



# **Public Works and Government Services Canada (PWGSC)**

## **Electrification of the Atwater and Charlevoix Areas Charlevoix Area**

**PWGSC Ref.: R.072066.001**

## **FOR TENDER**

### **TECHNICAL SPECIFICATIONS** **Electrical**

October 27, 2014

O/Ref.: 248-P-0006525-210-EL-S-0002-00

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Prepared by:



2014-10-27  
Louis Lajoie, Eng.

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**Important Note:** This list of sections is used to enumerate required works, without limitation, and to attribute works to contractors according to the symbols explained hereunder, and it is considered an integral part of the present specification.

E : Applicable section to electrical works performed at site

**END OF SECTION**

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## **LIST OF DRAWINGS**

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**ELECTRICAL**

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**END OF SECTION**

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## **Division 01 / General Requirements**

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**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises supplying and installation of a 400 A-120/240 V, distribution center and allied services, lighting of the pedestrian bridge and supplying of a second 400 A-120/240 V distribution center, power pedestals as well as shore power for boats and their delivery at Parks Canada's workshops.

**1.3 SCOPE OF WORK**

- .1 Work includes, without limitation:
  - .1 Supplying and installation of a 400 A-120/240 V distribution center including all components such as: switches, fuses, HQ metering, through, private metering and socket, electrical distribution panels, breakers, conduits, cables, receptacles, lighting, ventilation, controls, waterproof boxes and covers for receptacles, hardware, and accessories.
  - .2 Supplying and installation of a private meter, including current transformers, voltage transformers, and hardware.
  - .3 Supplying and installation of electrical connections,
  - .4 Supplying and installation of conduits and cables.
  - .5 Supplying and delivery of a second 400 A-120/240 V distribution center and seven boat power pedestal to Parks Canada's workshops.
  - .6 Demolition and delivery of the equipment to Parks Canada's workshops.
  - .7 Security measures including cones, fences, and working men panels.
  - .8 Strapping, hardware, and accessories.
  - .9 Field quality control.
  - .10 Shop drawings for all material and equipment, including concrete and pavement formulas.
  - .11 Excavation and backfilling.
  - .12 Coordination with Hydro-Quebec, CN, and all other public utilities.

- .13 Protection of archeological remains and objects.
- .14 Deviation of the bicycle path during the channel installation works.
- .15 Concrete protection in case of cold or freezing weather.

#### **1.4 WORK BY OTHERS**

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.
- .2 Co-ordinate Work with that of other Contractors. If any part of Work under this Contract depends for its proper execution or result upon Work of another Contractor, report promptly, in writing, any defects which may interfere with proper execution of Work.

#### **1.5 WORK SEQUENCE**

- .1 Construct Work in stages to accommodate Owner's continued intermittent use of premises during construction.
- .2 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

#### **1.6 CONTRACTOR USE OF PREMISES**

- .1 Restricted use of site until Substantial Performance.
- .2 Limit use of premises for Work to allow:
  - .1 Owner occupancy.
  - .2 Public usage.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 At completion of operations condition of existing work: Equal to or better than that which existed before new work started.

#### **1.7 OWNER OCCUPANCY**

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Establish Work schedule with the Departmental Representative in order to reduce conflicts and to facilitate utilization of the site by the Owner.

**1.8 EXISTING SERVICES**

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

**1.9 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Other documents as specified.

**1.10 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from projected activities.
- .2 Ensure detailed Project Schedule includes all milestone and activity corresponding to and necessary to complete Work in the delay.
- .3 Departmental Representative will review and return revised schedules within five (5) working days.
- .4 Revise impractical schedule and resubmit within five (5) working days.
- .5 Accepted revised schedule will become Master Plan and be used as baseline for updates.
- .6 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

- .7 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

### **1.11 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

- .1 Not used.

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED SECTIONS**

- .1 Division 26 - Electrical.
- .2 Division 31 - Earthwork.

**1.2 PAYMENT METHODS**

- .1 Construction Signage.
  - .1 Construction signage is paid by lump sum. Price includes supply, installation, moving and removing of traffic signage (working men panels, cones, fences, etc.), supply of labor, equipment, and any necessary incidental expenses to have a safe construction site.
- .2 Demolition.
  - .1 Demolition is paid by lump sum. Price includes supply of labor, equipment, and excavation and backfilling, machinery, removing lamp post, removal and storage inside the banners stands, banners and signage panels, taking over, loading, transportation, and unloading of wooden posts and lighting fixtures at Parks Canada's workshops at Lachine Canal situated at 1156 Mill Street, in Montreal (Quebec) (by appointment 48 hours before with Mr. Richard St-Jean at 514-283-8303), disposal of materials, and any necessary incidental expenses.
- .3 CEMA 3R Exterior Enclosure and Components.
  - .1 CEMA 3R exterior enclosure is paid by lump sum. The lump sum includes supplying and installation of CEMA 3R enclosure, main electrical feeding and distribution including switches, fuses, metering cabinet, transfer switch, private metering, current and voltage transformers, meter socket, CAMLOK receptacles enclosure, electrical panels, breakers, grounding, receptacles, conduits, wiring, ventilation, accessories, and hardware, and all inherent expenses required for a complete and functional installation as described in specifications and on drawings.
  - .2 The price also includes CSA approbation, enclosure and components shop drawings, and a scale drawing of arrangement of installation.
- .4 Conductors.
  - .1 Conductors are paid by linear meter of conductors. The price includes supplying and installation of conductors, manpower, all materials, accessories, hardware, necessary equipment, testing, and quality control.
  - .2 The price includes connection to equipment.

.5 Conduits.

- .1 Conduits are paid by linear meter of conduits. The price includes supplying and installation of conduits, manpower, all materials, accessories, hardware, necessary equipment, testing, and quality control.
- .2 The price includes connection to equipment.

.6 Second Class Excavation, Trenching, and Backfilling.

- .1 The price for the 2<sup>nd</sup> Class excavation, trenching, and backfilling is paid by linear meter of excavation, trenching, and backfilling done. The unit price includes demolition, sawing and removing of the pavement and concrete slab, excavation, backfilling, compaction, pumping and temporary retaining walls for the trench, repairing of the pavement and concrete slab, filling material, manual excavation and man-power, all materials and necessary equipment for the complete realization of the Work.
- .2 The price also includes costs associated with waiting for inspection of trench.

.7 High-Density Polymer Concrete Channel.

- .1 High-density polymer concrete channel is paid by unit price.
- .2 The price includes supplying and installation of channel, manpower, all materials, accessories, and hardware, and all necessary expenses required for a complete and functional installation as described in specifications and on drawings.

.8 Service Mast.

- .1 Service mast is paid by lump sum. The price includes supplying and installation of wooden pole, conduits, identification, branching head, grounding, sheet of metal, concrete, hardware, and accessories, and all necessary expenses required for a complete and functional installation

.9 Exterior CEMA 3R Enclosure Concrete Base.

- .1 Exterior CEMA 3R enclosure concrete base is paid by unit price. The price includes supplying and installation of concrete, rebar, installation and removal of formworks, anchor bolts, hardware, accessories, rigid insulation, and the rigid PVC conduits, and also the excavation and backfilling, removal and disposal of excavation material, and all necessary expenses for a complete and functional installation.
- .2 The price also includes backfilling material, restoration of surfaces, pumping and temporary retaining walls of excavation.

.10 Field Quality Control.

- .1 Field quality control is paid by lump sum. The price includes testing required in specifications done by an independent firm, including equipment, issuing of a report, and supplementary inspections, and all necessary expenses for the complete execution of Work.

.11 Supplying and Delivery of Power Pedestal.

- .1 Supplying and delivery of one power pedestal is paid by unit price. Unit price includes supplying and delivery of a power pedestal and the connection cables and plug, at Parks Canada's workshops at Lachine Canal situated at 1156 Mill Street, in Montreal (Quebec) (by appointment 48 hours before with Mr. Richard St-Jean at 514-283-8303).

.12 Supplying and delivery of CEMA 3R Exterior Enclosure and Components.

- .1 Supplying and delivery of one CEMA 3R exterior enclosure is paid by lump sum. The lump sum includes supplying and delivery of CEMA 3R enclosure, including switches, fuses, metering cabinet, transfer switch, private metering, meter socket, CAMLOK receptacles enclosure, electrical panels, breakers, grounding, receptacles, conduits, wiring, ventilation, accessories, and hardware, at Parks Canada's workshops at Lachine Canal situated at 1156 Mill Street, in Montreal (Quebec) (by appointment 48 hours before with Mr. Richard St-Jean at 514-283-8303).

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Province of Quebec.
  - .1 An Act Respecting Occupational Health and Safety, R.S.Q., c.S-2.1 (current edition) - Updated 2005.

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit site-specific Health and Safety Plan: Within seven (7) days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .2 Submit three (3) copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative.
- .3 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within fourteen (14) days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within seven (7) days after receipt of comments from Departmental Representative.
- .4 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .5 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.

### **1.3 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of Contract award. Contractor to submit written acknowledgement to CSST along with "Ouverture de Chantier" Notice.
- .3 Work zone locations include:
  - .1 Charlevoix area and pedestrian bridge.



- .4 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

#### **1.4 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

#### **1.5 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

#### **1.6 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

#### **1.7 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor shall be the Principal Contractor as described in the Quebec Act Respecting Health and Safety code for the Construction for only their scope and areas of work as defined and described this project specification.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

#### **1.8 COMPLIANCE REQUIREMENTS**

- .1 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

#### **1.9 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

#### **1.10 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience specific to activities associated with Work.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work.

#### **1.11 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

#### **1.12 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

#### **1.13 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

.1 Not used.

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

.1 Not used.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 Definitions:
  - .1 Environmental Pollution and Damage: Presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental protection: Prevention/control of pollution and habitat or environment disruption during construction.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
- .2 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .3 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .4 Include in Environmental Protection Plan:
  - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
  - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
  - .3 Names and qualifications of persons responsible for training site personnel.
  - .4 Descriptions of environmental protection personnel training program.
  - .5 Drawings indicating locations of proposed temporary excavations.
  - .6 Historical, archeological, and cultural plans defining procedures for the protection of these resources.

## **1.4 FIRES**

- .1 Fires and burning of rubbish on site is not permitted.

## **1.5 DRAINAGE**

- .1 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .2 Ensure pumped water into waterways, sewer, or drainage systems is free of suspended materials.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

## **1.6 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.

## **1.7 HISTORICAL/ARCHAEOLOGICAL CONTROL**

- .1 Provide historical and archaeological resources plan that defines procedures for identifying and protecting historical and archaeological resources known to be on project site and identifies procedures to be followed if historical and archaeological resources not previously known to be onsite or in area are discovered during construction.
- .2 Plan: Include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

## **1.8 ARCHEOLOGY**

- .1 The Lachine Canal National Historic site is considered as an archeological site of national importance. Contractor must collaborate with Parks Canada if archeological remains are discovered.

.2 Archeological Findings:

- .1 If Contractor thinks to have discovered archeological remains during construction, immediately advise Departmental Representative and wait for written directives before proceeding with construction in area of discovery.
- .2 Remains, antiquities, and any other element having a historic, archeological, or scientific interest, such as angular stones, commemorative plaques, slates, and other objects (remains or fragment) found on-site or in excavation or demolition areas, remain the property of Parks Canada. Protect objects and obtain directives from Departmental Representative.

.3 Protection of Remains and Objects:

- .1 Contractor must take every reasonable precaution during excavation to protect every discovered remains and clear area for archeological examination. Parks Canada will not tolerate any violation. If Contractor negligently deteriorates any type of remains, he will be held responsible and judged accordingly by Parks Canada.
- .2 During demolition work, take necessary precautions to protect kept existing structures. Progressively demolish elements in a controlled manner. Carefully demolish elements which have sections for future use. If elements are damaged during demolition work, immediately inform Departmental Representative.

## 1.9 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection Plan.
- .2 Contractor: After receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
  - .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

## **PART 2 - PRODUCTS**

### 2.1 NOT USED

- .1 Not Used.

**PART 3 - EXECUTION****3.1 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB 1.189-2000, Exterior Alkyd Primer for Wood.
  - .2 CGSB 1.59-1997, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International).
  - .1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment.

### **1.2 INSTALLATION AND REMOVAL**

- .1 Provide construction facilities in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

### **1.3 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Maintain and protect traffic on bicycle path during construction period, except as otherwise specifically directed by Departmental Representative. In any case, the bicycle path shall not be obstructed.
- .2 Provide measures for protection of traffic, including erection of barricades, fences, erection and maintenance of adequate warning, danger, direction signs, and traffic cones.
- .3 Protect travelling public from damage to person and property.
- .4 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with traffic.
- .5 Verify adequacy of existing roads and allowable load limit on these roads. Contractor is responsible for repair of damage to roads caused, landscaping, and all other surfaces by construction operations.
- .6 Provide necessary signs, barricades, distinctive markings, and traffic cones for safe movement of traffic.
- .7 Dust Control: Adequate to ensure safe operation at all times.



**1.4 CLEAN-UP**

- .1 Remove daily construction debris, waste materials, packaging material from work site.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**PART 2 - PRODUCTS****2.1 NOT USED**

- .1 Not Used.

**PART 3 - EXECUTION****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**PART 1 - GENERAL****1.1 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Delay:
    - .1 A maximum delay of seventy (70) working days after Contract granting is provided to proceed to Work Substantial Performance.
  - .2 Inspection:
    - .1 Departmental Representative's Inspection:
      - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
      - .2 Contractor to correct Work as directed.
    - .2 Completion Tasks: Submit written certificates both in English and French that tasks have been performed as follows:
      - .1 Work: Completed and inspected for compliance with Contract Documents.
      - .2 Defects: Corrected and deficiencies completed.
      - .3 Equipment and systems: Tested and fully operational.
      - .4 Work: Complete and ready for final inspection.
  - .3 Final Inspection:
    - .1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.
    - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
  - .4 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
  - .5 Commencement of Lien and Warranty Periods: Date of Owner's acceptance of submitted declaration of Substantial Performance to be

date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.6 Final Payment:

.1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

.7 Payment of Holdback: After issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

## **1.2 FINAL CLEANING**

.1 Clean Work areas and remove surplus materials, excess materials, rubbish, tools, and equipment.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

.1 Not Used.

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

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## **Division 02 / Existing Conditions**

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**PART 1 - GENERAL****1.1 REFERENCES**

- .1 CSA International.
- .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

**PART 2 - PRODUCTS****2.1 NOT USED**

- .1 Not used.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- .1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage, and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.
- .4 Disconnect, cap, plug, or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
  - .1 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
  - .2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

### 3.2 PREPARATION

- .1 Protection of In-Place Conditions:
  - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features, and parts of building to remain in place. Provide bracing and shoring required.
  - .2 Keep noise, dust, and inconvenience to occupants to minimum.
  - .3 Protect building systems, services, and equipment.
  - .4 Provide temporary dust screens, covers, railings, support, and other protection as required.
- .2 Demolition/Removal:
  - .1 Remove items as indicated, such as:
    - .1 Existing main electrical distribution.
    - .2 Branch circuit to Hydro-Quebec's network, including service mast, switch, pole guard, conduits, and wiring.
  - .2 Removal of pavements, curbs, and gutters:
    - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
    - .2 Protect adjacent joints and load transfer devices.
    - .3 Protect underlying and adjacent granular materials.

### 3.3 CLEANING

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

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## **Division 03 / Concrete**

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**PART 1 - GENERAL****1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
  - .4 CSA O151-04, Canadian Softwood Plywood.
  - .5 CSA O153-M1980(R2003), Poplar Plywood.
  - .6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
  - .7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
  - .8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
  - .9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada
- .2 Underwriters' Laboratories of Canada (ULC).
  - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit shop drawings for formwork and falsework.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- .1 Formwork Materials:
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.



- .2 Rigid insulation board: To CAN/ULC-S701.
- .2 Form Ties:
  - .1 For concrete not designated "Architectural", use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .3 Form Liner:
  - .1 Plywood: High density overlay Douglas Fir to CSA O121, Tongue and Groove edge, 20 mm thick.
- .4 Form Release Agent: Non-toxic, biodegradable, low VOC.
- .5 Form Stripping Agent: Colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal, 15 to 24 mm<sup>2</sup>/s at 40°C, flashpoint minimum 150°C, open cup.

### **PART 3 - EXECUTION**

#### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels, and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Do not place shores and mud sills on frozen ground.
- .5 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .7 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
- .8 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

- .10 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

### **3.2 REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
- .1 Remove formwork when concrete has reached 50% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

**END OF SECTION**

**PART 1 - GENERAL****1.1 REFERENCES**

- .1 American Concrete Institute (ACI).
  - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International.
  - .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - .2 ASTM A143/A143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
  - .3 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .4 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 CSA International.
  - .1 CSA-A23.1-09 /A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
  - .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
  - .4 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .6 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC).
  - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Canada.
    - .1 Indicate placing of reinforcement and:
      - .1 Bar bending details.
      - .2 Lists.
      - .3 Quantities of reinforcement.
      - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
      - .5 Indicate sizes, spacings and locations of chairs, spacers, and hangers.
    - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
  - .2 When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.

## 1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **PART 2 - PRODUCTS**

### 2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.

- .2 Reinforcing Steel: Billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing Steel: Weldable low alloy steel deformed bars to CSA-G30.18.
- .4 Cold-Drawn Annealed Steel Wire Ties: To ASTM A82/A82M.
- .5 Deformed steel wire for concrete reinforcement: to ASTM A82/A82M.
- .6 Welded Steel Wire Fabric: To ASTM A185/A185M.
  - .1 Provide in flat sheets only.
- .7 Chairs, Bolsters, Bar Supports, Spacers: To CSA-A23.1/A23.2.
- .8 Mechanical Splices: Subject to approval of Departmental Representative.
- .9 Plain Round Bars: To CSA-G40.20/G40.21.

## **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
  - .1 SP-66 unless indicated otherwise.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.

## **PART 3 - EXECUTION**

### **3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

### **3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
  - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

- .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

### **3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 ASTM International.
  - .1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .2 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 CSA International.
  - .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Shop Drawings:
  - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
  - .2 Submit drawings showing formwork and falsework design: To CSA A23.1/A23.2.
  - .3 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

### **1.3 DELIVERY, STORAGE, AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: Deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

- .2 Deviations to be submitted for review by the Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Cement: To CSA A3001, Type GU.
- .2 Blended Hydraulic Cement: Type GUb to CSA A3001.
- .3 Water: To CSA A23.1/A23.2.
- .4 Reinforcing Bars: To CAN/CSA-G30.18, Grade 400.
- .5 Welded Steel Wire Fabric: To ASTM A185.
- .6 Other Concrete Materials: To CSA A23.1/A23.2.

### **2.2 MIXES**

- .1 Performance Method for specifying concrete: To meet Departmental Representative performance criteria to CSA A23.1/A23.2.
  - .1 Provide concrete mix to meet following hard state requirements:
    - .1 Durability and class of exposure: F-2.
    - .2 Compressive strength at 28 age: 35 MPa minimum.
    - .3 Intended application: Slab and sidewalk.
    - .4 Aggregate size: 19 mm maximum.
    - .5 Entrained air: 5 to 8%.
    - .6 Sagging: 80 mm  $\pm$  30.
  - .2 Concrete supplier's certification.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- .1 Provide Departmental Representative 24-hour notice before each concrete pour.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.



.3 During Concreting Operations:

- .1 Development of cold joints not allowed.
- .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .4 Protect previous Work from staining.
- .5 Clean and remove stains prior to application of concrete finishes.

### 3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.

### 3.3 FINISHES

- .1 Formed surfaces exposed to view: Sack rubbed finish in accordance with CSA A23.1/A23.2.
- .2 Pavements, walks, curbs and exposed site concrete:
  - .1 Screed to plane surfaces and use wood floats.
  - .2 Provide round edges and joint spacings using standard tools.
  - .3 Trowel smooth to provide lightly brushed non-slip finish.

### 3.4 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

### 3.5 SEALING APPLICATION

- .1 After curing is complete, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m<sup>2</sup>/L. Allow first coat to dry before applying second coat.

### 3.6 SITE TOLERANCES

- .1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.

**3.7 CLEANING**

- .1 Clean at the end of Work.
- .2 Designate cleaning area for tools to limit water use and runoff.

**3.8 CONCRETE FREEZING PROTECTION**

- .1 The concrete freezing protection consists of building a shelter covering the Work. The shelter shall be realized in order to cover with canvas or tarpaulin the concrete surfaces being done. These covers shall be watertight, strong, and fixed in a manner that they cannot be displaced during the period of protection.
- .2 The shelter shall be sufficiently high and sized to allow, inside, pouring, finishing, and cure of concrete.
- .3 The shelter and the heating method shall be conceived in order to avoid ground from freezing. No concrete pouring on a frozen ground.
- .4 Heating apparatus, such as boilers, heaters, etc., shall be sized and in sufficient quantity to maintain concrete to the specified temperature. A warm air stream shall circulate inside the shelter. Heat shall reach all surfaces, formworked or not. If heating apparatus emit carbonic gases, these gases shall be evacuated outside the shelter.
- .5 Heating shall be maintained during 7 consecutive days.

**END OF SECTION**

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## **Division 26 / Electrical**

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**PART 1 - GENERAL****1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA C22.10-10, Canadian Electrical Code, Part 1 (21<sup>st</sup> Edition) and modification of Quebec.
  - .2 CAN/CSA-C22.3 n° 7-10, Underground Systems.
  - .3 CAN3-C235-83 (R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC).
  - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC).
  - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7<sup>th</sup> Edition.

**1.2 DEFINITIONS**

- .1 Electrical and Electronic Terms: Unless otherwise specified, terms used in these specifications and on drawings are those defined by IEEE SP1122.

**1.3 DESIGN REQUIREMENTS**

- .1 Operating Voltages: To CAN3-C235 Standard.
- .2 Motors, electric heating, control, and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language Operating Requirements: Provide identification nameplates and labels for control items in English and French.
- .4 Use one nameplate for both official languages.

**1.4 SUBMITTALS**

- .1 Product Data: Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish, and limitations.
- .2 Shop Drawings:
  - .1 Shop drawings for Work executed at site to be stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
  - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
  - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each piece of equipment.
  - .4 Drawing must indicate clearances for operation, maintenance, and replacement of operating equipment devices.
  - .5 Submit electronic version drawings and data sheets.
  - .6 If changes are required, notify Departmental Representative of these changes before they are made.
- .3 Certificates:
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval prior delivery to site.
  - .3 Submit test results of installed electrical systems and instrumentation.
  - .4 Permits and fees: In accordance with General Conditions of Contract.
- .4 Manufacturer's Field Reports: Submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

**1.5 QUALITY ASSURANCE**

- .1 Qualifications: Electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle materials.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
  - .2 Store and protect materials from nicks, scratches, and blemishes.
- .4 Replace defective or damaged materials with new.

**1.7 DEMOLITION**

- .1 Remove all existing electrical equipment as indicated. Equipment to be removed at correct timing.
- .2 All equipment to be removed:
  - .1 Shall be removed with all related cabling and mounting;
  - .2 Becomes the property of the Contractor who shall dispose it promptly, or, be delivered to Departmental Representative, as indicated.
    - .1 All existing equipment to be delivered to Departmental Representative shall be cleaned and put in appropriate packaging.

**1.8 SYSTEM STARTUP**

- .1 Instruct operating personnel in operation, care and maintenance of systems, system equipment, and components.
- .2 Provide one additional visit for one technician on site within the period of twelve months following the date of the substantial completion certificate.
- .3 Date of visit to be coordinated with Departmental Representative.

**1.9 OPERATING INSTRUCTIONS**

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

- .2 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and piece of equipment.
  - .2 Safety precautions.
  - .3 Procedures to be followed in event of equipment failure.
  - .4 Other instructions, as recommended by manufacturer of each system or equipment.
- .3 Post instructions where directed.
- .4 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .5 Ensure operating instructions will not fade when exposed to sunlight.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS AND EQUIPMENT**

- .1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site.

### **2.2 WIRING TERMINATIONS**

- .1 Ensure lugs, terminals, and screws used for termination of wiring are suitable for copper conductors as well as aluminum conductors.
- .2 Cable lugs to be compression type for the required size.

### **2.3 EQUIPMENT IDENTIFICATION**

- .1 The enclosure identification terms will be supplied by Departmental Representative.

### **2.4 WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings, numbered or self-adhesive coloured plastic tapes ("Pan-Quick" type), on both ends of phase conductors of feeders and branch circuit wiring, including neutral.
- .2 Maintain phase sequence and colour coding throughout the installation.
- .3 Colour Coding: To CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

**2.5 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer, inside and outside, and at least two coats of finish enamel.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1, except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1, except where specified otherwise.

**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 FIELD QUALITY CONTROL**

- .1 Conduct following:
  - .1 Circuits originating from branch distribution panels;
  - .2 Checking of earth continuity;
  - .3 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 1,000 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 testing results to the Departmental Representative.



**3.4 CLEANING**

- .1 Clean and touch up surfaces of painted equipment scratched or marred during shipment or installation, to match original paint.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED SECTIONS**

- .1 Section 26 05 00 - Common Work Results for Electrical.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA)/CSA International.
  - .1 CAN/CSA-C22.2, No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2 CSA C22.2, No. 65-03 (R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 National Electrical Manufacturers Association (NEMA).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit manufacturer's instructions, printed product literature, and data sheets for wire and box connectors, and include product characteristics, performance criteria, physical size, finish, and limitations.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Submit required documents.
- .2 Operation and Maintenance Data: Submit operation and maintenance data for wire and box connectors for incorporation into operation and maintenance manual.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Pressure type wire connectors to: CSA C22.2, No. 65, with current carrying parts of copper sized to fit copper conductors, as required.
- .2 Joint connectors for lighting fixtures, to current carrying copper elements, sized for copper conductors size 10 AWG or less.
- .3 Bushing Stud Connectors: To NEMA to consist of:
  - .1 Connector body and stud clamp for round copper conductors.
  - .2 Clamp for stranded copper conductors.
  - .3 Stud clamp bolts.
  - .4 Bolts for copper conductors.
  - .5 Sized for conductors as indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and cables, and proceeding as following:
  - .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 CAN/CSA-C22.2 No. 65.
  - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
  - .4 Install bushing stud connectors in accordance with NEMA.
  - .5 Where required, provide grounding and bonding in accordance with CSA C22.2 No. 41.

### **3.3 CLEANING**

- .1 Perform cleaning during construction.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 05 20 - Wire and Box Connectors (0 - 1,000 V).

### **1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA C22.2, No. 0.3-09, Test Methods for Electrical Wires and Cables.
- .2 Underwriters Laboratories of Canada (ULC).
  - .1 ULC-S139-00, Method of Fire Test for Evaluation of Integrity of Electrical Cables.

### **1.3 PRODUCT DATA**

- .1 Provide product data.

## **PART 2 - PRODUCTS**

### **2.1 BUILDING WIRES**

- .1 Conductors: Stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper Conductors: Size as indicated, with 1,000 V insulation of cross-linked thermosetting polyethylene material rated or RWU90 XLPE.

## **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 required 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 (0-1,000 V).
- .2 Cable Colour Coding: To Section 26 05 00 - Common Work Results for Electrical.

### **3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems or in underground ducts.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 CSA Group.
  - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22<sup>nd</sup> Edition), Safety Standard for Electrical Installations.
  - .2 CSA C22.2 No. 41-13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
  - .3 CSA C22.2 No. 65-13, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for connectors and terminations, and include product characteristics, performance criteria, physical size, finish, and limitations.

**PART 2 - PRODUCTS****2.1 CONNECTORS AND TERMINATIONS**

- .1 Copper long barrel compression connectors to CSA C22.2 No. 65 as required sized for conductors.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for connectors and terminations installation in accordance with manufacturer's written instructions.

**3.2 INSTALLATION**

- .1 Splices in accordance with manufacturer's instructions.

**3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

### **1.2 REFERENCES**

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE).
- .1 ANSI/IEEE 837- 02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish, and limitations.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT**

- .1 Rod Electrodes: Copper clad steel, 19 mm diameter by minimum 3 m long.
- .2 Plate Electrodes: Copper, surface area 0.2 m<sup>2</sup>, minimum 1.6 mm thick.
- .3 Grounding Conductors: Bare stranded copper, tinned, soft annealed, size as indicated.
- .4 Insulated Grounding Conductors: Green, copper conductors, size as indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

### **3.2 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to electrodes, using copper welding by thermit process.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.

### **3.3 MAINTENANCE HOLES**

- .1 Install conveniently located grounding stud, electrode, size as indicated stranded copper conductor in each maintenance hole.

### **3.4 ELECTRODES**

- .1 Install rod, plate electrodes, and make grounding connections as indicated.
- .2 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

### **3.5 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Service equipment, transformers, switchgear, duct systems, distribution panels, and outdoor lighting.

### **3.6 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests before energizing electrical system.

### **3.7 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International).
- .1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20<sup>th</sup> Edition.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

**PART 2 - PRODUCTS****2.1 SPLITTERS**

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

**2.2 JUNCTION AND PULL BOXES**

- .1 Interior Boxes:
  - .1 Construction: Welded steel enclosure without knock-out.
  - .2 Cover Surface Mounted: Screw-on flat covers.
- .2 Exterior Boxes:
  - .1 Exterior junction and pull boxes made of same materials and coating as conduits used.

**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 Unless indicated otherwise, mount cabinet as indicated.

**3.3 IDENTIFICATION**

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

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International).
- .1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20<sup>th</sup> Edition.

**PART 2 - PRODUCTS****2.1 OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Aluminium box with waterproof cover.

**2.2 FITTINGS - GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .3 Double locknuts and insulated bushings on sheet metal boxes.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- .1 Support boxes independently of connecting conduits.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 CSA International.
  - .1 CSA C22.2 No.40-M1989(R2009), Cutout, Junction and Pull Boxes.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for raceway, and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
  - .2 Store and protect raceway from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 - PRODUCTS****2.1 EXTERIOR RACEWAYS**

- .1 Exterior raceways with a closed end for land burial flush to the surface for crossing of bicycle path by electrical cables. These exterior raceways are supplied in 3 000 mm length each. Closed ends are situated at the extremities of the channel assembly.
- .2 The raceway and its covers are made of high density polymer reinforced concrete. The material is highly dielectric. The material is not porous and is not affected by water and freeze and thaw cycles.
- .3 The raceway and its covers are have a H20 loading rate and are able to sustain an 18,182 kg load. All covers shall have the inscription "Parcs Canada - Canada Parks".

- .4 Vandal-proof bolts are supplied for the fixing of the covers. Four socket wrenches are supplied for the installation and removal of the cover's bolts.
- .5 Two additional covers (800 mm length) shall be supplied to allow electrical wiring to enter and exit the channel at both ends. Covers shall have four secured vandal-proof bolts.
- .6 Manufacturer: OldCastle, Plastibeton Channel System Series, 1216 Model or equivalent.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- .1 Deviate bicycle path.
- .2 Saw pavement and excavate.
- .3 Install a layer of 0-20 mm stone and compact to 95% MP.
- .4 Install levelling blocks, fill with 0-20 mm stone and compact to 95% MP.
- .5 Install raceways and adjust height of levelling blocks to obtain same height for raceway and bicycle path.
- .6 Fill excavation with 0-20 mm stone and compact to 95% MP by layer of 150 mm up to the foundation level.
- .7 Pave the raceway's adjacent sections and make sure that raceway is at pavement's level.
- .8 Remove bicycle path deviation and restore area to its initial state.

#### **3.2 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
  - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data: Submit manufacturer's printed product literature, specifications, and datasheets.

**PART 2 - PRODUCTS****2.1 CONDUITS**

- .1 Electrical Metallic Tubing (EMT): To CSA C22.2 No. 83, with couplings. Interior use in cabinet only.
- .2 Rigid PVC Conduit: To CSA C22.2 No. 211.2. Use in bottom of trench only.
- .3 Rigid metal conduits to CSA C22.2 No. 45, hot dipped galvanized steel, threaded.



**2.2 CONDUIT FASTENINGS**

- .1 One-hole steel straps to secure surface conduits smaller than 50 mm.
- .1 Two-hole steel straps for conduits 50 mm or larger diameter.

**2.3 CONDUIT FITTINGS**

- .1 Fittings: To CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.  
Coating: Same as conduit.
- .2 Ensure factory "ells" where 90° bends 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

**2.4 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

**2.5 FISH CORD**

- .1 Polypropylene.

**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 Mount conduits, except as indicated.
- .2 Use rigid PVC conduit underground.
- .3 Bend Conduit Cold:
  - .1 Replace conduit if kinked or flattened more than  $\frac{1}{10}$ <sup>th</sup> of its original diameter.
- .4 Mechanically bend steel conduit over 19 mm diameter.

- .5 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .6 Install fish cord in empty conduits.
- .7 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.
- .8 Dry out conduits before installing wire.

### **3.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to cabinet lines.

### **3.4 CONDUITS UNDERGROUND**

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

### **3.5 CLEANING**

- .1 Clean site on a weekly basis.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 Insulated Cable Engineers Association, Inc. (ICEA).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for cables, and include product characteristics, performance criteria, physical size, finish and limitations.

**PART 2 - PRODUCTS****2.1 CABLE PROTECTION**

- .1 38 x 140 mm planks pressure treated with clear copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.

**3.2 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 CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 After installation of cables, seal duct ends with duct sealing compound.

**3.3 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using qualified personnel.
  - .1 Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits, and grounds.
  - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance Tests:
  - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1,000 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.
- .6 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 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 Record leakage current at each step.
- .7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

**3.4 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 CSA International.
  - .1 CAN3-C17-M84(R2008), Alternating - Current Electricity Metering.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for metering and switchboard instruments, and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Include meter, outline dimensions, panel drilling dimensions, and installation cut-out template.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location, and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
  - .2 Store and protect metering and switchboard instruments from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 - PRODUCTS****2.1 MEASUREMENT UNITS**

- .1 General.
  - .1 The unit is an AC power monitor with a built-in advanced configuration system and LCD data display. The unit is designed for measurement of electrical

parameters in a variety of three-phase and single-phase circuits. The unit is enclosed in a modular housing for a panel mounting, with IP65 degree of protection in front of the panel. The power monitor can be provided with analog or digital outputs. These outputs can be selected to output a pulse proportional to the real and reactive energy measured, or to annunciate alarms. The instrument can also be equipped with a serial RS-485/RS-232 port, an EtherNet/IP port, and analog outputs.

- .2 Equipped with a communication port, the unit communicates power and energy parameters to all other systems.

## **2.2 TECHNICAL SPECS**

### **.1 General Specifications:**

- .1 Temperature, operating: -25°C to 55°C (R.H. from 0 to 90% noncondensing at 40°C) according to EN62053-21, EN50470-1, and EN62053-23 Standards.
- .2 Temperature, storage: -30°C to 70°C (R.H. from 0 to 90% noncondensing at 40°C) according to EN62053-21, EN50470-1, and EN62053-23 Standards.
- .3 Installation category: Cat. III (IEC60664 and EN60664).
- .4 Dielectric strength: 4 kV AC rms for 1 minute.
- .5 Noise rejection CMRR: 100 dB, 48 to 62 Hz.
- .6 EMC: According to EN62052-11 Standard.
- .7 Electrostatic discharge: 15 kV air discharge.
- .8 Immunity to radiated electromagnetic fields:
  - .1 Test with current: 10 V/m from 80 to 2 000 MHz.
  - .2 Test without any current: 30 V/m from 80 to 2 000 MHz.
- .9 Burst: On current and voltage measuring inputs circuit: 4 kV.
- .10 Immunity to conducted disturbances: 10 V/m from 150 kHz to 80 MHz.
- .11 Surge: On current and voltage measuring inputs circuit: 4 kV; on "L" auxiliary power supply input: 1 kV.
- .12 Radio frequency suppression: According to CISPR22.

- .2 Standard Compliance:
  - .1 Safety: According to IEC60664, IEC61010-1 EN60664, and EN61010-1.
  - .2 Metrology: According to EN62052-11, EN62053-21, EN62053-23, EN50470-3, and MID "annex MI-003".
  - .3 Pulse output: According to DIN43864 and IEC62053-31.
  - .4 Approvals: CE, cULus (E56639).
  - .5 Connections: Screw type.
  - .6 Cable cross-section area: 2.5 mm<sup>2</sup> (14 AWG) max.
    - .1 Screw tightening torque: 0.4 N•m min/0.8 N•m max.
    - .2 Suggested screw tightening torque: 0.5 N•m.
- .3 Housing DIN:
  - .1 Dimensions (D x H x D) approx.:
    - .1 Module holder: 96 x 96 x 50 mm.
    - .2 A and B type Modules: 89,5 x 63 x 16 mm.
    - .3 C type module: 89,5 x 63 x 20 mm.
  - .2 Depth, max: 81,7 mm.
  - .3 Material: ABS, self-extinguishing: UL-94 V-0.
  - .4 Mounting: Panel mounting.
  - .5 Pollution degree: 2.
  - .6 Front: IP65, NEMA 4X, and NEMA 12.
  - .7 Screw terminals: IP20.
  - .8 Weight, approx.: 400 g.
- .4 Application softwares included and programmed by Contractor as per Client's specifications.



**2.3 MEASURED FEATURES**

- .1 Voltage.
- .2 Current.
- .3 Frequency.
- .4 Consumption.
- .5 Demand.
- .6 Voltage Unbalance.
- .7 Current Unbalance.
- .8 Kilowatt.
- .9 kVAR.
- .10 kVA.
- .11 True Power Factor.
- .12 kWh.
- .13 kVARH
- .14 kVAH.
- .15 kW Demand.
- .16 kVAR Demand.
- .17 kVA Demand.
- .18 Demand Power Factor.
- .19 Analog Output (0-20 MA).
- .20 Pulse (digital) Output.
- .21 RS-485 port.
- .22 EtherNet/IP port.

**2.4 MANUFACTURER**

- .1 Allen-Bradley, 1420-V1-ENT Model (PowerMonitor 500 EtherNet/IP power meter, 240V ACV-LL 120V AC V-LN/240V ACV-LL).

**PART 3 - EXECUTION****3.1 METERING INSTALLATION**

- .1 Install meters in location free from vibration and shock.
- .2 Make connections in accordance with manufacturer's diagrams.
- .3 Locate meters within 1 m of instrument transformers.
  - .1 Use 32 mm conduit for interconnections.
  - .2 Use separate conduit for each set of current transformer connections, exclusive for metering.

**3.2 FIELD QUALITY CONTROL**

- .1 Conduct tests in accordance with Section 26 05 00 - Common Work Results for Electrical and in accordance with manufacturer's recommendations.
- .2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.
- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.
- .4 Perform tests to obtain correct calibration.
- .5 Do not dismantle meters and instruments.

**3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metering and switchboard instrument installation.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 CSA International.
  - .1 CSA C13-M83, Instrument Transformers.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for control and signal transformers and include product characteristics, performance criteria, physical size, finish, and limitations.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location, and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
  - .2 Store and protect control and signal transformers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 - PRODUCTS****2.1 POTENTIAL TRANSFORMERS**

- .1 Potential Transformers: To CSA C13, dry type for indoor-outdoor uses, with following characteristics:
  - .1 Nominal voltage class: 240 V.
  - .2 Rated frequency: 60 Hz.

- .3 Basic impulse level: 1 kV minimum.
- .4 Voltage ratio: as manufacturer's indications.
- .5 Accuracy rating:  $\pm 1\%$  of full scale.
- .2 Potential transformers equipped with fuse holder and fuses.

## **2.2 CURRENT TRANSFORMERS**

- .1 Current Transformers: To CSA C13, dry type for indoor-outdoor uses with following characteristics:
  - .1 Nominal voltage class: Manufacturer's indication.
  - .2 Rated frequency: 60 Hz.
  - .3 Basic impulse level: 1 kV.
  - .4 Metering accuracy rating:  $\pm 1\%$  of full scale.
  - .5 Solid-core or split-core
  - .6 Rated primary and secondary current: 400:5.
- .2 Positive action automatic short-circuiting device in secondary terminals.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- .1 Install current transformers into the splitter through and fix with Nylon Tyrap, and ensure accessibility.
- .2 Install voltage transformers into the splitter through and fix with metal screws.
- .3 Connect meter and ensure proper functioning.

### **3.2 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**3.3 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by control and signal transformers installation.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

### **1.2 REFERENCES**

- .1 CSA International.
  - .1 CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
  - .2 Include on drawings:
    - .1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

### **1.4 CLOSEOUT SUBMITTALS**

- .1 Operation and Maintenance Data: Submit operation and maintenance data for panelboards.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect panelboards from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **PART 2 - PRODUCTS**

### **2.1 PANELBOARDS**

- .1 Panelboards: To CSA C22.2 No.29 and product 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.
- .2 250 V Panelboards: Bus and breakers rated for 22 kA (symmetrical) interrupting capacity 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 Minimum of 2 flush locks for each panel board.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating of mains.
- .8 Copper Mains: Suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 Trim and Door Finish: Baked enamel.
- .11 Isolated ground bus.
- .12 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panelboard.

### **2.2 BREAKERS**

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping 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 all breakers.



## **2.3 EQUIPMENT IDENTIFICATION**

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

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for panelboards installation in accordance with manufacturer's written instructions.

### **3.2 INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards.
- .3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

### **3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by panelboards installation.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 CSA International.
  - .1 CAN/CSA C22.2 No. 94.1-07, Enclosures for Electrical Equipment, Non Environment Considerations.
- .2 National Electrical Manufacturers Association (NEMA).
  - .1 NEMA 250-2008, Enclosures for Electrical Equipment (1000 Volts Maximum).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for electrical cabinets and enclosures and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name, and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location, and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
  - .2 Store and protect electrical cabinets and enclosures from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- .1 12 gauge, 304 type stainless steel enclosure with a 304 stainless steel with a 78 x 78 x 6 mm stainless steel corner-iron frame for rigidity, weatherproof CEMA 3R type. Contractor has the sole responsibility to determine the required dimensions in

order to incorporate all the electrical feeder as well as distribution equipment and accessories. The dimensions shown on the drawings are minimal.

- .2 Stainless steel hardware.
- .3 Two or three 12 gauge 304 stainless steel doors, on both sides.
- .4 Stainless steel piano-hinge.
- .5 Zinc-plated 3-point dead bolt door latching system with round rods and guide EBERHARD 5647 or approved equivalent, with stainless steel padlockable handles EBERHARD 8062 or approved equivalent, and CORBIN 15481RS locks and 5R-6352 keys or approved equivalent. Retaining doors systems by fixed stainless steel rods.
- .6 Steel galvanized mounting plate.
- .7 Neoprene weatherproof gasket.
- .8 Ventilation louvers with screens, deflectors and thermostatic controlled evacuation ventilator, Hammond SKT-011419NO cooling thermostat or approved equivalent, and accessories by the manufacturer. Supplied and installed on each side of the enclosure.
- .9 Finish: Brushed stainless steel.
- .10 The enclosure shall have a thermal isolation with reflective surface. All edges are covered with aluminium tape.
- .11 Provide space for future equipment add-ons equivalent of 20% of the interior surface. A minimal space shall be provided between the equipment and the shell of the enclosure. Provide a 100 mm minimum on the sides, 150 mm on top, and 300 mm on the bottom.
- .12 Supply four doors on each side at the bottom of cabinet for connection of customer cables during events. Dimensions of openings: 100 mm (width) x 305 mm (length). These doors have automatic closing and locking devices.
- .13 Installation of plugs of any type shall allow closing the front doors.
- .14 Supply and install eight anchor bolts to secure cabinet to concrete base.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for electrical cabinet and enclosure installation in accordance with manufacturer's written instructions.

**3.2 INSTALLATION**

- .1 Assemble enclosure in accordance with manufacturer's instructions and securely mount on building structure with channels, supports, and fastenings.
- .2 Mount equipment in enclosure.
- .3 Label electrical cabinets and enclosure to Section 26 05 00 - Common Work Results for Electrical.

**3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Provide fuse performance data characteristics for each fuse type and size. Performance data to include: Average melting time-current characteristics.
- .2 Shop Drawings:
  - .1 Provide shop drawings.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in moisture free location.

**1.4 EXTRA MATERIALS**

- .1 Provide six spare fuses of each type and size installed.

**PART 2 - PRODUCTS****2.1 FUSES - GENERAL**

- .1 Fuse type references L1, L2, J1, R1 have been adopted for use in this specification.
- .2 Fuses: Product of one manufacturer.

**2.2 FUSE TYPES**

- .1 Class L Fuses.
  - .1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
  - .2 Type L2, fast acting.

- .2 Class J Fuses.
  - .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
  - .2 Type J2, fast acting.
- .3 Class R -R Fuses.
  - .1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.
  - .2 Type R2, time delay, capable of carrying 500% of its rated current for 10 s minimum.
  - .3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.
- .4 Class C Fuses.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
  - .1 Install rejection clips for Class R fuses.
- .3 Ensure correct fuses fitted to assigned electrical circuit.
- .4 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.
- .5 Install spare fuses in fuse storage cabinet.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 CSA International.
  - .1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-National Standard with UL 489, and NMX-J-266-ANCE-2010).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish, and limitations.
- .2 Include time-current characteristic curves for breakers with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage with ampacity of 100 A and over.
- .3 Certificates:
  - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet Standards and Regulations.
    - .1 Production certificate of origin must be submitted to Departmental Representative for approval.
  - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
  - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.



- .4 Production certificate of origin must contain:
  - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
  - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
  - .3 Contractor's name and address and person responsible for project.
  - .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
  - .5 Name and address of building where circuit breakers will be installed:
    - .1 Project title;
    - .2 End user's reference number;
    - .3 List of circuit breakers.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store circuit breakers indoors and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
  - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

### **PART 2 - PRODUCTS**

#### **2.1 BREAKERS GENERAL**

- .1 Moulded-case circuit breakers, circuit breakers, ground-fault circuit-interrupters: To CSA C22.2 No. 5.
- .2 Bolt-on Moulded Case Circuit Breaker: Quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .3 Common-Trip Breakers: With single handle for multi-pole applications.
- .4 Circuit breakers to have minimum 22 kA symmetrical rms interrupting capacity rating.

## **2.2 THERMAL MAGNETIC BREAKERS**

- .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 ADDITIONAL FEATURES**

- .1 Include:
  - .1 On-off locking device for all breakers.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

### **3.2 INSTALLATION**

- .1 Install circuit breakers.

### **3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 CSA Group.
  - .1 CAN/CSA-C22.2 No. 4-04(R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).
  - .2 CSA C22.2 No. 39-13, Fuseholder Assemblies.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish, and limitations.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
  - .2 Store and protect disconnect switches - fused and non-fused from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 - PRODUCTS****2.1 DISCONNECT SWITCHES**

- .1 Fusible and Non-fusible, disconnect switch in CSA Enclosure 1, to CAN/CSA-C22.2 No. 4, size as indicated.
- .2 Provision for padlocking in on-off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.

- .4 Fuses: Size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.
- .5 Fuseholders: To CSA C22.2 No. 39 suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 "ON-OFF" switch position indication on switch enclosure cover.

## **2.2 MANUAL TRANSFER SWITCH**

- .1 Fusible, disconnect switch in CSA enclosure 1, to CAN/CSA-C22.2 No. 4, size as indicated.
- .2 Provision for padlocking in on-off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Quick-make, quick-break action.
- .5 "ON-OFF" switch position indication on switch enclosure cover.
- .6 Contacts with de-ionizing arc chutes.
- .7 Intensive use switch made for 100% load break and load make rated.

## **2.3 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for disconnect switches - fused and non-fused installation in accordance with manufacturer's written instructions.

## **3.2 INSTALLATION**

- .1 Install disconnect switches complete with fuses.

**3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

**END OF SECTION**

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## **Division 31 / Earthwork**

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**PART 1 - GENERAL****1.1 REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
  - .1 ASTM C117-13, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-63 (2007)e1, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D1557-12, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA).
  - .1 CAN/CSA-A3000-03 (R2005), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete

**1.2 DEFINITIONS**

- .1 Excavation Classes: Two classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock: Solid material which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2 Common excavation: Excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified Excavation: Excavation of deposits of whatever character encountered in Work.
- .3 Top soil: Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and seeding.
- .4 Waste Material: Excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow Material: Material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Unsuitable Materials:
  - .1 Compressive and weak fill materials under the excavated areas.
  - .2 Frost susceptible materials under the excavated areas.
  - .3 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136 Standards: Sieve sizes to CAN/CGSB-8.1.

- .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

- .3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.



- .7 Unshrinkable Fill: Very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

### **1.3 DOCUMENTS TO BE SUBMITTED FOR APPROBATION/INFORMATION**

- .1 Submit required documents.
- .2 Quality Control:
  - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
  - .2 Submit for review by Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this Section.
  - .3 Submit to Departmental Representative written notice at least seven (7) days prior to excavation work, to ensure cross sections are taken.
  - .4 Submit to Departmental Representative written notice when bottom of excavation is reached.
- .3 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
  - .2 Submit records of underground utility locates, indicating: Location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.

### **1.4 QUALITY ASSURANCE**

- .1 Submit design and supporting data at least two (2) weeks prior to beginning Work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Quebec and/or Canada.
- .3 Keep a copy of design and supporting data on the Work site.
- .4 Hire a qualified professional engineer registered or licensed in Province of Quebec and/or Canada, to be in charge of the conception and the inspection of the cofferdams and bracings, during the Work.
- .5 Do not use soil material until written report of soil test results is approved by Departmental Representative.

.6 Health and Safety Requirements.

- .1 Do construction occupational health and safety.

## **1.5 PROTECTION OF EXISTING STRUCTURES**

- .1 Protect existing structures in accordance with local regulations.

.2 Underground structures and utility systems.

- .1 Before commencing Work verify and establish location of buried services on and adjacent to site.
- .2 Details indicated on the drawings regarding the dimensions, location and depth at which underground structures and utilities are buried are only provided for general information purposes and are not necessarily accurate or complete.
- .3 Before starting to dig trenches, notify the Departmental Representative and/or the authorities of the public utility companies involved and determine the location and condition of the underground structures and systems. Clearly identify the locations to prevent any service interruptions while the Work is being performed.
- .4 Confirm the location of the underground systems by carefully performing trial excavations.
- .5 Maintain in operation and protect against any damage all water, sewage, gas, electricity and telephone lines as well as other systems or structures that might be in the areas to be excavated.
- .6 Before moving or disturbing a structure or a public utility system in any way, obtain appropriate directives from the Departmental Representative.
- .7 Obtain appropriate directives from Departmental Representative before removal or detour of existing systems at the excavation site. Assume the costs for this Work.
- .8 Take note of the location of the underground lines that have been retained, diverted or abandoned.
- .9 Confirm the location of excavations recently performed near Work area.

.3 Existing buildings and structures on the property.

- .1 In the presence of the Departmental Representative, check the condition of the buildings, trees and other plants, lawns, fences, service poles, cables, railroad tracks, road surfaces, survey markers and elevation indicators that need to stay in place and which may be damaged during the Work.

- .2 Protect existing buildings and structures on the property likely to sustain damage, against all such damage while the Work is being performed. In the event of damage, immediately restore the affected components to their original state, to the Departmental Representative's satisfaction.
- .3 If roots or branches need to be cut to complete the excavation work, only perform this work after obtaining the Departmental Representative's approval.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

#### **.1 Type 1 Fill: Crushed stone 20-0:**

Clean, hard, durable crushed stone or gravel free of shale, clay and friable, organic or deleterious material; the sizing of the material shall remain within the range indicated below, when tested in accordance with the ASTM C136-06 and ASTM C117-04 Standards, and the sizing curve plotted on a semi-logarithmic graph shall be continuous and progressive. The fill shall be certified DB 0-20 fill.

#### **ASTM Sizing: % Throughs**

31.5	mm	100
20	mm	90-100
14	mm	68-93
5	mm	35-60
1.25	mm	19-38
315	µm	9-17
80	µm	2-7

#### **.2 Type 2 Fill: Granular Class A Soils:**

Compactable soils, essentially comprising granular, hard, durable, non-plastic material, such as MG-112 sand, gravel or crushed stone. These soils shall be free of shale, clay, and friable, organic or deleterious material, and of contaminated material. These soils shall not be frost prone. These soils shall not contain rubble greater than 100 mm in diameter.

#### **.3 Type 3 Fill: Regular Class B Soil:**

All compactable, unfrozen material may be used except organic soils. The soil components must be minerals, free from stones greater than 150 mm in diameter, clinker, ashes, waste, pieces of sod or other harmful material.

**.4 Drainage Fill:**

Crushed stone 19 mm in diameter, clean, hard, and durable, containing no dust or foreign material, organic or plant material, or flat or elongated fragments.

**.5 Stone Dust:**

Screened stone: hard, clean, durable, free of shale, clay and friable, organic or deleterious material; in compliance with the following sizing (ASTM C136-06 and ASTM C117-04):

**ASTM Sizing; % Through**

10	mm	100
5	mm	75-100
160	µm	4-25
80	µm	0-10

**.6 Dimensionally Stabilized Fill Materials:**

.1 0.4 MPa maximum compression strength at 28 days;

.2 maximum Portland cement content of 25 kg/m<sup>3</sup>, comprising 40% fly ash as cement replacement: in accordance with the CAN/CSA-A3000, Type GU Standard;

.3 0.07 MPa minimum strength at 24 hours;

.4 Concrete aggregate: In accordance with the CAN/CSA-A23.1/A23.2-04 Standard;

.5 Portland cement: Type GU;

.6 Slump: 160 mm.

**.7 Geotextile Membrane:** Texel No. 7609 type or approved equivalent.

.8 Before using, have the Departmental Representative approve all fill materials. After receiving approval, always purchase the same materials from the same sources.

.9 Before resorting to using borrowed material, the Contractor may use excavated material if it meets the requirements of this section of the specifications and is approved by the Departmental Representative. In-situ soils shall not be used as type 2 fill. They may be considered as type 3 fill if they meet the requirements for this type of fill.

.10 Provide supplementary fill material suitable for the Work, from an outside supplier.

- .11 **Bedding and surround materials for pipes and underground structures:** The bedding and surround of underground structures or the anti-contamination layer are produced using MG-20b calibre granular materials complying with the Quebec Department of Transport's 2101 and 2103 Standards shown in the tables appearing in the "Granular Materials" article, and whose petrographic number is 300 max. with  $M_gSO_4$  (NQ2560-450) durability of 35 % max.

**ASTM Sizing; % Throughs**

31.5	mm	100
20	mm	90-100
14	mm	68-93
5	mm	35-60
1.25	mm	19-38
315	$\mu m$	9-17
80	$\mu m$	5-11

**PART 3 - EXECUTION**

**3.1 PREPARATORY WORK**

- .1 At the start of the Work, clear away all obstacles, snow and ice from the surfaces of the excavation and backfill area to the extent indicated and/or required to perform Work.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

**3.2 PREPARATION/PROTECTION**

- .1 Protect existing features in accordance with applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

**3.3 STRIPPING OF TOP SOIL**

- .1 Once the bushes, weeds and sod have been removed from the site, start excavating the top soil in the areas required for completion of the Work.
- .2 Excavate the top soil down to the subsoil. Do not mix the top soil with material from the subsoil.
- .3 Pile the top soil in the areas designated by the Departmental Representative for later use in landscaping operations. Do not pile the earth higher than 2 m.
- .4 Remove the unused top soil from the site.

**3.4 PILING**

- .1 Pile the backfill material in the areas designated by the Departmental Representative and store the aggregate material to prevent any segregation.
- .2 Protect the fill materials against any contamination.

**3.5 COFFERDAMS, BRACING, CROSS BRIDGING, AND UNDERPINNING**

- .1 Build temporary falsework as required.
- .2 Perform the following operations during backfilling:
  - .1 Unless otherwise indicated or directed by the Departmental Representative, remove the sheet piles and falsework from the excavation sites.
  - .2 Do not remove the cross bridging before the fill material has been piled to the height at which it stands.
  - .3 Gradually remove the sheet piles, keeping the compacted backfill at least 500 mm above the bottom of the sheet piles.
- .3 When the sheet piles need to remain in place, cut the tops of the sheet piles at the level indicated.
- .4 Perform the following operations once the infrastructure construction is completed.
  - .1 Remove the cofferdams, falsework and cross bridging.
  - .2 Remove the surplus material from the site.

**3.6 EXCAVATION DEWATERING AND UPLIFT PREVENTION**

- .1 Keep the excavations dry throughout Work.
- .2 If there is a risk of boiling or uplift, do not excavate below the water table. To prevent the conduits or the excavation floor from heaving, lower the water table, cut back the sheet piles or use other appropriate methods.
- .3 Protect open pits against flooding and damage that may result from surface runoff.
- .4 Evacuate the water in a manner that poses no risk to public or private properties, or to any part of the completed Work or Work in progress.
- .5 Provide and install flocculation tanks, settling tanks or other water treatment facilities to remove suspended solids or other undesirable material before discharging the water into a storm sewer, watercourse, or drainage basin.

**3.7 EXCAVATION**

- .1 Notify the Departmental Representative at least one week before starting the excavations and record the elevations of the natural land in his presence where necessary.
- .2 Perform the excavation work according to the indicated mapping, profiles, levels, cuts and dimensions.
- .3 The excavation work shall in no way alter the load-bearing capacity of adjacent foundations.
- .4 Do not move the earth under the canopy of trees or bushes that are to remain in place. If it is necessary to excavate between the roots, excavate by hand and cut the roots with a well-sharpened axe or saw.
- .5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave any open trench at end of day's operation.
- .6 Excavation materials and piled materials shall be stored at an adequate distance from the trenches.
- .7 Limit Work performed with construction machinery in the immediate vicinity of unfilled trenches.
- .8 Dispose all excavation surpluses or unsuitable materials away from work site.
- .9 Avoid blocking surface runoff or natural watercourses.

- .10 Excavation bottoms shall be free of loose, soft or organic material.
- .11 If the soil at the bottom of the excavations appears to be unsuitable, notify the Departmental Representative.
- .12 Once the excavations are completed in an area, have them approved by the Departmental Representative.
- .13 Remove all unsuitable material, such as stone, rock fragments, and others, from the excavation site that might slides down into it.
- .14 Contour the excavations by hand, reinforce the walls and remove all loose material and debris from the excavations. If the material at the bottom of the excavation has been disturbed, compact it until it is at least as dense as the undisturbed soil. Clean cracks found in the rock and fill them with concrete grout or mortar to the Departmental Representative's satisfaction.
- .15 Install geotextiles.

### **3.8 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below or as mentioned on the plans. Compaction densities are percentages of maximum densities obtained from ASTM D698, and/or ASTM D1557.
  - .1 Place unshrinkable fill in areas as indicated.

### **3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

### **3.10 BACKFILLING**

- .1 Perform compaction of backfilling materials with vibrating equipment.
- .2 Do not proceed with backfilling operations until Departmental Representative has inspected and approved the installations.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.



- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading.
  - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
    - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative:
    - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .7 Place unshrinkable fill in areas as indicated.
- .8 Consolidate and level unshrinkable fill with internal vibrators.

### **3.11 SITE RESTORATION**

- .1 Once Work is completed, remove any surplus material and debris, re-grade the slopes and correct any defects.
- .2 Replace top soil as indicated.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Restore the surfaces of roads affected during the Work to the condition and level that existed before the excavation began, ensuring that these structures are restored to their original thickness.
- .5 Clean and restore areas damaged during the Work, according to the Departmental Representative's directives.
- .6 During the first 24 hours, use temporary shoring to support the loads exerted by traffic on the dimensionally stabilized backfills.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**3.12 DISPOSAL OF WASTE MATERIALS****.1 General.**

.1 The Contractor shall load, transport and dispose of all waste material off-site, at the location, which he shall select and which is suited to the disposal of said waste, in compliance with the directives of the MDDEP's Soil Protection and Contaminated Sites Rehabilitation Policy.

.2 Loading, transportation and disposal of waste are at the Contractor's expense.

**.2 Dry Materials.**

.1 All materials from 2<sup>nd</sup> class excavation such as crushed or shredded residue, which are non-petruscible and contain no hazardous waste such as scrap wood, rubble, waste plaster, and concrete, masonry and paving refuse, shall be transported and disposed of at a dry materials dump authorized by Quebec's Ministère de l'Environnement (Ministry of the Environment). The Contractor must provide the Departmental Representative with proof that the selected dumpsite meets the requirements of this article as well as receipts issued by the dumpsite upon reception of the material. The cost of sorting, handling, and disposing of these materials shall be assumed by the Contractor.

**.3 Unusable Materials.**

.1 All materials from 2<sup>nd</sup> class excavation and deemed unusable by the Departmental Representative, such as putrid matter, top soil, loam, etc., shall be transported to a suitable location chosen by the Contractor and approved by the Departmental Representative. Rotting materials from debris will also be loaded into closed truck boxes. The cost of sorting, handling and disposing of these materials shall be assumed by the Contractor.

.2 If deemed necessary by the Departmental Representative, the Contractor shall, for filling trenches, replace unusable materials with acceptable materials.

**3.13 DISPOSAL OF EXCAVATION SURPLUS**

.1 Excavation surplus refused by the Departmental Representative for the project's backfilling purposes can be disposed of at a site selected by the Contractor and approved by the Departmental Representative, and located at least 75 m (250 ft.) from a road's right-of-way or the shoreline of a water course. Materials must be placed so as not to be visible from a public road or obstruct the flow of water. Once disposal has been completed, the materials must be leveled to the satisfaction of the owner(s) of the land. The Contractor must obtain a letter of authorization from each of the owners of the land covered by these provisions. A copy of this agreement must be provided to the Departmental Representative before material is transported.

- .2 All Work covered by the preceding provisions shall be carried out in compliance with the directives and/or regulations of the MDDEP's *Soil Protection and Contaminated Sites Rehabilitation Policy*, which, in the event of contradiction, take priority over the preceding requirements.
- .3 All expenses related to any use whatsoever of the above-mentioned disposal and/or landfill site, including the obtention of any permit and/or authorization, as well as the loading, transportation and disposal, shall be at the Contractor's expense.
- .4 All sites for the storage and disposal of debris (excavation surplus excluding any refuse) considered within the framework of this contract must first be approved by the Departmental Representative no later than the first worksite meeting. None of these materials can be disposed of until this approval has been obtained.
- .5 Part of the debris is used by the Contractor to carry out Work covered by this contract. If excavation surplus is required by the Departmental Representative, the Contractor shall transport and spread this surplus material at his expenses, at designated locations within an overland radius of 8.0 km, as established by the Departmental Representative.
- .6 All excavation surplus and 1<sup>st</sup> and 2<sup>nd</sup> Classes debris not required by the Departmental Representative become the property of the Contractor.
- .7 The Contractor shall ensure that these materials are not disposed of in a flood zone and, prior to the start of Work, shall provide the Departmental Representative with a permit.
- .8 The Contractor is solely responsible for consequences resulting from the filling of one or more properties and possible claims or lawsuits from the property owners concerned, with regards to the leveling, the quality of debris materials, damages to trees, terraces, etc. The disposal of excavation surplus must not impede the natural drainage of the site.

**END OF SECTION**

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## **Division 33 / Utilities**

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**PART 1 - GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CAN/CSA-C83- 96(R2005), Communication and Power Line Hardware.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, Shipping, Handling, and Unloading:
  - .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Protection:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
  - .2 Replace defective or damaged materials with new.

**PART 2 - PRODUCTS****2.1 MATERIAL**

- .1 Service Mast: Rigid heavy duty, galvanized steel, suitable for attachment of support clamps, insulator rack, weatherhead, service drop fittings.
- .2 Service mast support devices.
- .3 Insulator Rack: To CAN/CSA-C83, three-wire, heavy duty.

- .4 Service Tap Support: Suitable for preformed grip or other attachment for spun cables to approval of supply authority.
- .5 Weatherhead: Cast iron to approval of supply authority.
- .6 Rigid Steel Galvanized Conduit and Fittings.
- .7 Pole protection and concrete.
- .8 Wooden Poles:
  - .1 Wooden poles: To CAN/CSA-O15, Class 4 Eastern White Cedar and:
    - .1 Length: 7.62 m
    - .2 Minimum diameter: At butt 300 mm, at top 170 mm.
    - .3 Pressure treated: To CAN/CSA-O80.

### **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 wooden pole service mast, insulator rack, service tap support, weatherhead, pole protection, and concrete.
- .2 Install service drop conductors allowing sufficient conductor length for connection to service equipment.
- .3 Allow sufficient conductor length for connection to supply by power supply authority.
- .4 Allow sufficient conductor length for drip loops.
- .5 Make grounding connections in accordance with Section 26 05 28 - Grounding - Secondary .

#### **3.3 FIELD QUALITY CONTROL**

- .1 Site Tests:
  - .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical .

- .2 Perform additional tests if required by authority having jurisdiction.

### **3.4 CLEANING**

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

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## **Division 35 / Waterway and Marine Construction**

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## **PART 1 - GENERALITIES**

### **1.1 GENERAL REQUIREMENTS**

- .1 Power pedestal shall be listed and marked, tested, and certified to conform with ANSI/UL® 231 Standard entitled "Power Outlets" and CAN/CSA C22.2 No. 29 Standard entitled "Panelboards and Enclosed Panelboards".
- .2 Shall be compliant with all sections of the latest edition of NFPA® 303, "Fire Protection Standards for Marinas and Boatyards".
- .3 Shall be compliant with NEC and NFPA 70 406.8 (B)(2)(a), which states: "A receptacle installed in a wet location shall be installed in a weatherproof enclosure, the integrity of which is not affected when the attachment plug is inserted".

### **1.2 CONSTRUCTION REQUIREMENTS**

- .1 All materials and components used in the construction of the power pedestal shall be listed.
- .2 Main Housing: Shall be constructed of  $\frac{3}{16}$  in. thick injection-molded listed polycarbonate and shall be painted with UV-resistant 2-part polyurethane coating and be listed as a NEMA® Type 3R weatherproof enclosure. The housing shall pivot at the mid-section to provide access to the terminal block assembly.
- .3 Access Panels: Shall be constructed of  $\frac{3}{16}$  in. thick injection-molded listed polycarbonate, painted with UV-resistant 2-part polyurethane coating, and be flush-mounted.
- .4 Top: Shall be constructed of  $\frac{3}{16}$  in. thick injection-molded listed polycarbonate and shall be covered with a UV-resistant 2-part polyurethane coating.
- .5 Lens: Shall be constructed of  $\frac{3}{16}$  in. thick injection-molded listed clear or amber-colored polycarbonate.
- .6 Mounting Base: Shall be constructed of  $\frac{1}{4}$  in. thick injection-molded polycarbonate and isolate the bottom of the pedestal housing from the mounting surface to shield against the corrosive effects of concrete and pressure-treated wood decking.
- .7 Hardware: Shall be stainless steel, Phillips® drive.

### **1.3 LIGHTING**

- .1 Each power pedestal shall contain a non-metered lighting assembly.
- .2 Lighting assembly shall be standard 5-W LED which is controlled by an electromechanical photocell.

- .3 Lighting assembly shall be protected by a 20 A, single-pole circuit breaker or fuse.
- .4 Standard lighting assembly shall provide 360° downward illumination and provide minimum dock lighting of one foot-candle at 15 feet and not interfere with boater navigation.

## **PART 2 - PRODUCTS**

### **2.1 RECEPTACLES & CIRCUIT BREAKERS**

- .1 Receptacles shall be corrosion-resistant, locking grounding type conforming to NEMA® 5-20R and NEMA® L5-30R Requirements, and are rated for marine ship-to-shore use.
- .2 Receptacles shall be Nylon made with corrosion-resistant stainless steel plate or equivalent.
- .3 Receptacles shall be mounted at a minimum height of 30 in. above the deck surface and at a minimum angle of 35° from horizontal for ship-to-shore power cord strain relief.
- .4 Each receptacle shall be individually protected by a thermal-magnetic ground fault circuit interrupting (GFCI) type circuit breaker with 10 kAIC interrupting rating.
- .5 Circuit breakers and twist-lock receptacles shall be assembled together on a panel section which can pivot out as a single mechanism for simplified maintenance practices.
- .6 Circuit breakers and receptacles shall be covered by a hinged weatherproof lockable door which must latch closed with or without the plugs and ship-to-shore power cards attached.
- .7 GFCI receptacles shall be covered by the same hinged weatherproof lockable door, which complies with NEC Article 406.9 (8)(1), which states: "15 and 20 A, 125 V and 250 V receptacles installed in wet locations shall have an enclosure that is weatherproof whether or not the attachment plug is inserted".

### **2.2 SOLID-STATE ELECTRIC KWH MONITORING (OPTIONAL)**

- .1 Each pedestal shall be capable of containing solid-state electric monitors which output kilowatt-hours (kWh) consumption at each slip via an electromechanical counter and/or wireless remote transmission.
- .2 Each solid-state electric monitor shall be rated for 200 A, listed, marked, and tested to conform to ANSI-C12.1 and NTEP Standards with  $\pm 1\%$  accuracy.
- .3 Each solid-state electric monitor shall be capable of monitoring ground faults at each slip.
- .4 Each solid-state electric monitor shall be capable of monitoring any additional external digital output device or analog device equipped with an analog pulse output i.e water meters or other electric kWh monitoring devices.

**2.3 WIRING & TERMINAL BLOCK**

- .1 Power pedestal shall be completely factory pre-wired to the load side of the copper  $\frac{3}{8}$  in. stud lug compression terminal block assembly.
- .2 Electrical wiring shall be high-stranding tin-plated copper THHW/MTW VW-1 Boat Cable rated for 105°C.
- .3 Line and load side terminations to the copper bus bar shall be made by compression-type ring terminals on  $\frac{3}{8}$  in.-16 stainless steel stud with stainless steel  $\frac{3}{8}$  in. x  $\frac{3}{4}$  in. O.D. flat washer,  $\frac{3}{8}$  in. stainless steel Belleville captive spring washer and  $\frac{3}{8}$  in.-16 silicon-bronze hex nut, torqued to 180 inch-pounds.
- .4 Line side wiring size shall be maximum 4/0 AWG for loop feeding and 350 kcmil for direct feed.
- .5 Maximum standard terminal block load shall not exceed 250 A at 125/250 VAC or 277/480 VAC.
- .6 All exposed metallic parts shall be grounded as part of the integral equipment ground.

**2.4 TELEPHONE, CABLE TELEVISION, INTERNET (OPTIONAL)**

- .1 Power pedestals shall be capable of providing single and/or dual telephone (RJ-11), cable television (F), and Internet (RJ-45) connectors.

**2.5 PLUMBING (OPTIONAL)**

- .1 Each pedestal shall be capable of providing single or dual  $\frac{1}{2}$  in. or  $\frac{3}{4}$  in. IPS stainless steel ball valve hose bibs.
- .2 Plumbing connections must be partitioned from all electrical wiring/components by an integral partition box.

**2.6 HOSE/CABLE BRACKETS**

- .1 Each pedestal shall be equipped with brackets capable of holding 50 feet of standard  $\frac{5}{8}$  in. I.D. garden hose, or 50 feet of 50 A, 4-wire shorepower (S.O.) cord.

**PART 3 - EXECUTION****3.1 DELIVERY**

- .1 Deliver equipment at Parks Canada's workshops.

**END OF SECTION**