuit breakers and 60A and the serial number.
 - The name and signature of the authorized distributor for the manufacturer who supplied the circuit breakers.
 - The number of circuit-breakers at licensed dealer.
 - The signature of the local representative of the manufacturer.
- .7 In case reports of controls must be made by the manufacturer to the Departmental Representative : within three days after the checks and tests the installation and electric instruments prescribed in Article FIELD QUALITY CONTROL, PART 3 of this section, a written report of the manufacturer showing that the research meets the criteria specified.

1.11 Interference schematics

- .1 If necessary, prepare schemes to ensure that electrical equipment can be mounted in space and where indicated without disturbing the other sections and equipment while leaving space for the proper maintenance of these equipment.
- .2 If a Departmental Representative considers that there may be interference in a particular location; they may require the Contractor to prepare plans of interference of these places.

1.12 Quality assurance

- .1 The Contractor shall have full control of his own work including those of the subcontractors.
- .2 The Contractor shall direct and supervise the work adequately in order to ensure compliance with plans and specifications.
- .3 The Contractor shall be solely responsible for the methods, techniques and sequences for carrying out the work.
- .4 The contractor must have a site supervisor that can represent him in his absence. Any notice, order, direction, etc.. given to the supervisor shall be construed as given to the contractor himself.
- .5 The Contractor shall ensure that its work will be done promptly before pouring concrete or performing other similar work. Supply and install sleeves required. If it is necessary to cut or repair work completed or not, to use his own expense, a specialist in the part of the work involved making cuts and repairs.

COMMON WORK RESULTS FOR ELECTRICAL

October 2018

Page 8 of 23

- .6 If the materials supplied by the Contractor must be incorporated into the work of other contractors such as masonry, carpentry or plastering, the contractor will be responsible for providing the equipment and to incorporate measures for necessary openings to develop.
- .7 If the Contractor covers or permits to cover work before tests and inspections have been made, the Contractor shall, upon request, uncover the work in question, to complete the inspections and tests in a satisfactory manner and deliver such part of the work in the condition at the contractor's own cost.
- .8 The Contractor shall protect his own work, finished or unfinished, and that of other contractors against any damages resulting from the execution of his own work. Cover floors, etc., as needed with heavy fabric. Repair, without cost and to the satisfaction of the Departmental Representative, all damages on floors or other parts of the building resulting from the execution of his own work.
- .9 When the work is completed, all tools, surplus materials or waste will be removed and the premises will be left perfectly clean.
- .10 Quality Assurance: according to Section 01 45 00 - Quality Control.
- .11 Qualification: electrical work must be performed by authorized, qualified by a master electrician or an electrical contractor holding a license issued by the province in which the work will be performed or by apprentices in accordance with the relevant authorities and in accordance with the terms of provincial legislation concerning territorial vocational training and qualification of the workforce.
 - .1 Employees enrolled in a provincial apprenticeship program can perform specific tasks if they are under the direct supervision of a qualified licensed electrician.
 - .2 Tasks permitted: depending on the degree of training and according to the demonstrated ability to perform specific tasks.
- .12 Site meetings
 - .1 in the case where site meeting are made by the manufacturer as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, in appropriate NMS Section, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
- .13 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.13 Delivery, storage and handling

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within [2] weeks after award of Contract.

- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .3 Materials must be delivered and stored according to manufacturer's instructions and ensure that their labels and seals are intact.
- .4 Ship and store in a standing position, the equipment to assemble.
- .5 Ship sections and assembly anchoring patterns before hardware.
- .6 Close the doors of the equipment and keep them locked. Protect equipment against damage and dust.
- .7 If necessary, shim moving parts to avoid damage when moving or shipping the material. The guidelines for the removal of wedges before commissioning should be displayed in French clearly and prominently.
- .8 Store electrical equipment inside unless otherwise indicated.

1.14 System startup

- .1 In accordance with section 01 91 13 – General Commissioning (Cx) Requirements
- .2 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .3 Provide written notice of 5 working days of the date of testing.
- .4 All equipment as well as the various systems, must be turned on, adjusted and calibrated by the contractor so as to provide the capacity and performance required of plans and specifications.
- .5 perform startup tests in the presence of the people responsible and the owner`s representative.
- .6 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .7 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.15 Operating instructions

- .1 Submit three (3) copies (unless otherwise indicated) of the operations manual and maintenance in binders identified for this purpose. These manuals will consist of a hardcover three-ring and identified with an electronic printing device such as "P-Touch" on the front cover and the vertical side.
- .2 Operating instructions to include following:
 - .1 The details of the components, construction features, function and maintenance requirements of the various components to facilitate the starting, operation, maintenance, repair, alteration, extension and expansion of or any part characteristic of the installation.

- .2 Technical data and product characteristics must be accompanied by supplementary information such as newsletters, illustrations and exploded views of component parts, technical descriptions and parts lists. The flyers advertising or brochures are not accepted.
 - .3 Wiring diagrams, circuit diagrams, control sequence for each main system and for each device, the principle diagrams and yield curves, startup procedures, adjusting, adjustment, lubrication, operation and stop, security measures, procedures to follow in case of failure, and other instructions, as recommended by the manufacturer of each body system.
 - .4 The names and addresses of the local suppliers of products mentioned in manuals.
 - .5 A copy of each shop drawings revised with comments made to them for approval and changes during construction.
 - .6 Warranties, factory test reports, verification certificates, certificates of circuit breakers, etc.
 - .7 Data sheets must be in French.
 - .8 The entire manual should be in electronic (Autocad (latest version), Word, Excel or Acrobat (PDF)).
 - .9 All drawings and / or drawings types used in the Autocad format will also be provided in electronic DWG format.
- .3 Provide tools, equipment and services of qualified instructors for the training of operating personnel and maintenance for the operation, the control, adjustment, diagnosis of problems and maintenance of all systems and equipment, during normal hours of work and before acceptance and delivery of systems and equipment.
 - .4 When other additional requirements specifies this, manufacturers must carry out demonstrations and train staff according to the requirements for training hours specified in each relevant section.
 - .5 Training courses should be based on the contents of the operations manual and maintenance and as-built drawings.

1.16 Software and computer DATA

- .1 With all equipment provided with a processor whose parameters are programmable, the Contractor shall provide the owner of software programming and settings stored in the memory of the equipment. Training on the equipment in question should also cover how the software works.

1.17 Rights, permits and inspection

- .1 Submit to the authorities concerned, the required number of copies of drawings and specifications to enable them to study and approve before work begins.
- .2 Pay all related costs.
- .3 The contractor is responsible to apply for connection to the electricity distributor.

- .4 If applicable, drawings and specifications required by the authorities will be provided directly by the Departmental Representative to cost to the contractor.
- .5 At the end of the work, provide the required certificates, including a copy to Departmental Representative. Pay all charges for additional copies required by the authorities concerned.

1.18 Specific requirements - Commissioning

- .1 In addition to the requirements mentioned in sections of the discipline "Electricity", the Contractor shall collaborate with the Departmental Representative to meet the requirements of the commissioning plan, Section 01 91 13 - General Commissioning (Cx) Requirements.

PART 2 – PRODUCTS

2.1 Materials and equipment

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Control panels and component should be factory assembled.
- .4 Provide materials, equipment and new sets of design and of known quality, recent model, whose characteristics are known and which replacement parts are available upon request.
- .5 Control panels and components shall be factory assembled.
- .6 Unless otherwise specified, to maintain consistency, use only products from one manufacturer when it comes to material or equipment of the same type or class.
- .7 Follow manufacturer's recommendations in regard to safety, inspection doors, maintenance and repairs.
- .8 Ensure the maintenance and dismantling may be done without hindering to the elements of the construction or other installations.
- .9 Provide means for accessing material, for maintenance purpose.
- .10 Wherever possible, align the edges of pieces of equipment as well as other items with walls of the building.
- .11 Check the joints made in the factory and tighten if necessary to ensure continuity of installation.
- .12 Identify and comply with manufacturers' recommendations regarding storage and hardware installation.

2.2 Electric motors, equipment and controls

- .1 Check responsibilities regarding installation and coordination with regard to motors, equipment and command / control, as indicated. Unless otherwise specified, starters and starter centers are supplied and installed by the discipline "Electricity". Section of mechanics, supplies and installs engines and equipment under its discipline.
- .2 Unless otherwise specified in the plans, the control wiring and conduit will be provided related discipline under "Electricity", with the exception of ducts, wiring and connections operating at voltages below 120 V and related systems control prescribed in sections for mechanical systems and on the drawings of mechanical systems.
- .3 Ensure that the phase sequence is adequate for the driving forces and have a direction of rotation in the clockwise direction.

2.3 Warning signs

- .1 Warning Signs: in accordance with requirements of inspection authorities and Departmental Representative.

2.4 Wiring terminations

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 Equipment identification

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: Unless otherwise specified, use plates made of plastic lamicaid 3 mm (1/8 inch) thick, mechanically fastened using self-tapping screws with engraved inscription in white on black for the normal network, in white on red for emergency panels and equipment connected to the emergency equipment and for fire alarm, white on orange panels for computer and related equipment and white on blue for uninterruptible power supplies (UPS), signs and any other equipment serviced by UPS.
 - .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

COMMON WORK RESULTS FOR ELECTRICAL

October 2018

Page 13 of 23

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five 25 letters per nameplate and label.
- .5 The nameplates of terminal boxes and junction boxes must indicate the characteristics of the network and / or voltage, identification, and the circuit panel from which the supply and indicate what is being fed downstream (after).
- .6 Instructions must be in French.
- .7 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .8 The nameplates of terminal boxes and junction boxes must indicate the characteristics of the network and / or voltage, identification, and the circuit panel from which it is fed and indicate what is fed downstream (after).
- .9 The transformer nameplates shall indicate the identification, the panel and the circuit from which the power is supplied, numbers of circuits and the panel which is supplied by the transformer.
- .10 Nameplates on junction box and fire alarm should indicate network characteristics: fire alarm detection.
- .11 Side panels 120/208 V and 120/240 V and 347/600 V:
 - .1 For new projects, the contractor must identify the circuit breakers used in referring to the numbers on the doors of the premises. Panels on the cards, identification of the file should appear (name of panel-year-month-day.XLS), each panel must have a Excel file. At the end of the project, the Contractor shall deliver them to the Departmental Representative identified the computer files.
 - .2 For existing panels, the contractor should note that each sheet panels affected will be updated either by computer or legible handwriting.
- .12 Electrical Appliances
 - .1 All panels, disconnects, fuses, junction boxes and pull, starters, center starters, contactors, each circuit of the main panels and other equipment provided by this division will all wear a name plate engraved in white lamicaid on black or red background for emergency, according to the formats given in section 2.6.1.2 of this section. This identification will correspond to the date shown on the plans.
- .13 List of formats nameplates to use:
 - .1 Main service chart: 7
 - .2 Junction box, pulling box: 5
 - .3 Automatic diverter: 7

- .4 Meter, alarm: 5 / fusible: 2
- .5 Contactor and starters: 5
- .6 Main breaker: 5
- .7 Generator: 7
- .8 Pilot-light: 5
- .9 Control panel: 7
- .10 Motor control center: 7
- .11 Breakers: 5
- .12 Transformers: 5
- .13 Junction cabinets and fire alarm pulling cabinets : 2
- .14 Panel board
- .15 Switch gear 25 kV:7
- .16 UPS (uninterrupted power supply): 7
- .17 Unit 125 V DC: 7
- .18 Control panel and electrical management: 7
- .19 Motors: 5
- .14 Control Pannel
 - .1 Within each of the main panel and on the gutters, the identification phase "A", "B", "C", "N", will be affixed with letters of 50 mm (2 in.) high minimum.
- .15 Motors
 - .1 For each motor, make marking on the motor identifying the isolating device and its location and the starter or the engine controller.
- .16 Boxes
 - .1 All junction and pulling boxes used for branch circuits shall be identified as follows: number of electrical panel and circuit numbers. Registration shall be enforced by an adhesive tape-type P-Touch.
- .17 Systems
 - .1 All boxes of the different systems must carry the name of the system (eg telephone, computer).

.18 Sockets and switches

- .1 Each outlet and switch shall bear the following identification: no. panel and no. circuit.
- .2 The low voltage switch must bear the following identification: No. of panel relay, No. relay on another line and have no. panel and no. circuit.
- .3 The identification will be as follows: P-Touch (electronic lettering machine type P-Touch) c / w self adhesive strip under pressure effect of 12 mm wide No. TC-201.

The adhesive tape will do the complete opposite of the plate and part of the back so that the band does not come off. Before sticking the tape, clean the plates of all impurities.
- .4 The colors will be as followed:

Normal: Black letters with clear background

Urgency: Red letters with clear background

U.P.S.: blue letters on clear background
- .5 In addition, the Contractor shall install an identification P Touch adhesive on the device itself, but in the back of the plate and fold behind the ear devices outlets and switches. This identification will be the same as on the plate (No. panel and No. circuit).

.19 Emergency lighting, exit sign, battery lighting, fire alarm, etc.

- .1 All appliances must carry the following markings: No. panel and No. circuit, the text will be white on red.

2.6 Wiring identification

- .1 Identify wiring with permanent indelible identifying markings, numbered and coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: in compliance with Code de Construction du Québec, chapter V- Electrical.
- .4 Use colour coded wires in communication cables, matched throughout system.
- .5 In each panel, in all junction and pull boxes, each conductor (including neutral) will be identified by the (No. panel and No. circuit) or its function (alarm circuits 1, 2, 3, etc..) by using ring-marks.

2.7 Conduit and cable identification

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 50 mm wide auxiliary colour.

	<u>Prime</u>	<u>Auxiliary</u>	
up to 250 V	Yellow		
up to 600 V	Yellow	Green	
up to 5 kV	Yellow	Blue	
up to 15 kV	Yellow	Red	
Telephone	Green		
Other Communication Systems	Green	Blue	
Fire Alarm	Red		
	Emergency	Red	Blue
Voice			
	Other	Red	Yellow
Security Systems			

- .4 In addition to the color code, each main distribution systems, main roads, secondary electrical distribution, telephone distribution line, will be given an identification vinyl (plastic) attached by stainless steel fasteners at every 15 m and at points of cross walls, ceilings and floors.

Entries will be according to the designations given to plans.

- .5 Plastic cards of 50 mm x 150 mm perforated around and fastened with "TY-RAP" fasteners.

2.8 Finishes

- .1 Comply with the requirements of the architect. The color of all electromechanical equipment is apparent in the choice of the architect in the range of all standard colors and non-manufacturer standards, including special colors.
- .2 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel. Paint outdoor and indoor electrical equipment switchgear and distribution enclosures light gray ASA-61 to EEMAC 2Y-1.
- .3 Clean and touch up the painted surfaces in the workshop that were scratched or damaged during shipping and installation. Use a paint that matches the original painting.
- .4 Clean and prime the hooks, brackets, fasteners and other devices visible, not galvanized to protect against rust.

PART 3 – EXECUTION**3.1 Installation**

- .1 Do complete installation in accordance with Code de Construction du Québec, chapter V-Electrical.

3.2 Nameplates and labels

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 Opening and crossing of architectural and structural elements

- .1 Make the necessary arrangements for openings in the roof and exterior walls are equipped with flashing and protected against the elements. Coordinate the requirements of this section with those of the Division 07 - Thermal and Moisture.
- .2 All work described below for the installation of sleeves, openings or closing of openings in an existing building and new construction will be implemented by:
 - The electrical contractor, except openings indicated on the plans of structure and / or architecture.
- .3 The work of opening foundations includes any drilling, casing, floors and interior walls as well as all drilling required for installation of equipment, piping and their supports, inserts, bolts, etc..
- .4 As recommended by the architect, not all existing openings reused must be sealed, made watertight and / or flame retardant composition to make them equivalent to the element passed through.
- .5 Place the sleeves where pipes go through masonry or concrete, or structures listed for their fire resistance.
- .6 All sleeves, inserts, bolts, etc., Will be installed before the walls and floors are constructed and the concrete is poured.
- .7 Use as sleeves of steel pipe, Schedule 40 with anchors set in the center, Ø 12 mm above the pipes. Steel sleeves welded 16 gauge, may be used only when the required internal diameter of the sleeve will not match a standard diameter schedule 40 pipe. Apply prior to installation, a coat of paint dry zinc.
- .8 When using plastic sleeves for penetrations of walls or floors with a degree of fire resistance, remove them before installing the ducts.
- .9 Install cables, conduits and fittings to be embedded or plastered neatly against the building structure so as to minimize the thickness of fur.
- .10 Openings and materials must be of sufficient size for the installation of thermal and acoustical insulation and should allow for thermal movement. Openings and sleeves shall be completely independent ducts to be subsequently installed.

- .11 If an additional piercing is required, it may occur after it has requested and obtained written permission from the owner and / or his representative and / or consultant in structure.
- .12 The piercing of the holes by air hammer or electric vibratory action as well as the drilling by hand and any other means by mechanical shocks are prohibited. The holes should be drilled using a rotary drill with water or other device approved by the consultant structure.
- .13 For crossings of the exterior walls and watertight basins, using sleeves with flange secured to the center by continuous welding.
- .14 Dimensions: leave an annular gap of at least 12mm between the sleeve and the pipe without insulation or between the sleeve and the insulation.
- .15 Lay the sleeves so they are flush with the surfaces of concrete and masonry and concrete floors poured directly on the ground that they exceed 50 mm all other types of floors.
- .16 The Contractor shall fill all the gaps around ducts using prefabricated seals when the sleeves pass through foundation walls, exterior walls, concrete walls, the walls of watertight basins and slabs with waterproof membrane.
- .17 In the case of passing through walls or floors rated for fire resistance; see item 3.4 in the present section.
- .18 Any piercing of the enclosure of the building floors or interior walls should be sealed as directed by the architect to maintain quality of the soundproofing, insulation and / or fireproofing. The architect may apply to products other than those proposed in the previous sub-sections. The specialist contractor shall comply with the approval and the final decision of the architect.
- .19 Any piercing in steel beams must be coordinated between the contractor and the contractor specialized in structure and final details will be specified on shop drawings in structure according to specific needs.

3.4 Fireproofing

- .1 Where cables or conduits pass through floors and firewalls, provide fire stop systems in compliance with local codes. The Contractor shall require the supplier of fire stop materials, technical bulletins corresponding to firestop materials for use with the ULC listing number (SP) corresponding to the assembly which will be performed on site.

3.5 Soundproffing

- .1 Unless otherwise indicated fill all the spaces left free between the sleeves and / or conduits and walls and / or floors with wool acoustic low density and seal the periphery of each side with an acoustic sealer silicone.
- .2 Once all conductors are installed and for all empty conduits, seal on each side of openings of the conduits with low density acoustic wool to a depth of 50 mm. Install the latter so as to remove for the passage of other drivers.

3.6 Mounting heights

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify with Departmental Representative before proceeding with installation.

3.7 Protection

- .1 During construction, protect the exposed and live material to ensure staff safety.
- .2 Enclose and mark live (energized) parts by the inscription "live circuit 120 volts" (or the appropriate voltage), in French.
- .3 Provide for the installation of temporary doors to close the rooms containing electrical distribution equipment. Keep these doors locked except when the electrician provides direct supervision.

3.8 Field quality control

- .1 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Any other system: Fire alarm system, communication network, monitoring of doors, intrusion, etc.. by specialized firms.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .2 Carry out tests in presence of Departmental Representative.
- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .4 Submit the test results to the Departmental Representative in the form of a written report.

- .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .6 Tests
 - .1 Make tests to check that no wires or circuit does not contain a ground. Also do with the acting Departmental Representative, tests to prove that connections are made everywhere and offer no resistance, such a voltage drop exceeding 3% when all appliances are in use.

Finally, balance the lighting circuits on the tables and side tables so that the main phases of the building are perfectly balanced.

3.9 Cleaning

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
- .3 Clean all duct systems and their boxes before pulling conductors.
- .4 Clean the inside of all boxes of wiring devices and lighting fixtures and heating systems special.
- .5 Prior to commissioning, clean all equipment, panels, transformers, starters, etc., Their control panel and accessories.
- .6 When the final cleaning, cleaning of the reflectors, diffusers, globes and other lighting products that have been exposed to dust and dirt.

3.10 Plans « With construction annotations »

- .1 During the execution of the work, to record all changes on a copy of site in red.
- .2 At the end of the work, transcribe all the changes in red color legibly on a clean copy. Identify each plan in the lower right corner in letters at least 12 mm high, as follows: "CERTIFIED AS BUILT" THIS PLAN HAS BEEN REVISED AND SHOWS SYSTEMS / ELECTRICAL EQUIPMENT AS THEY HAVE BEEN INSTALLED (Signature of Contractor) (Date).

3.11 Responsibilities during temporary trial testing

- .1 Protect the work against loss or damage until its acceptance.
- .2 During the temporary use, the warranty period will not be affected.

- .3 The owner can use the facilities and equipment for testing before they have accepted. Provide labor, materials and necessary instruments for testing.
- .4 Facility and equipment should be cleaned, refurbished and in good working condition before their acceptance and isolate equipment that could be damaged.
- .5 Prevent dust, dirt and other foreign matter from entering openings of facilities and equipment for temporary use.

3.12 Reception of work disciplinary « Electricity »

- .1 This procedure of acceptance of work does not prevent the taking possession of the building by the owner and if the occupation is conducted prior to approval of work, the systems must be put in operation and kept in service until at the time of receipt of the work.
- .2 Acceptance of the work will be required by the general contractor when the work under will be fully completed. The general contractor will make a joint written request with its subcontractor identifying the work of the subcontractor of the discipline "Electricity" are fully completed and ready for the reception. In the event that certain works are not completed, they must be clearly identified by the Contractor's request and justification to be appended.

The Departmental Representative will then determine whether the acceptance of work. Upon receipt of the request of the Contractor General, the Departmental Representative will, on schedule with the general conditions, a site visit and prepare a list of deficiencies. If it happened that there remains work to be completed or that the list of deficiencies is too great to justify the reception of the work (more than 0.5% of the value of work covered), the Contractor shall complete and / or correct its work before a list of deficiencies is issued.

- .3 Whichever occurs first, either under clause turnaround or from the date the Contractor General has asked the reception of the work and confirmed that these are completed, it will reimburse the owner of all fees and additional costs it must pay to the Departmental Representative in relation to extended services including surveillance, without limitation, all costs incurred for monitoring (in the office and on site) and travel expenses, subsistence and accommodation, for all additional visits to the scheduled visit to make a list of deficiencies and to that provided to ensure that all deficiencies have been corrected. The pace of site visits will be maintained as during the execution of works if the original schedule is exceeded.
- .4 The visit to check if all deficiencies are corrected will be done one month after issuing the list of deficiencies, in order to allow a reasonable time to correct deficiencies.

3.13 Electrical equipment support

- .1 In the general purpose areas, all electrical devices (switch, gutter, distribution panel, starter, box measuring, etc.) Must be installed on a plywood 19 mm thick, fireproof, painted gray, or media profiles. Use a fireproof paint.
- .2 In fire resistant areas, use metal supports such as galvanized steel profiles for mounting electrical appliances.
- .3 All wall-mounted plates are to be supplied and installed by general contractor.

3.14 Excavation, filling and concrete

- .1 Ensure that the excavation for electrical services is buried along the outline and depth indicated. Install protective materials around and over electrical services at the scene, and at all times during excavation and backfill.
- .2 The work must comply with Section 12 of the Quebec Construction Code, Chapter V, Electricity.
- .3 The excavation, backfilling are under the responsibility from other disciplines.

3.15 Extended future plans

- .1 In any place where a space was left free for future use, the Contractor shall see that this space is free, but must also install conduit and other equipment relating to its work so that future connections of equipment can be added without having to redo some of the facilities of electricity.

3.16 Access doors

- .1 The Contractor shall provide access panels as they are manufactured by a recognized manufacturer either located on floors, walls or ceilings. Each device is identified and its function will be described on a framed picture.
- .2 These accesses, wall and ceiling, will be made of steel with a base paint finishing and with doors and frames. The hatch can be mounted with concealed hinges and lock and key and barrel (a common key for all hatches for electricity). These traps will be 30 cm x 30 cm or more as minimum access to reach.
- .3 These access panels will be installed by the general contractor at the places indicated by the contractor of this field.
- .4 In places where suspended ceilings are provided in removable tiles, these will then be used as access hatches.
- .5 Access panels that are installed in walls and ceilings will have the same fire resistance as the wall or ceiling where they are installed.
- .6 Access panels must comply with the Building Code of Quebec, Chapter 1, Building and NBC, latest edition.

3.17 Uniformity and consistency

- .1 The Contractor shall comply perfect uniformity between the different systems for each specialty.
- .2 The Departmental Representative may at any time, prior to installation, if deemed necessary, move within 3 m any equipment such as equipment of ancillary services, fans, lights, switches, sockets, breakers circuits, transformers, lighting, etc.. at no additional cost. It is incumbent upon the contractor to coordinate with other trades and contractors representative and get the necessary approvals from Departmental Representative.
- .3 No light fixture shall be placed above the pipes, ducts or other obstructions.

- .4 All fittings used as pull boxes and junction boxes must be selected according to the requirements of the Building Code of Québec, chapter V, latest edition taking into account the number and the conductor and conduit involved.
- .5 Pull boxes and junction boxes must be located in protected areas and easily accessible.
- .6 Contractors should note that the plans provided to him as a guide and are sometimes on a smaller scale and do not always have Dimension. He must use his judgment and ensure that the accessories of these systems integrate well with the structure and architecture of the building.
- .7 For the same specialty or same trade, the equipment of the same type (eg, fluorescent fixtures, incandescent, starters, etc.) must come from a single manufacturer.

END OF SECTION

PART 1 – GENERAL

- .1 Generally, the plans and specifications are intended to describe the work required such as the establishment, installation, testing, material requirements, etc. to ensure full implementation of the work. Run all in accordance with standards, laws and regulations
- .2 The contractor is responsible for the proper execution of all work described in plans and specifications.
- .3 The general contractor is responsible to supply temporary services for electricity and telephone services for himself and the sub-contractors during the time of construction.
- .4 The contractor is responsible to ensure adequate coordination with subcontractors.
- .5 The equipment and specified materials establish minimum requirements of quality and performance.
- .6 Not limited to, the work is summarized in section 26 05 05.

1.1 Demand for power supply

- .1 Temporary electrical services including construction, if required, are excluded from this application and are the responsibility of the general contractor.
- .2 The contractor is responsible of the demand and coordination with Hydro-Quebec for the modification of the building service entrance

1.2 Other utilities

- .1 Request for service of other utilities (telephone, cable, municipal electric services, if applicable), are under the sole responsibility of the contractor.
- .2 Other requests for « temporary » public services required for construction period covered by the general contractor.

1.3 Relations between architectural, structural, mechanical and electrical documents

- .1 Plans, specifications and addenda of architectural, structural, mechanical or electricity complement each other and must be consulted and studied together to be aware of how this may affect the particular work of each trade. No additional amount will be paid to the contractor for not foreseeing the cost of all the work, travel and other similar work, etc. which are necessitated by the structure of the building or equipment, pipes and conduits, accessories or other items or work required.

1.4 Organisation of the specifications

- .1 This document covers the description and installation of all equipment which are generally used for making all types of electrical work.
- .2 The scope of work relating to these works is outlined in the plans and section 26 05 05 of the specifications.

END OF SECTION

PART 1 – GENERAL**1.1 General**

- .1 This section covers electrical works to perform.
- .2 Contractor shall provide necessary labour, equipments, cables, electrical conductors and ducts, documentation, devices, machinery, scaffolding supports, services, testing equipments, materials and all related components for building, delivery, installation, connection, testing, commissioning and warranty of equipments and materials for all works described in this section.
- .3 Conductors for each power supply of required caliber and disconnection for a steady state voltage drop under 3% in each feeder and branch.
- .4 Contractor shall perform works in accordance with any and all contractual requirements and must examine worksite and gather all details pertaining to existing conditions and limitations. Contractor shall be aware of problems that may arise during works; in no case will any claims be accepted if conditions are not respected due to negligence.
- .5 Contractor shall verify all plans of every discipline of current project to fully know every connections of which contractor is responsible. Should any electrical equipment become faulty after bad connections, electrical contractor will be held responsible along with contractor who provided said equipment.
- .6 Contractor shall start all connected equipments in presence of contractor who provided said equipments, to prevent defects or failures.

1.2 Scope of work

- .1 Works as described hereunder are not exhaustive. Works are described more specifically in documents, plans and drawings. All components or accessories necessary for a full and complete installation must be provided and installed, even if not specifically described to on documents.
 - .1 Carry out every dismantling and demolishing work required.
 - .2 Replace the current 120/240V 200A service entrance by a new 120/240V 600A service entrance. Coordinate the replacement with Hydro-Quebec and all the electrical shed interior refit needed.
 - .3 Supply, install and connect:
 - The new services kiosks (concerning everything but what is linked to water supply and the concrete slab). All the steel used for the structure must stainless or hot-dip galvanized with at least a paint primer and a coat of marine duty paint.;
 - The new distribution panel board on the wharf and in the electrical shed;
 - All the equipment needed for the new service entrance;
 - Street lights, bollard lights and recessed lights for pontoons;

- A new marine hydraulic crane (complete with its hydraulic unit). The connection of the hydraulic unit must be made according to manufacturer's recommendations. Coordinate concrete slab's size with General contractor based on where the conduit must rise out of the ground beside its control panel's location.
- Two new lighting control panels. One will be connected to the Department's panel board and the other to the panel board belonging to Carleton-sur-Mer. Each control panel must have at least:
 - A NEMA 1 cabinet painted in gray;
 - A removable backplate ;
 - A 120/240V lighting contactor. The latter will have a capacity of 60A with at least 8 poles for the Department and 30A with at least 4 poles for the local council ;
 - A ON/AUTO/OFF main switch ;
 - An astronomic clock and a photocell for the auto mode ;
 - Four (4) 15A circuit breakers for Carleton-sur-Mer's panel. Example :
 - Panel PC-02 : Circuit 1 : Lighting bollards ;
 - Panel PC-02 : Circuit 2 : Street lights ;
 - Eight (8) 15A circuit breakers the Department's panel. Example :
 - Panel PC-01 : Circuit 1 : 350W lights for Crane #1 ;
 - Panel PC-01 : Circuit 2 : 350W lights for Crane #2 ;
 - Panel PC-01 : Circuit 3 : Other 108W street lights ;
 - Panel PC-01 : Circuit 4 : Existing 400W HPS lights ;
 - Panel PC-01 : Circuit 5 : Recessed lights on pontoons ;
 - **IMPORTANT: A GFCI breaker must be provided.**
 - Panel PC-01 : Circuit 6 : Floodlight on the breakwater wharf.
 - Panels must be CSA approved.

.4 Supply and install:

- The two electrical circuits (conductors, conduits, breakers, etc.) needed for the signal light and the floodlight at the breakwater wharf's end. Both lights will be supplied and installed by others;
- An additional electrical circuit (conduits and breaker only) for another marine crane identical to the first one and which will be supplied and installed by others on a long time scale.

- All the prefabricated concrete pullboxes needed and the underground duct network for all the new loads;
 - Waterproof marine cables, corrosion resistant, complete with plugs and receptacles also waterproof. These cables will be installed between each pontoons and between the last pontoon and watertight junction boxes (BJ-01 and BJ-02) located on the breakwater wharf to allow a quick and easy disconnection of cables for winter storage.
 - The marine cable for the services kiosk must be installed in a tray or on a set of non-metallic supports. The cable must be accessible to be completely removed and must not be harmful or be damaged by boats.
 - Plugs and receptacles must twist-lock and attached to pontoons at an accessible location.
 - Due to necessary wire gage for recessed lights, non-metallic watertight junction boxes must be use at each pontoon to provided sealed connections. These boxes will be installed under the deck surface.
 - The junction boxes BJ-01 and BJ-02 must be waterproof, made of stainless steel and of type NEMA 4X. The lattes will serve as a link between conductors from underground duct bank and flexible cables described above (cable for the service kiosk and the two cables for recessed lights);
 - The junction box must also have three twist-lock receptacles on the load side (one for each circuit) and must be attached to a raised support resistant to corrosion and anchored to concrete or attached to the permanent ramp giving access to pontoons;
 - Contrary to receptacles required on the wharf, plugs and receptacles used to create these two « permanent » electrical circuits yet easily disconnectable are allowed to be of a non-NEMA type as long as they are approved for a use in Canada (CSA/cUL).
- .5 Connect:
- An access control system supplied by others and made of a barrier, a magnetic card reader with keyboard and two detection loops for vehicules to operate the barrier.
 - NOTE: If detection loops arent provided with the barrier, loops shall be provided by the electrician contractor.
- .6 The complete installation must assure a level of corrosion resistance. In order to achieve this, all mounting accessories exposed to weather must be stainless steel. Conduits installed outdoor should be preferably in threaded black steel PVC covered or otherwise made of PVC. All conduits installed underground must be made of PVC DB/2 type.
- .7 Each time a PVC conduit rise out of the ground, provide an additional length for the installation of a transition coupling.

- .8 Perform a close coordination with other trades
- .9 Shutdowns must be as limited as possible.

1.3 General contractor

- .1 General contractor is responsible for providing materials and completing the following works:
 - .1 Installation of required concrete for electrical equipment bases;
 - .2 Excavation, backfilling, compaction and concreting;
 - .3 Concrete molds.

1.4 Shop drawings for submittal

- .1 The list of shop drawings to submit for review is included as Appendix “C”.

1.5 Cable list

- .1 The cable list is included as Appendix “E”.

PART 2 – PRODUCTS

2.1 Electrical equipments

- .1 All main electrical equipments are shown on drawings;

2.2 Lighting equipments list

- .1 Contractor to coordinate lighting equipments and accessories voltages as described on plans.
- .2 List of lighting equipments in Appendix "A".

2.3 Pullboxes

- .1 The contractor must supply prefabricated pullbox with cast iron covers. If conduit holes aren't prefabricated in the walls, the contractor must validate with the manufacturer that conduit holes won't negatively affect the reinforced concrete structure.
- .2 Reinforced concrete must conform to standards: NQ 2622-420, ASTM C 478, 857, 890.

2.4 Panelboard

- .1 Two new panelboards are required. Consult drawing number E-03.

2.5 Motors/starters

- .1 Included with the marine crane. Consult Appendix « B ».

2.6 Specific electrical equipment

- .1 Marine hydraulic crane. Consult Appendix « B » ;

2.7 List of materials to submit to owner

- .1 List of material to give to the owner is included in Appendix "D".

PART 3 – EXECUTION

3.1 Neutral conductor

- .1 Connect neutral conductors to common neutral omnibus bar. Identify each neutral conductor appropriately.
- .2 Fit every 120ACV circuit with own neutral conductor. Do not use a common neutral conductor for multiple circuits. Branches may be fitted with a common neutral in accordance with Code de Construction du Québec.

3.2 Circuit breakers rupture capacity

- .1 Rupture capacity of circuit breakers to meet the following:
 - A) To full nominal value.

END OF SECTION

APPENDIX A

List of lighting equipments

October 2018

LIST OF LIGHTING EQUIPEMENTS**To be given to Carleton-sur-Mer's council**

1. 30 ft high galvanized steel round pole painted in black color with 5 inches diameter. The paint must be of a marine type resistant to salty environments and including at least a paint primer and a coat of paint. Steel gage and diameter must be confirmed by the contractor and the manufacturer before ordering in order to be conforming for a use in the climatic zone in which Carleton-sur-Mer is part of. Model number from *Industries Précisions Plus* is PP-SRS-5-30-HAB-BK-1T (or approved equivalent)

The light shall be from Lumec, model CAND1-65W2LED-3K-G2-CGB-RLE3 and the arm from Lumec as well, and model PC-TBD-1A-BKTX. The light and the arm shall be painted in black or textured black. The lamp will be a 3000°K LED type, of distribution type III, connected to 120V and without photocell. The paint must be of a marine type resistant to salty environments and including at least a paint primer and a coat of paint.

Important notice: During shop drawings review phase, design notes regarding the pole/stem/lighting set up for Carleton-sur-Mer region must be submitted signed and sealed by an engineer member of the OIQ.

2. Lighting bollard in aluminium painted in textured black color from Lumec, model CALB2-6LEDW-120-BKTX. The paint must be of a marine type resistant to salty environments and including at least a paint primer and a coat of paint. The lamp will be a 3000°K LED type, of distribution type V, connected to 120V and without photocell.

To the Department:

3. 30 ft high galvanized steel square pole painted in black color with 5 inches diameter. The paint must be of a marine type resistant to salty environments and including at least a paint primer and a coat of paint. Steel gage and diameter must be confirmed by the contractor and the manufacturer before ordering in order to be conforming for a use in the climatic zone in which Carleton-sur-Mer is part of. Model number from *Industries Précisions Plus* is PP-SSS-5-30-HAB-BK-2T (or approved equivalent). The front stem shall have 6 ft long and the left one (at 90 degrees) 4 ft long. The two lights shall be from Philips, models RFL-350W112LED-4K-G2-R3S and RFM-108W48LED4K-G2-4. The light and the arm shall be painted in black or textured black. The lamp will be a 4000°K LED type, of distribution type III and IV respectively, connected to two different 120V circuits and without photocell. The paint must be of a marine type resistant to salty environments and including at least a paint primer and a coat of paint.

Important notices: During shop drawings review phase, design notes regarding the concrete base/pole/stem/lighting set up for Carleton-sur-Mer region must be submitted signed and sealed by an engineer member of the OIQ.

Indicate the presence of two separate electrical supplies.

By default, RFM and RFL lights don't have a paint primer plus a coat of marine paint.

October 2018

ELECTRICAL – GENERAL INFORMATION,
ON WORKS

4. 30 ft high galvanized steel square pole painted in black color with 5 inches diameter. The paint must be of a marine type resistant to salty environments and including at least a paint primer and a coat of paint. Steel gage and diameter must be confirmed by the contractor and the manufacturer before ordering in order to be conforming for a use in the climatic zone in which Carleton-sur-Mer is part of. Model number from *Industries Précisions Plus* is PP-SSS-5-30-HAB-BK-1T-6FT (or approved equivalent).

The light shall be from Philips, model RFM-108W48LED4K-G2-4. The light and the arm shall be painted in black or textured black. The lamp will be a 4000°K LED type, of distribution type IV, connected to 120V and without photocell. The paint must be of a marine type resistant to salty environments and including at least a paint primer and a coat of paint.

Important notices: During shop drawings review phase, design notes regarding the concrete base/pole/stem/lighting set up for Carleton-sur-Mer region must be submitted signed and sealed by an engineer member of the OIQ.

By default, RFM and RFL lights don't have a paint primer plus a coat of marine paint.

5. 30 ft high galvanized steel square pole painted in black color with 5 inches diameter. The paint must be of a marine type resistant to salty environments and including at least a paint primer and a coat of paint. Steel gage and diameter must be confirmed by the contractor and the manufacturer before ordering in order to be conforming for a use in the climatic zone in which Carleton-sur-Mer is part of. Model number from *Industries Précisions Plus* is PP-SSS-5-30-HAB-BK-2T (or approved equivalent). Both stems shall have 4 ft long. One shall be located at the front and the other one on the left or right side (90 degrees) depending from posts to posts.

The two lights shall be from Philips, models RFL-350W112LED-4K-G2-R3S and RFM-108W48LED4K-G2-4. The light and the arm shall be painted in black or textured black. The lamp will be a 4000°K LED type, of distribution type III and IV respectively, connected to two different 120V circuits and without photocell. The paint must be of a marine type resistant to salty environments and including at least a paint primer and a coat of paint.

Important notices: During shop drawings review phase, design notes regarding the concrete base/pole/stem/lighting set up for Carleton-sur-Mer region must be submitted signed and sealed by an engineer member of the OIQ.

Indicate the presence of two separate electrical supplies.

By default, RFM and RFL lights don't have a paint primer plus a coat of marine paint.

6. Low-voltage recessed light made of stainless steel to be installed on floating pontoons. Catalog number 2021-30SS from *WAC Lighting* (or approved equivalent). The lamp will be a 3000°K LED and connected to 12-15V circuits supplied by a 300 VA minimum very low-voltage transformer to be supplied separately. The very low voltage transformer must be in a stainless steel NEMA 4X watertight enclosure (BJ-02) including a grounded backplate and protected at least by a primary fuse according to Code.

Important notices: A test with one light must be done during the evening, night or in a dark room with the site supervisor before the installation on site. The vertical light beam must be visible at a horizontal distance of at least 3 m.

APPENDIX B

Particular electrical equipment

APPENDIX B

MARINE HYDRAULIC CRANE	
MAKE:	Hydronav or equivalent.
MODEL :	Articulated jib crane, HLM 5-2S or equivalent
<p><u>HYDRAULIC CRANE</u></p> <p>General description</p> <ul style="list-style-type: none"> - The new marine crane with articulated jib must be rated marine duty. <p>Operational requirements</p> <ul style="list-style-type: none"> - The proposed articulated jib crane must have a lift capacity of at least 3050 kg with safe working load (SWL) of at least 750 kg at an hydraulic range of at least 6.95 meters. - A maximum torque of 5.5 T*m, a slewing angle of 360 degrees and a slewing torque of 1100 kg*m. <p>Crane's physical characteristics</p> <ul style="list-style-type: none"> - A crane weight « empty » must be below 1000 kg; - The base must be able to be bolted to a concrete slab. <p>Structure</p> <ul style="list-style-type: none"> - The crane's rotation system must allow soft starts and stops. <p>Cylinders</p> <ul style="list-style-type: none"> - Hydraulic cylinders are equipped with check valves to prevent cylinders movement in case of a hydraulic pressure drop. - Outside parts are made of stainless steel but are also painted and treated against marine corrosion. - Cylinder rods are made of high quality Cr + Cr <p>Surface treatment</p> <ul style="list-style-type: none"> - All external surface treatments are adapted for saline environments and to provide a long time corrosion resistance. <ul style="list-style-type: none"> • External surfaces sandblasted Sa 2,5 • Hot dip zinc galvanization of 100 µm thick dry. • 1st intermediate layer : Intergard 269 or equivalent of 40 µm thick dry. • 2nd intermediate layer : Intergard 475 HS or equivalent of 130 µm thick dry. • Top coat : Interfine 878 without isocyanate or equivalent of 70 µm thick dry. - Total thickness dry : 350 µm 	

APPENDIX B

Piping

- Hydraulic stainless steel 316 pipes must can be DIN standard or following ISO standard. All fittings must also be in stainless steel 316.
- Flexible hoses fittings should be in zinc plated steel with a rubber coating to protect against water infiltration.
- Flexibles hydraulic hoses must be protected by a plastic spiral sheath.

Control

- Weatherproof control valves with 5 functions (4 for the crane and 1 for the winch). An hydraulic emergency stop function must be factory implemented in the directionnal control.
- An overload protection system must be included.

Winch

- The drum must have at least 50m of 3/8 inch diameter wire.
- The wire must made of stainless steel and be twist-free.
- The winch must have an automatic break system and a proportionnal command allowing variable speeds from very slow (1 m/min) up to maximum speed.
- The winch's command must have a security feature controlled by integrated limit switches.

HYDRAULIC UNIT**Tank**

- A tank of suffisant capacity to provide enough volume for the pump. Equipped with a manual level indicator.

Motor

- Electrical motor, 7.5 HP, 230V, 60 Hz, 1 phase. 1800 RPM TEFC

Pump

- Pump of a suffisant size allowing to provide enough volume and pression to equipments.

Filtration

- Standard filtration system.

APPENDIX B**Control panel**

- The control panel must have the following characteristics :
 - Control panel with handle and lock made of stainless steel
 - Stainless steel NEMA 4X enclosure
 - 30A fused security switch
 - Control transformer, protected by fuses
 - Motor stater FVNR 10HP 230 V/1 ph/60 Hz protected by a breaker
 - 2 push buttons (1 run 1 stop)
 - Lamps (POWER ON & OVERLOAD), name plates, terminal blocks, wires, cable trays, etc.
 - The supplier must supply CAD drawings and the whole panel must be approved CSA.

Protection aux intempéries

- The hydraulic unit must in enclosed in an aluminium enclosure coated with a corrosive resistant coating made of a primer and at least a coat of paint.
- The enclosure must adequately ventilated.
- The enclosure must have a front access door.
- The control panel can be located outside the enclosure.

APPENDIX C

List of shop drawings to submit

SHOP DRAWINGS TO SUBMIT

FOLLOW-UP TABLE

CONTRACTOR:	PROJECT: Reconstruction of Carleton-sur-Mer wharf
	PROJECT MANAGER : Élisabeth Marceau, ing.
TRADE:ÉLECTRICITY	FILE N° : 721198 (Department) / 117036.001 (Norda)

[illegible]

Prepared by : Daniel Siméon, Eng., P. Eng.

Date: 2018-10-12

APPENDIX D

List of materials to give to owner

MATERIAL TO GIVE TO THE OWNER

FOLLOW-UP TABLE

CONTRACTOR:	PROJECT: Reconstruction of Carleton-sur-Mer wharf
	PROJECT MANAGER : Elisabeth Marceau, ing., M. Sc.
TRADE: ELECTRICITY	FILE N° : 721198 (Department) / 117036.001 (Norda)


[illegible]

Prepared by : Daniel Siméon, Eng., P. Eng.

Date: 2018-10-12

APPENDIX E

Cable list

<div>  <div> <div>Client: M.P.O</div> <div>Projet : Reconstruction du Quai de Carleton</div> </div> <div> <div>Liste des câbles électrique</div> <div>Émission : Pour soumission</div> </div> <div> <div>No de projet : 117036.001</div> <div>Date : Octobre 2018</div> <div>Document:</div> <div>Rev : 01</div> </div> </div>										
Rev.	Numéro câble	Calibre Isolation	Type Couleur	Départ Raccordé par	Cheminement	Destination Raccordé par	Longueur [m]	Fourni par	Dessin raccordement	Puissance raccordée Chute de tension calculée
		2 x 1c #1/0 Cu 1 x 1c #6 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 100A, 2 pôles Entrepreneur	Canalisations souterraines Conduits #9, 9A	Grue Marine HO-01 Entrepreneur	220	Entrepreneur		Moteur 7.5 HP / 40 A 2.56%
		2 x 1c #1 Cu 1 x 1c #8 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 100A, 2 pôles Raccordé par d'autres	Canalisations souterraines Conduits #9, 27	Grue Marine HO-02 Fourni et raccordé par d'autres	143	Par d'autres		Moteur 7.5 HP / 40 A 2.53%
		3 x 1c #3/0 Cu 1x 1c #6 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 70A, 2 pôles+N Entrepreneur	Canalisations souterraines Conduit #11, 30, 35	BJ-01 (pour îlot pontons) Entrepreneur	275	Entrepreneur		40A (îlot de services C) 2.15%
		1 x 4c #2 Cu	STOW jaune	BJ-01 (pour îlot pontons) Entrepreneur	Chemin de câbles	îlot de service C (pontons) Entrepreneur	35	Entrepreneur		40A (îlot de services C) 0.69%
		2 x 1c #2 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	PS-02, disjoncteur 15A, 1 pôle Entrepreneur	Canalisations souterraines Conduit #10	îlot de service D (ville) Entrepreneur	250	Entrepreneur		12A (îlot de service D) 2.96%
		2 x 1c #2 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	PS-02, disjoncteur 15A, 1 pôle Entrepreneur	Canalisations souterraines Conduit #10	îlot de service D (ville) Entrepreneur	250	Entrepreneur		12A (îlot de service D) 2.96%
		2 x 1c #1/0 Cu 1x 1c #6 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduit #10	îlot de service D (ville) Entrepreneur	250	Entrepreneur		16A (îlot de service D) 2.48%
		2 x 1c #1/0 Cu 1x 1c #6 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduit #10	îlot de service D (ville) Entrepreneur	250	Entrepreneur		16A (îlot de service D) 2.48%
		2 x 1c #2 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 30A, 2 pôles Entrepreneur	Canalisations souterraines Conduit #10	îlot de service D (ville) Entrepreneur	250	Entrepreneur		24A (îlot de service D) 2.96%
		6x 1c #4/0 Cu 2x 1c #4 Cu	RW90 0.6kV RW90 vert	Sectionneur 400/600A Entrepreneur	Canalisations souterraines Conduits #8 et #12, 24 et 26	Panneau de distribution Quai, PS-03 Entrepreneur	210	Entrepreneur		148.8A (2x îlots de service B) 2.49%
		3x 1c 1250MCM Cu	RW90 0.6kV	Poteau de branchement (mât) Entrepreneur	Canalisations souterraines et en surface	Caniveau de répartition 600A Entrepreneur	25	Entrepreneur		480A 0.33%
		2 x 1c #6 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduits 25, 5	îlot de service B2 Entrepreneur	40	Entrepreneur		16A (îlot de service B2) 1.59%
		2 x 1c #6 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduits 25, 5	îlot de service B2 Entrepreneur	40	Entrepreneur		16A (îlot de service B2) 1.59%
		2 x 1c #8 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 30A, 2 pôles Entrepreneur	Canalisations souterraines Conduits 25, 5	îlot de service B2 Entrepreneur	40	Entrepreneur		24A (îlot de service B2) 1.93%
		2 x 1c #4 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 50A, 2 pôles Entrepreneur	Canalisations souterraines Conduits 25, 5	îlot de service B2 Entrepreneur	40	Entrepreneur		40A (îlot de service B2) 1.27%
		2 x 1c #4 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduits #23, 5, 5A	îlot de service B1 Entrepreneur	70	Entrepreneur		16A (îlot de service B1) 1.75%
		2 x 1c #4 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduits #23, 5, 5A	îlot de service B1 Entrepreneur	70	Entrepreneur		16A (îlot de service B1) 1.75%
		2 x 1c #6 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 30A, 2 pôles Entrepreneur	Canalisations souterraines Conduits #23, 5, 5A	îlot de service B1 Entrepreneur	70	Entrepreneur		24A (îlot de service B1) 2.09%
		2 x 1c #4 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	Panneau PS-03, disj. 50A, 2 pôles Entrepreneur	Canalisations souterraines Conduits #23, 5, 5A	îlot de service B1 Entrepreneur	70	Entrepreneur		40A (îlot de service B1) 2.23%



Client: M.P.O
Projet : Reconstruction du Quai de Carleton

No de projet : 117036.001
Date : Octobre 2018
Document:
Rev : 01

Liste des câbles électrique
Émission : Pour soumission

Rev.	Numéro câble	Calibre Isolation	Type Couleur	Départ Raccordé par	Cheminement	Destination Raccordé par	Longueur [m]	Fourni par	Dessin raccordement	Puissance raccordée Chute de tension calculée
		3 x 1c #10 Cu 1x 1c #14 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 15A, 2 pôles+N Entrepreneur	Canalisations souterraines Conduits #11, 31, 32	Projecteur brise-lame Raccordé par d'autres	330	Entrepreneur		160W (projecteur brise-lame) 2.76%
		3 x 1c #10 Cu 1x 1c #14 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 15A, 2 pôles+N Entrepreneur	Canalisations souterraines Conduits #11, 31, 34	Feu d'atterrage Raccordé par d'autres	330	Entrepreneur		19W (feu d'atterrage) 0.52%
		2 x 1c #6 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduits #5, 15	Ilot de service A1 Entrepreneur	60	Entrepreneur		16A (ilot de service A1) 2.39%
		2 x 1c #6 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduits #5, 15	Ilot de service A1 Entrepreneur	60	Entrepreneur		16A (ilot de service A1) 2.39%
		2 x 1c #6 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 30A, 2 pôles Entrepreneur	Canalisations souterraines Conduits #5, 15	Ilot de service A1 Entrepreneur	60	Entrepreneur		24A (ilot de service A1) 1.79%
		2 x 1c #4 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduits #5, 16	Ilot de service A2 Entrepreneur	110	Entrepreneur		16A (ilot de service A2) 2.39%
		2 x 1c #4 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 20A, 1 pôle Entrepreneur	Canalisations souterraines Conduits #5, 16	Ilot de service A2 Entrepreneur	110	Entrepreneur		16A (ilot de service A2) 2.39%
		2 x 1c #4 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 30A, 2 pôles Entrepreneur	Canalisations souterraines Conduits #5, 16	Ilot de service A2 Entrepreneur	110	Entrepreneur		24A (ilot de service A2) 1.64%
		2 x 1c #12 Cu 1x 1c #14 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 15A, 1 pôle Entrepreneur	Canalisations souterraines Conduit #13	Barrière motorisé Entrepreneur	30	Entrepreneur		50 VA 0.13%
		2 x 1c #12 Cu 1x 1c #14 Cu	RW90 0.6kV RW90 vert	Barrière motorisée Entrepreneur	Canalisations souterraines Conduit #14	Lecteur de carte magnétique Entrepreneur	15	Entrepreneur		5 VA (alimentation électrique) 0.01%
		2 x 1c #14 Cu	RW90 0.6kV	Lecteur de carte magnétique Entrepreneur	Canalisations souterraines Conduit #14	Barrière motorisée Entrepreneur	15	Entrepreneur		1 VA (contact sec) 0.01%
		2 x 1c #6 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	PS-01, disjoncteur 60A, 1 pôle Entrepreneur	Conduit électrique métallique Mural	Panneau contrôle éclairage PC-01 Entrepreneur	5	Entrepreneur		3535 W 0.37%
		2 x 1c #2 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	Panneau contrôle éclairage PC-01 Entrepreneur	Canalisations souterraines Conduits #6, 17 à 22, 28, 29	Luminaires DEL 350W Entrepreneur	315	Entrepreneur		1400 W (350 W x 4) 2.78%
		2 x 1c #4 Cu 1x 1c #8 Cu	RW90 0.6kV RW90 vert	Panneau contrôle éclairage PC-01 Entrepreneur	Canalisations souterraines Conduits #6, 17 à 22, 28, 29	Luminaires DEL 108W Entrepreneur	375	Entrepreneur		540 W (108 W x 5) 1.91%
		2 x 1c #6 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	Panneau contrôle éclairage PC-01 Entrepreneur	Canalisations souterraines Conduit #2	Luminaires SHP 400W Entrepreneur	115	Entrepreneur		1395 W (465W x 3) 2.42%
		2 x 1c #6 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	Panneau contrôle éclairage PC-01 Entrepreneur	Canalisations souterraines Conduits #6, 30, 33	BJ-02 (pour éclairage pontons) Entrepreneur	275	Entrepreneur		200 VA (luminaires encastrés) 1.14%
		1 x 3c #2 Cu	STOW jaune	BJ-02 (pour éclairage pontons) Entrepreneur	Chemin de câbles	Luminaires encastrés (16) Entrepreneur	50	Entrepreneur		100 VA (luminaires encastrés) 2.63%
		1 x 3c #2 Cu	STOW jaune	BJ-02 (pour éclairage pontons) Entrepreneur	Chemin de câbles	Luminaires encastrés (16) Entrepreneur	50	Entrepreneur		100 VA (luminaires encastrés) 2.63%
		2 x 1c #10 Cu 1x 1c #14 Cu	RW90 0.6kV RW90 vert	PS-02, disjoncteur 30A, 1 pôle Entrepreneur	Conduit électrique métallique Mural	Panneau contrôle éclairage PC-02 Entrepreneur	5	Entrepreneur		225 W 0.06%
		2 x 1c #8 Cu 1x 1c #10 Cu	RW90 0.6kV RW90 vert	Panneau contrôle éclairage PC-02 Entrepreneur	Canalisations souterraines Conduit #7	Luminaires décoratifs DEL 65W Entrepreneur	315	Entrepreneur		195 W (65 W x 3) 1.91%
		2 x 1c #12 Cu 1x 1c #14 Cu	RW90 0.6kV RW90 vert	Panneau contrôle éclairage PC-02 Entrepreneur	Canalisations souterraines Conduit #7, 36	Luminaires décoratifs DEL 6W Entrepreneur	360	Entrepreneur		30 W (6 W x 5) 0.90%

PART 1 – GENERAL

1.1 Related requirements

- .1 Wire and Box connectors, materials, related materials and their installations

1.2 References

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2 No.65-Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.3 Waste management and disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 – PRODUCTS

2.1 Materials

- .1 Pressure type wire connectors to: with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 NEMA to consist of:
 - .1 Connector body and stud clamp for copper
 - .2 Clamp for stranded copper conductors.
 - .3 Clamp for stranded aluminum ACSR conductors

- .4 Stud clamp bolts.
- .5 Bolts for copper conductor or bar.
- .6 Bolts for aluminum conductor bar.
- .7 Sized for conductors and bars as indicated.
- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required
- .5 Watertight approved for TECK Cable

PART 3 – EXECUTION

3.1 Installation

- .1 Install the connectors as per manufacturer`s recommendations for bar connection.
- .2 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws [with appropriate compression tool recommended by manufacturer]. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2, NEMA.
 - .5 Contractor must prove that each screw has been tightened as per manufacturer`s recommendation.

END OF SECTION

PART 1 - GENERAL**1.1 Related requirements**

- .1 This section applies to copper conductors, ACM Alloy conductors and aluminum conductors designed for nominal voltages from 0 to 1000 volts, and the ducts and most common electrical insulators.

1.2 References

- .1 Québec Construction Code, Chapter V, Electricital.
- .2 CSA C22.2 no 0.3, Testing methods for Electrical Cables and Wires.

1.3 Product DATA

- .1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures et 26 05 00 – Electrical General Requirements.
- .2 Perform electrical test methods in accordance with section 26 05 00 – Electrical General Requirements.

1.4 Delivery, storage and handling

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 – PRODUCTS**2.1 Building wires**

- .1 Where cables assemblies are specified to have a PVC overall covering it may be required to comply to the Vertical Tray Fire Test of CSA C22.2 No.0.3 for the applicable Building Code classification of the project as it relates to the actual installed location.
- .2 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .3 Copper conductors: size as indicated, with 1000V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.
- .4 Use insulated wiring of 1000 V for motors controlled by variable frequency.
- .5 At least one insulated GREEN conductor of minimum size 12 AWG is required.

2.2 Teck 90 cable

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .1 Grounding conductor: copper.

- .2 Circuit conductors: copper size as indicated.
- .3 Insulation: Cross-linked polyethylene XLPE. Rating: 1 000 V. Inner jacket: polyvinyl chloride material. Armour: aluminum sheet.
- .4 All Teck Cables will be of type 90 with exterior PVC sheathing. Comply with CAN/CSA-C22.2 no 131 and 174 for hazardous locations (HL) and Fire retardant (FT-4).
- .5 Teck Cables, when installed in cable trays, must meet the Québec Standards Building Code, Chapter V – *Electricité* section 4 and 12, as well as adjustment factors relevant to tables 5A and 5D.
- .6 Fastenings:
 - .1 One-hole steel straps to secure surface cables 50 mm and smaller. Two-hole steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables at 1.5 mm centers.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .7 Connectors:
 - .1 Watertight, explosion-proof approved for TECK cable.

2.3 Conductors exposed to sunlight

- .1 Insulated wires and power cables directly exposed to sunlight have to be protected specifically approved for such use and be labeled accordingly.

PART 3 – EXECUTION

3.1 Field quality control

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 General cable installation

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.
- .7 Drop cables in trenches in accordance with section 33 71 73.02 – Underground electrical service.
- .8 Drop cables in cable trays in accordance with section 26 05 36 – Cable Trays for Electrical Systems
- .9 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

3.3 Installation of building wires

- .1 Unless otherwise stated, all wiring must be under conduit.
- .2 Use the types of conduits or pipe in accordance to the requirements of the respective section.

3.4 Installation of teck 90 cable (0-1000 V)

- .1 Install cable as indicated securely supported by staples, straps or hangers.
- .2 when there are 2 cables in the same course, bind them in a «U».
- .3 When there are two cables on the same path in the building, Teck cables must be installed in cable shelves.
- .4 Cable terminations in accordance with section 26 05 20 - Wire and Box Connectors 0 - 1000V.

END OF SECTION

PART 1 – GENERAL

1.1 References

- .1 Canadian Standards Association, (CSA International)
- .2 Grounding equipment based on CSA C22.2 No. 41.
- .3 CAN/CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.2 Waste management and disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS

2.1 Equipment

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.
- .3 Rod electrodes: copper clad steel 19 mm diameter by 3 m long.
- .4 Plate electrodes: copper, surface area 0.2 m², 1.6 mm thick.
- .5 Grounding conductors: bare stranded copper, tinned, soft annealed size as indicated.
- .6 Insulated grounding conductors: green, type RW-90, size as indicated.
- .7 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .8 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.

- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.
- .7 Compression connectors

2.2 Manufacturer

- .1 Accepted Manufacturers: Thomas & Betts for mechanical joints and Cadwell or Thermoweld for welded joints by aluminothermy or Burndy

PART 3 – EXECUTION

3.1 Installation general

- .1 Install complete permanent, continuous grounding system including, electrodes (minimum 3 per site), conductors, connectors, as indicated, to satisfy the requirements of the Departmental Representative and local authorities.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted unless they complete the installation of a compression joint.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Install zig-zag grounding transformer [on line side of main interrupter].
- .11 Make grounding connections in radial configuration only, with connections terminating at street side of water pipe. Avoid loop connections.
- .12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

- .13 Ground secondary service pedestals.

3.2 Electrodes

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.
- .3 Make the connection for continuity of mass with at minimum a 6 AWG conductor at the nearest point of entry from the connection of all metallic network of water when it is not used as a ground.
- .4 Also ensure that continuity of all gas distributing metal piping under pressure and make connection to conductors of the main ground.
- .5 Install electrode embedded in concrete footings of the foundation of the building, and connect the terminals to the grounding network.
- .6 Install the electrode plates or rods and make connections to ground as indicated. Coordinate with the general contractor of the rock drilling rods for installation.
- .7 Bond separate, multiple electrodes together.
- .8 Use copper conductors for connections to electrodes, size as indicated.
- .9 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevail as per Quebec Construction Code. Make connections as indicated.
- .10 Install a junction box (access) bottomless fiber on each rod in order to simplify the location in the soil. The box must not exceed 150 mm, finished grade.

3.3 System and circuit grounding

- .1 Install system and circuit grounding connections to neutral of primary 347/600 V system, secondary 120/208 V, 120/240 V system.

3.4 Equipment grounding

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.5 Grounding bus

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections, size as indicated.

3.6 Communication systems

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements or manufacturer.
 - .2 Sound System and Intercom: ground all lines and cable tray under the guidance and direction of manufacturer.
 - .3 Sound, fire alarm, intercommunication systems as indicated by manufacturer.

3.7 Field quality control

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation. Give a copy of the results to the Departmental Representative. Tests should be performed by a specialized firm and signed by an engineer.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 – GENERAL**1.1 Related requirements**

- .1 This Section specifies U shape support channels either surface mounted, suspended or set in poured concrete walls and ceilings.

1.2 Waste management and disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS**2.1 Support channels**

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended, or set in poured concrete walls and ceilings.
- .2 Installation accessories such as threaded rods, bolts, washers, nuts, spring nuts, etc., or steel plated, chrome or zinc.
- .3 Galvanized products according to CAN/CSA-G164 standards.
- .4 Fasteners used outdoors or in wet areas must be stainless steel.
- .5 Inside pontoons only: Non-metallic U shape, minimal size 41 x 41 mm and 2.5 mm thick.

PART 3 – EXECUTION**3.1 Installation**

- .1 Refer to Section 01 61 00 - Common Product Requirements for fastenings and supports.
- .2 Secure equipment to hollow, solid, masonry, tile and plaster surfaces with lead anchors or nylon shields.

- .3 Secure equipment to poured concrete with expandable inserts.
- .4 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .5 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .6 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .7 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .8 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .9 For surface mounting of two or more conduits use channels at 1 m on centre spacing.
- .10 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .11 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .12 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .13 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .15 Coat with galvanized parts all surfaces that are scratched, altered or cut.
- .16 For non-metallic channels, all cuts must be treated with waterproofing agent.

END OF SECTION

PART 1 – GENERAL**1.1 References**

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-[06], Canadian Electrical Code, Part 1, current edition.
 - .2 Splitters are referenced to comply with CSA C22.2 No. 76.
 - .3 Junction and pull boxes are referenced to comply with CSA C22.2 No. 40.

1.2 Action and informational submittals

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures and 26 05 00 – Common Work Results For Electrical.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Section 26 05 00 - Common Work Results For Electrical.

1.3 Delivery, storage and handling

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 – PRODUCTS**2.1 Splitters**

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position. NEMA 12.
- .2 Terminations: main and branch lugs, connection blocks to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 Junction and pull boxes

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.

SPLITTERS, JUNCTION, PULL BOXES AND CABINETS

October 2018

Page 2 of 3

- .3 Covers Surface Mounted: 150 x 150, must be fitted with hinges, with the exception of those installed in pontoons dedicated to recessed lights.
- .4 Junction boxes installed in pontoons must be made of fiber reinforced polyester with thick walls and of type NEMA 4X.

2.3 Cabinets

- .1 Type E Empty: Sheet steel enclosure for surface mounting with sides and folded edges overlapping fitted with hinged door, handle, lock and a latch.
- .2 Type T Terminal: surface return flange, flush overlapping sides mounting as indicated containing 19 mm thick, sheet steel backboard.
- .3 Construction: welded [sheet steel] [aluminum] [as indicated] hinged door, [handle], [latch] [lock 2 keys] and catch

2.4 Connections

- .1 Insulated metal bushings and connectors with nylon insulated groove, size no. 8 AWG or more.
- .2 Pressure pads to prevent debris to penetrate the outlets.
- .3 Access fittings for pipes up to 35 mm in diameter and pull boxes for larger conduits.
- .4 Locking nuts and insulated metal bushings on sheet metal box.

2.4 Pull pits

- .1 Prefabricated reinforced concrete pull pit with cast iron cover and waterproof seals.
- .2 If the bottom isn't opened, drill holes or cut an opening to let water flow.

PART 3 – EXECUTION**3.1 Splitter installation**

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 Junction, pull boxes and cabinets installation

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install additional pull boxes so as not to exceed 30 m of conduit run between pull boxes or 4-90 degree elbows.
- .5 Supply terminal blocks in the junction boxes containing more than 4 joints.
- .6 Inside pontoons, install junction boxes for recessed lights on non-metallic U-channel. All cuts must be treated with waterproofing agent. All hardware used to installed boxes or channels must be in stainless steel. It is forbidden to use screws.

3.3 Identification

- .1 Equipment Identification: to Section 26 05 00- Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name voltage and phase or as indicated.

3.2 Pull pits installation

- .1 Install pull pits according to drawings and plumbed on a sitting of clean stones 10-20 mm.
- .2 To support cables passing through, install corrosion resistant angle irons with polypropylene resin cable supports ou equivalent. All hardware must be in stainless steel or in plastic.

END OF SECTION

PART 1 – GENERAL

1.1 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1, 20th Edition.
 - .2 Outlet boxes, conduit boxes and fittings are based on CSA C22.2 No. 18.

1.2 Action and informational submittals

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 26 05 00 – Common work results for electrical
- .2 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures and Section 26 05 00 – Common work result for electrical.

1.3 Delivery, storage and handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 – PRODUCTS

2.1 Outlet and conduit boxes general

- .1 Size boxes in accordance with the Quebec construction code, chapter V, Electrical.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 Galvanized steel outlet boxes

- .1 One-piece electro-galvanized construction. Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 102 mm extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 Masonry boxes

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 Concrete boxes

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.8 Fittings – General

- .1 Bushing and connectors with nylon insulated throats for n° 8 AWG caliber and up.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 – EXECUTION

3.1 Installation

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 – GENERAL**1.1 Section contents**

This section specifies rigid and flexible fasteners, fittings and installation.

1.2 Ducts location

- .1 Location of ducts in trench is shown on a schematic form on drawings. Dig trenches in parallel with and close to the trench for the water conduit.

1.3 References

- .1 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2, Rigid PVC Unplasticized Conduit.
 - .6 CAN/CSA-C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada.
- .2 Construction Code of Quebec, Chapter V, Electrical.

1.4 Action and informational submittals

- .1 Submit required samples and documents in accordance with Sections 01 33 00 – Submittal Procedures and 26 05 00 – General Requirements.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

1.7 Waste management and disposal

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 – PRODUCTS**2.1 Conduits**

- .1 Rigid metallic conduits: in accordance with standard CSA C22.2 no 45, threaded galvanized steel.

- .2 Epoxy coated conduits: in accordance with standard CSA C22.2 no 45, with zinc coating and anti-corrosive finishing coat with an epoxy based resin, inside and outside.
- .3 Electrical metallic tubing (EMT): in accordance with standard CSA C22.2 no 83, equipped with “Raintight” connectors.
- .4 Rigid PVC conduits: in accordance with standard CSA C22.2 no 211.2.
- .5 Flexible metal conduit: to CSA C22.2 no 56, liquid-tight flexible metal.
- .6 FRE conduit: CSA C22.2
- .7 Flexible PVC conduit: to CAN/CSA-C22.2 no 227.3.
- .8 Rigid PVC type DB/2 conduit for direct burial.

2.2 Conduit fastenings

- .1 One hole steel straps to secure surface conduits 50mm and smaller.
Two hole steel straps for conduits larger than 50mm.
Use stainless steel fasteners when installed outside or in damp locations.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 2m on centre.
- .4 Threaded rods, 6mm diameter, to support suspended channels.

2.3 Conduit fittings – General

- .1 Connectors: to CAN/CSA C22.2 no 18 manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory “ells” where 90 degrees bends for 25mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.
- .4 Ferrules for fittings in boxes, when required, to Construction Code of Quebec, Chapter V - Electricity, metal type and nylon isolated.

2.4 Expansion fittings

- .1 Provide expansion fittings required for all conduits:
 - embedded in concrete and crossing expansion joints through the building;
 - apparent and undergoing significant changes in temperature;
 - exceeds the limit allowed by the manufacturers.
- .2 Weatherproof expansion fittings with internal bonding assembly suitable for 200mm linear expansion.
- .3 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19mm deflection.
- .4 Weatherproof expansion fittings for linear expansion at entry of panel.

2.5 Fish cord

- .1 Polypropylene 6mm.

2.6 Bonding

- .1 In all conduits and for each circuit, a green insulated conductor with a minimum gage according to Code must be installed.

2.7 Conduits exposed to sun light

- .1 Non-metallic pipes that are entirely exposed to sunlight have to be specifically approved for this usage and be marked in accordance.

PART 3 – EXECUTION**3.1 Manufacturer's instructions**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 Installation

- .1 Install the visible conduits so as to diminish the part's head-way and by using the least amount of space possible.
- .2 Conceal conduits except those which are installed in mechanical and electrical facility rooms.
- .3 Use electrical metallic tubes (EMT) with tight connectors in technical rooms, warehouses, service garages etc. and standard fittings for ordinary locations.
- .4 Use rigid PVC type DB/2 conduits in underground facilities.

- .5 Use rigid threaded galvanized steel conduit in places classified explosion proof, in tunnels and wetlands.
- .6 Use epoxy or PVC coated conduit in corrosive or saline installations.
- .7 Use over a maximum length of 3m flexible metallic conduits when connecting to motors, transformers and equipment capable of vibration located in dry areas, incandescent bulbs, built-in and without pre-threaded outlet box, mounted fluorescent light fixture connection, projecting or built-in, works or elements in movable metal partitions.
- .8 Use flexible metal conduit and liquid-tight connections when connecting to motors and / or equipment which may vibrate or transformers located in damp or wet or corrosive environments.
- .9 Use explosion proof flexible connections for connection to explosion proof motors.
- .10 Install waterproof connections on conduits installed in dangerous locations. Fill them with sealing compound.
- .11 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .12 Mechanically bend steel conduit over 21mm diameter.
- .13 Use conduits of at least 21 mm for lighting and power circuits.
- .14 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .15 Install fish cord in empty conduits and those filled at less than 40%.
- .16 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .17 Dry conduits out before installing wire.

3.3 Visible conduits

- .1 Unless indicated otherwise, install the conduits parallel or perpendicular to the building's layout lines.
- .2 Behind infrared or gas radiators, install conduits by leaving a space of 1.5m.
- .3 Make the conduits pass through the wings of the steel framework elements, if needed.
- .4 In locations where this is not possible, group the conduits into U-bend stirrups.
- .5 Unless otherwise specified, the conduits should not cross through framework elements.
- .6 In the case of conduits placed parallel to steam or hot water pipes, make provisions for a lateral space of at least 75mm; also make provisions for a space of at least 25mm in the case of crossings.
- .7 Install PVC expansion joints on conduit when installed in places where the temperature varies from 10 degrees and more. It must have an expansion joint for each length of 7.5m and 15m between each joint.

3.4 Concealed conduits

- .1 Install conduits parallel or perpendicular to civil structures.
- .2 It is forbidden to install horizontal conduits in masonry walls.
- .3 It is forbidden to embed the conduits into terrazzo works and concrete toppings.
- .4 No horizontal conduits will be accepted in drywall. Only vertical conduits will be tolerated.

3.5 Conduits in cast-in-place concrete

- .1 Do not install conduits in concrete structures unless otherwise specified in the shop drawings and specifications.
- .2 Locate to suit reinforcing steel. Install in centre one third of slab.
- .3 Protect conduits at their exit points from a concrete work.
- .4 Install sleeves where conduits pass through slab or wall.
- .5 Before covering a concrete work with a water repellent membrane, install oversized joints in the locations where conduits have to pass through the latter. Apply a cold compound between the joints and conduits.
- .6 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
- .7 Encase conduits completely in concrete with minimum 25mm concrete cover.
- .8 Organize conduits in slab to minimize cross-overs.
- .9 Aluminum conduits shall not be concealed in concrete structures.

3.6 Conduits underground

- .1 If possible, slope conduits to provide drainage toward pull pits.
- .2 Waterproof the joints using a thick layer of bituminous paint.
- .3 Install conduit at more than 0.6m below grade level or as directed.
- .4 The underground conduits shall be of rigid PVC type DB/2 53mm minimum.
- .5 The underground conduits must be surrounded by a 150mm layer of fine sand unless otherwise stated.

END OF SECTION

PART 1 – GENERAL

1.1 Description

- .1 This Section specifies the installation of direct buried cables and cables in ducts including protection, markers and testing.

1.2 References

- .1 Canadian Standards Association, (CSA International)
- .2 Insulated Cable Engineers Association, Inc. (ICEA)

1.3 Waste management and disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .5 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by a Departmental Representative.
- .6 Do not dispose of preservative treated wood through incineration.
- .7 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.
- .8 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by a Departmental Representative.
- .9 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS

2.1 Cable protection

- .1 Two different plastic tape marked « Danger Électricité » and « Warning Electric line below » installed side by side.

PART 3 – EXECUTION

3.1 Cable installation in ducts

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use ACNOR approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 At each junction box, pullbox and pull pit, identify cables after installment as indicated in Section 26 05 00 – Common Work Results - Electrical.
- .8 After installation of cables, seal duct ends with duct sealing compound.

3.2 Cable installation in cabletrough

- .1 Install cables separately in cabletrough or as indicated.
- .2 Splices are not acceptable in cabletrough unless indicated otherwise. If spliced, joints and fittings must isolated and accessible in cabletrough.
- .3 Cables must be installed in cabletrough as much as possible.
- .4 Use proper pulley to fish cables.
- .5 Radii of cables must not be less than three times the diameter of cables or as directed by manufacturer. Radii of pulleys and cables must me these requirements.
- .6 When fishing cables, use socks simultaneously around both ducts and eyelets fixed to conductors.
- .7 Identify cables after installment as indicated in Section 26 05 00 – Common Work Results - Electrical.
- .8 Fasten the cables with nylon ties every 6 meters in the horizontal cable trays.
- .9 Fasten cables with the appropriate metal fasteners for cables / cable trays, every 1.5 meters in the vertical cable trays.
- .10 Install metal separators between different voltage cables.
- .11 Protect cables with appropriate cover over cable trays in areas subject to mechanical damage and as indicated.

3.3 Field quality control

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 For three-phase circuits, verify and establish a phase sequence A-B-C from left to right, from top to bottom and front to back and keep it for the entire system with the exception of the equipment installed in reverse and electrically connected.
- .4 Check phase rotation and identify each phase conductor of each feeder.
- .5 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .6 Pre-acceptance tests.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .7 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.
 - .3 High Potential (Hipot) Testing.
 - .1 Conduct hipot testing at original factory test voltage in accordance with manufacturer's recommendations.
 - .4 Leakage Current Testing.
 - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
 - .2 Hold maximum voltage for specified time period by manufacturer.
 - .3 Record leakage current at each step.
- .8 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .9 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

PART 1 – GENERALITIES**1.1 This section include**

- .1 All motors are provided and installed by other sections. The electrical connection of the motors is part of this section.
- .2 For the safety switches provided and installed by other sections, the electrical connection is part of this section.

PART 2 – PRODUCTS

- .1 Connection and isolation's accessories.

PART 3 – ACCOMPLISHMENT**3.1 Work involved**

- .1 Connect the equipment following the instructions of the manufacturer. Connect the motor control panel to the PVC type DB/2 conduit with a conduit allowed for use in saline environments as per section 26 05 34 – Conduits, attach and connections of conduits.
- .2 The motor rotation check up must be done before it gets connected to its mechanical load
- .3 Before powering up the motor:
 - .1 Make sure that the overload relay are well set to insure the required protection and that they interlock the operating circuitry;
 - .2 Make sure that the remote command circuitry is check up. Note any changes of control wiring to the schematic diagram.

3.2 Quality control

- .1 Test the equipment as per section 26 05 00 – General requirements.

END OF SECTION

PART 1 – GENERAL**1.1 Section contents**

This section specifies standard and custom panelboards and their installation.

1.2 References

- .1 Canadian Standard Association (CSA International).
 - .1 CSA C22.2 No 29, Panelboards and Enclosed Panelboards.

1.3 Shop drawings and product DATA

- .1 Submit shop drawings and product data in accordance with Sections 26 05 00 – General Requirements and 01 33 00 – Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimensions.

1.4 Panelboards description

- .1 To see panelboards description, refer to Section 26 05 05 – Scope of work, Specific Clauses, Descriptions and Lists.

1.5 Waste management and disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 00 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

PART 2 – PRODUCTS**2.1 Panelboards**

- .1 Panelboards of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements, manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250V and 600V Panelboards: A symmetrical interrupting capacity 25 000 A @ 600V and 22 000 A or as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboards and key panelboards alike.
- .6 Copper bus with neutral of same ampere rating as mains.
- .7 All tables must have bar grounding.
- .8 Mains: suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 The front panel must be fitted with hinged left and right retaining bolts (door in door) to facilitate access for maintenance personnel.
- .11 Trim and door finish: baked grey enamel.
- .12 For all unused spaces, install devices for adding breakers later.
- .13 Every panelboard installed outdoor must be installed in a NEMA 4X stainless steel enclosure.

2.2 Serial protection

- .1 No integral protection (series) will be accepted if the sum of the rated currents of motors connected directly between the devices connected in series is greater than 1% of rated breaking capacity of the downstream circuit breaker.

2.3 Breakers

- .1 Breakers: to Section 26 28 21 – Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic stripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Lock-on devices for receptacles, fire alarm clock outlet, emergency, door supervisory, intercom, stairway, exit and night light circuits.

2.4 Equipment identification

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results – Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.5 Manufacturers

- .1 Accepted products: Cutler-Hammer, Siemens, Square D, GE or equivalent.

PART 3 – EXECUTION

3.1 Installation

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted on panelboards on plywood backboards. Where practical, group panelboards on common backboards.
- .3 Mount panelboards to height specified in Section 26 05 00 – Common Work Results – Electrical or as indicated.
- .4 Connect all circuits to load elements.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.
- .6 When there are distribution panels installed side by side, boxes must be welded together and be of same size, lids must be separated, doors of the same size and must be perfectly aligned.
- .7 Provide each circuit taken at 120 VAC and services of its own neutral conductor and do not use common neutral multi-circuit. The derivations of lighting can be provided with a common neutral with the Code of Construction of Québec, chapter V, electricity.
- .8 Each time the panel will be installed flush, install three Ø 27 mm empty ducts into the ceiling space and three Ø 27 mm ducts into the ceiling space of the lower floor (if applicable). If no ceiling was provided, finish the ducts as high as possible between the floor structure or provide an access door 300 x 600 mm to 300 mm above the panel.
- .9 The connection of branch lines to the panel should be made on the sides of the distribution panels. Only the supply conduits can be connected to the top or bottom.

END OF SECTION

PART 1 – GENERAL**1.1 Section content**

- .1 Switches, outlets, cover plates and other wiring devices and their installation.

1.2 References

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 42, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 No. 42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No. 55, Special Use Switches.
 - .4 CSA-C22.2 No. 111, General-Use Snap Switches (National standard, with UL 20, current edition).

1.3 Shop drawings and product DATA

- .1 Submit shop drawings and product data in accordance with Sections 01 33 00 – Submittal Procedures and 26 05 00 – General Requirements.
- .2 Submit a set of drawings for each model of electrical outlets and switches specified.
- .3 The drawings shall clearly identify the following:
 - Manufacturer
 - Model
 - Description
 - Amperage and voltage
 - Nema Configuration
 - Catalog Number
 - Color
 - Performance:
 - . Electrical
 - . Mechanical
 - . Environmental
 - Material:
 - . Front

- . Rear body
- . Contact
- Dimensions

1.4 Waste management and disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility proposed by Consultant and approved by engineer.

PART 2 – PRODUCTS

2.1 Switches

- .1 Switches: single pole, double pole, three-way or four-way switches, 15 or 20 amp, 120-277 V ac or 347 V ac as indicated.
- .2 Manually-operated general purpose ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Toggles: in white or as indicated by the Architect.
- .3 Toggles operated fully rated for LED lamps, and up to 120% of rated capacity for motor loads.
- .4 For all of the installation, use only switches manufactured by a single manufacturer.

.5 Accepted products:

		Hubbell	Leviton	Seymour
.1	120V 15A 1 pôle	HBL1203W	1203-2W	PS15AC3W
.2	120V 20A 1 pôle	HBL1223W	1223-2W	PS20AC3W
.3	347V 15A 1 pôle	HBL18201WCN	18201-W	PS371510W
.4	347V 15A 1 pôle	HBL18203WCN	18221-W	PS372010W

or équivalent

2.2 Outlets

.1 Indoor outlets to 125 VAC, depending on the following accepted manufacturers:

		Hubbell	Leviton	Seymour
.1	Single 15 A Conf. 5-15R	HBL5251	5251-W	5261
.2	Double 15 A Conf. 5-15R	HBL5262W	5262-W	5262AW
.3	Double 20 A Conf. 5-20R	HBL5362W	5362-W	5362AW
.4	Single 30 A Conf. 5-30R	HBL9308	5371	3802
.5	Double 15 A GFCI Conf. 5-15R	GF5262WA	7599-W	N/A
.6	Double 20 A GFCI Conf. 5-20R	GF5362WA	7899-W	N/A

.2 Outdoor outlets to 125 VAC, depending on the following accepted manufacturers:

		Hubbell	Leviton	Seymour
.1	Double 15 A Twist-lock Conf. L5-15R	HBL47CM00	equivalent	equivalent
.2	Double 15 A Twist-lock Conf. 5-15R	HBL52CM62I	equivalent	equivalent
.3	Single 20 A Twist-lock Conf. L5-20R	HBL23CM10	equivalent	equivalent

- .3 Outdoor 120/240 V ac outlets, depending on the following accepted manufacturers:

		Hubbell	Leviton	Seymour
.1	Single 50 A Twist-lock Conf. L14-30R	HBL2710	equivalent	equivalent
.2	Single 50 A Pins and sleeves Non-NEMA	M4100R12	equivalent	equivalent

- .4 Outdoor outlets must be yellow color. White, ivory or gray color for those protected by a GFCI breaker (15 A and 20 A) in panelboards.

2.3 Special wiring devices

- .1 Special wiring devices
- .1 Clock hanger outlets, 15 A, 125 V, 3 wire, grounding type, suitable for No. 10 AWG for installation in flush outlet box.
 - .2 Lamps: as indicated, equipped with an LED lamp or neon of 0,04 W, 125 V red plastic, built-in.
 - .3 Motion Detectors: as indicated, infrared and/or ultrasound for wall or ceiling complete with all necessary accessories for a complete assembly.
 - .4 Tape clear plastic identification, typed in black, as indicated.

2.4 Cover plates

- .1 Cover all devices and wiring boxes for telephone, cable and computer conduit systems with cover plates.
- .2 For the entire system, use only cover plates made by a single manufacturer: Hubbell, Leviton, Pass & Seymour or equivalent.
- .3 Plate lids galvanized steel junction boxes for surface-mounted.
- .4 Plate covers nonmagnetic stainless steel (# 302) brushed vertically 1 mm thick for wiring devices hospital grade type mounted in outlet boxes or recessed surface.
- .5 Stainless steel cover plate (# 430) brushed vertically 1 mm thick for wiring devices mounted in outlet boxes or recessed surface.
- .6 Cover plate moulded aluminum, weatherproof, double-leaf spring with gaskets for electrical outlets doubles, as indicated.
- .7 Polycarbonate cover plate or equivalent, spring, weather-resistant, with neoprene gaskets for electrical outlets and switches simple or double. Hardware in stainless steel.
- .8 Plates the same color as the wiring device (yellow or white/ivory/gray).

PART 3 – EXECUTION**3.1 Installation**

- .1 Switches and dimmers:
 - .1 Install single throw switches with handle in “UP” position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches and dimmers at height in accordance with Section 26 05 00 – Common Work Results – Electrical.
- .2 Outlets:
 - .1 Install outlets in gang type outlet box when more than one outlet is required in one location.
 - .2 Mount outlets at height, in accordance with Section 26 05 00 – Common Work Results – Electrical.
 - .3 Where split outlets has one portion switched, mount vertically and switch upper portion.
- .3 Cover plates:
 - .1 Protect stainless steel cover plates finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.
 - .4 Identify the panel number and circuit number corresponding to all devices and wiring junction boxes, using an adhesive, laminated and waterproof white plastic type P-Touch label. The adhesive label shall exceed the width of the plate, 10 mm on each side, to return and paste in the back.

Lettering color:

Normal type network: black

Emergency type network: red

Other networks: to coordinate.
- .4 FS and FD box types:
 - .1 Coordinate with the general contractor install recessed cans so that the surface of the box is flush with the wall surface. Provide a seal around the box before installing the cover plate.
 - .2 Boxes used outdoors must be marine grade or made for an installation in saline environments.

.5 General:

- .1 Outputs and dimmers location in accordance with Section 26 05 00 – General requirements, or as indicated.

END OF SECTION

PART 1 – GENERAL**1.1 Sections contents**

- .1 Moulded case circuit breakers materials, circuit breakers and protection against ground fault, circuit breakers, fuse and protective accessories against the high fault currents.

1.2 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, current edition).

1.3 Shop drawings and product DATA

- .1 Submit shop drawings and product data in accordance with Sections 26 05 00 – General Requirements, and 01 33 00 – Submittal Procedures.
- .2 Include the characteristic curves established according to the constant time-current for circuit breakers with a capacity of 100 A or more, or with a breaking capacity of 22 000 A symmetrical and over, to the line voltage.
- .3 Provide all available data regarding the values of the capacity of power failure and short circuit I^2t maximum allowable values for all circuit breakers.

1.4 Waste management and disposal

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .3 Separate for reuse and recycling and place in designated containers steel, metal, and plastic waste in accordance with Waste Management Plan.

PART 2 – PRODUCTS**2.1 General requirements**

- .1 Moulded case circuit breakers, switches, and devices for protection against ground fault, circuit breakers, fuse and protective accessories against the high fault currents.
- .2 Moulded Case Circuit Breakers, bolted to the bus bars, quick-closing type and snap-action, manually operated and automatic, with compensation for an ambient temperature of 40°C.
- .3 Common-trip circuit breakers, equipped with a single handle for multi-pole circuits.
- .4 Breakers equipped with magnetic snap-action trips, designed to act only when the current value reaches the setting value.
- .5 Circuit breakers equipped with interchangeable trips, as indicated.

2.2 Thermal magnetic breakers (design A)

- .1 Moulded case circuit breaker, to operate automatically, by means of thermal and magnetic tripping devices, to provide inverse time current tripping, and instantaneous tripping for short circuit protection.

2.3 Magnetic breakers (design B)

- .1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.
- .2 Use these circuit breakers for starter combination with magnetic circuit breakers.

2.4 Current limiting and series rated thermal magnetic breakers (design C)

- .1 Thermal magnetic breakers with current limiters.
 - .1 Coordinate protection features, depending on time / current limiting fuses with those of circuit breakers.
 - .2 Coordination should be established so that the circuit breaker cuts off the fault current to the maximum value of its breaking.
 - .3 Fuses can be removed separately and are bonded to the circuit breaker. The circuit breaker tripping occurs when removing a fuse or its lid or when a fuse blows.
- .2 Indications and guidelines for manufacturers, circuit breakers and current limiting circuit breakers to be installed in series are used when the value of short-circuit may exceed the breaking capacity of circuit breakers thermomagnetic standards.
- .3 Magnetic circuit breakers will be used only in ensuring protection against short circuits.
- .4 Circuit breakers for installation in series are recommended for installations likely to leakage currents. Before prescribing for installation of circuit breakers in series, one must examine the requirements for coordination and system reliability.
- .5 Circuit breakers to be installed in series must have been audited by the manufacturer and must be approved. The installation and use of these circuit breakers shall conform to the guidelines of the manufacturer and recognized methods.
- .6 Refer to Section 26 05 05 – Specific Clauses.

2.5 Solid state trip breakers (design D)

- .1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for ground fault short circuit protection.

2.6 Insulated case circuit breakers

- .1 Insulated case circuit breakers operated by triggers transistor capable of operating without external source and producing a trigger time / current reversed in overload conditions and triggering long delay, short delay and instantaneous as protection against short circuits of the phase conductors and leakage to ground.

- .2 The insulated case circuit breakers must have the following characteristics:
 - .1 Direct delayed shutter, fitted with coils designed for a nominal range cut-off of 80 to 160% of their nominal value, under conditions of overload.
 - .2 Instant trigger action designed to cut a nominal range of 500 to 1500% of the rated circuit breaker to protect against short circuits.
 - .3 Mechanism common maneuver by stored energy, allowing a fast closing.
 - .4 Operating mechanism with stored energy, reset motor, allowing a fast closing, with a manual reset lever spring in an emergency and a switch to shut off the engine to reset the spring.
 - .5 On-off and spring reset indicators.

2.7 Optional features

- .1 Include:
 - .1 Shunt trip.
 - .2 Auxiliary switch.
 - .3 Motor-operated mechanism.
 - .4 Under-voltage release.
 - .5 On-off locking devices.
 - .6 Handle mechanism.

2.8 Manufacturers

- .1 Accepted products: Cutler-Hammer, Siemens, Schneider Electric, GE or equivalent.

PART 3 – EXECUTION

3.1 Installation

- .1 Install circuit breakers as indicated.
- .2 Install locking devices on circuits listed in Section 26 24 16.01 – Panelboards Breaker Type.
- .3 The order in which circuit breakers should be installed in the panels must meet the one shown in the plans.

END OF SECTION

PARTIE 1 – GÉNÉRALITÉS

1.1 Section contents

- .1 This section is intended for protective equipment against ground leakage and its components.

1.2 Payment

- .1 Payments for field testing of ground fault equipment performed by the Contractor in accordance with Section 01 29 83 – Payment Procedures: Testing Laboratory Services.

1.3 References

- .1 Canadian Standard Association (CSA International)
 - .1 CAN/CSA-C22.2 No. 144, Ground Fault Circuit Interrupters.
 - .2 National Electrical Manufacturers Association (NEMA).
 - .1 NEMA PG 2.2, Application Guide for Ground Fault Protection Devices for Equipment.

1.5 Action and informational submittals

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit product data and shop drawings required of each element of the protection system.
- .3 Submit test report for field testing of ground fault equipment to the Consultant and a certificate that system as installed meets criteria specified herein.

1.6 Waste management and disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility proposed by the Contractor and approved by DCC Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS

2.1 Description

- .1 Duplex receptacles protected. Only for ground networks (Class "A") less than 6 mA.
- .2 Heating cable network. Only by the heating cable networks for food (Class "B") 30 mA.

2.2 Materials

- .1 Equipment and components for ground fault circuits to be of same manufacturer.

2.3 Branch differential circuit breaker

- .1 Differential single-pole circuit breaker with test device and reset, capacity as indicated.
- .2 All single-pole outlets (single or double) of 15A or 20A capacity installed outdoor on the wharf must be protected by differential circuit breakers installed in the panelboard.

2.4 Distribution differential circuit breaker

- .1 Circuit breaker single-pole or double-pole, capacity as indicated, used to supply a distribution panel and including:
 - .1 Circuit breaker with shunt trip;
 - .2 Residual current detector;
 - .3 Test device and reset;
 - .4 CSA approved box, type as indicated, surface-mounted;
 - .5 Light signal triggered by ground leakage.

2.5 Outlets protected against ground leakage

- .1 Duplex receptacles, protected, for circuit 15 A, 120 V, including:
 - .1 Ground leakage detectors, with semiconductors;
 - .2 Test device and reset;
 - .3 CSA approved case, mounted flush with front plate in stainless steel (# 430).

2.6 Network protection panels against ground leakage

- .1 Panel suitable for autonomous power supply as indicated and with the following characteristics:
 - .1 Breaker as indicated with shunt trip.
 - .2 Relay leakage current to ground factory set at 10 mA and with a characteristic inverse time adjustable from 1 second to 0.025 seconds from the time of detection of the leak.
 - .3 Zero sequence current detector.

- .4 Test devices and reset.
 - .5 CSA approved box, type 1, surface-mounted.
- And in the case of networks not grounded:
- .6 Light signal triggered by ground leakage.
 - .7 Artificial neutral high-strength, fused.

2.7 Pump protection panels against ground leakage

- .1 The material described below is used to protect people against electric shock on the supply circuits of the pumps. These panels do not include circuit breaker and therefore require an external protection. The device is designed to open the engine start switch.
 - .2 Safety panel pump circuits as indicated and with the following characteristics:
 - .1 Test button, light signal triggered by ground leakage, and reset button.
 - .2 Platelets circuit connection and power charging circuit and the control circuit of the starter.
 - .3 Detector Sensitivity: 10 mA.
 - .4 CSA approved box, type 1, surface-mounted.
 - .5 Contactor Ratings: 5 A, 120 V, 60 Hz.
- And in the case of not grounded networks:
- .6 Artificial neutral high resistance, protected by fuses.

PART 3 – EXECUTION

3.1 Installation

- .1 Do not ground neutral on loading side of ground fault relay.
- .2 Pass phase conductors, including neutral, through zero sequence transformers.
- .3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.2 Field quality control

- .1 Perform tests in accordance with Section 26 05 00 – General Requirements and coordinate if necessary with Section 01 45 00 – Quality Control.
- .2 Arrange for field testing of ground fault equipment by independent testing laboratory or Contractor before commissioning service.

- .3 Submit test reports to CDC representative and provide a certificate stating that the entire protection system installed meets the criteria specified in this quotation.
- .4 Test the system by simulating ground leakage.

END OF SECTION