



**Fisheries and Oceans
Canada**



Small Craft Harbours

New Marginal Wharf 403 Construction at Cap-des-Caissie

File No. FP802-170320

ELECTRICAL SPECIFICATIONS

Cap-des-Caissie, Kent County, New-Brunswick

December 11, 2017

- Part 1 General
- 1.1 RELATED SECTIONS
 - .1 Division 01 – General Requirements.
- 1.2 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 C22.1-15, Canadian Electrical Code (CEC), Part 1 (23rd Edition), Safety Standard for Electrical Installations.
 - .2 C22.3 No. 7-15, Underground Systems.
 - .3 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
 - .4 Z462-15 Workplace Electrical Safety.
 - .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC Y1-2-1979, Performance Specifications for Finishing Systems for Outdoor Electrical Equipment.
 - .3 Institute of Electrical and Electronics Engineers (IEEE)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
- 1.3 DEFINITIONS
 - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- 1.4 DESIGN REQUIREMENTS
 - .1 Operating voltages: to CAN3-C235.
 - .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.
- 1.5 ACTION AND INFORMATIONAL SUBMITTALS
 - .1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Submit to Electrical Inspection Services necessary number of drawings and specifications for examination and approval prior to commencement of work.

- .3 Product Data: submit WHMIS SDS in accordance with Section 01 35 29 – Health and Safety Requirements.
- .4 Shop drawings:
 - .1 Submit manufacturer shop drawings of all equipment.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, accessories 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 item of equipment.
 - .4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .5 If changes are required, resubmit corrected drawings.
- .5 Quality Control: in accordance with Section 01 45 00 – Testing and Quality Control.
 - .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 before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
- .6 Electronic Shop Drawings:
 - .1 Where the use of electronic shop drawings has been agreed to by the Departmental Representative, the following submittal requirements are to be followed:
 - .1 Shop drawings to be submitted in PDF format, legible and clear.
 - .2 Shop drawings to be grouped by specification section, with one PDF file per specification section. The file name to indicate the section number and name, i.e. “26 56 20 Site Lighting Rev0.PDF” with resubmissions appended Rev1, Rev2, etc.
 - .3 Supplemental information not previously submitted to be identified as follows: “26 56 20 Site Lighting Supplement 1.PDF”, Supplement 2, etc.
 - .4 A cover sheet is to be incorporated into each PDF submission and indicate the project name and number, specification section number and name, the contractors name, suppliers name, date submitted, contractor’s stamp and signature identifying that the contractor has reviewed the information prior to submission for correctness and completeness. Sufficient white space (minimum of ¼ page) is to be left for the Departmental Representative’s stamp and comments.
 - .5 Part numbers for submitted products to be clearly highlighted, boxed or arrowed with all required accessories and components indicated.
 - .6 Submitted information must be specific, detailed and relevant to the project. Bulk, generic information is not acceptable.
- .7 Upon completion of project, submit as-built drawings and maintenance manuals.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 – Testing and Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
 - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Site Meetings:
 - .1 Site Meetings: as part of Field Services described in Part 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 Twice during progress of Work at 25% and 60% complete.
 - .2 Upon completion of Work, after cleaning is carried out.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.8 SYSTEM STARTUP

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

1.9 SITE VISIT

- .1 Prior to tender submission, visit the site and become familiar with the job and all conditions which may affect costs. Ignorance of existing conditions will not be considered as basis for extra claims.

1.10 MEASUREMENT FOR PAYMENT

- .1 Electrical will be measured by lump sum.

1.11 SCHEDULE

- .1 Note that the Owner/fishermen intend to carry on business as usual and work activities must be coordinated to maintain electrical services in occupied areas. Provide any required temporary work.
- .2 The existing electrical services are to remain energized for fishing season during the upgrade/renovation work. After fishing season is completed, the new services are to be energized and the existing electrical made obsolete is to be removed.
- .3 All power shutdowns which affect fishermen or wharf operation must occur after fishing season is completed and have prior approval of Owner and must be scheduled in writing at least 48 hours in advance.
- .4 Outages associated with upgrade of utility lines and switchover to new service to be coordinated with utility after fishing season is completed.
- .5 Overtime work and work outside normal work hours deemed necessary to accomplish scheduling are the responsibility of the contractor and must meet the requirements of the Department of Post-Secondary Education, Training and Labour. All costs resulting from such overtime work must be included in the Contractor's total tender price.

1.12 ESSENTIAL SERVICES

- .1 Electrical services are considered essential services during fishing season and must be maintained in operation at all times.
- .2 Should interruptions to these services be deemed necessary they must be approved and scheduled in writing with the Owner at least 48 hours in advance.
- .3 Interruptions must be taken when acceptable to the Owner and may include weekday and weekend nights.
- .4 If an interruption in an essential service is taken, work must progress continuously until the service is restored.
- .5 Interruptions may be cancelled by the Owner at any time either prior to or during should an emergency arise. Any work must be immediately aborted and systems returned to full operating state.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

- .1 Use new material and equipment unless otherwise specified.
- .2 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
- .3 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.

- .4 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 and submit such approval as described in PART 1 – ACTION AND INFORMATIONAL SUBMITTALS.
- .5 Factory assemble control panels and component assemblies.

2.2 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 Immediately notify Departmental Representative in writing of unforeseen or unanticipated material delivery problems by manufacturer. Provide support documentation.
- .3 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction.
- .2 Decal signs, minimum size 175 mm x 250 mm.

2.4 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: plastic laminate lamicoïd 3 mm thick plastic engraving sheet, matte white finish face, black core, lettering accurately aligned and engraved into core and mechanically attached with 3m VHB acrylic adhesive type 4941.
 - .2 Sizes as follows:

NAMEPLATE SIZES

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

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate.

- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Lamicoïd nameplate installed on panelboards shall indicate the following:
 - .1 Designated name of equipment.
 - .2 Overcurrent protection device rating
 - .3 Voltages, number of phases and wires.
 - .4 Designation of power source.
 - .5 The following is an example:

PANEL MS0 – 400A 120/240V – 1PH – 3W

- .7 Lamicoïd nameplates installed on control panels, contactors and large junction and pull boxes shall contain the following information:
 - .1 Designated name of equipment.
 - .2 Designated name of power source.
 - .3 Voltage(s), number of phases and wires.
 - .4 Branch circuit breaker number(s) where possible.

2.5 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, indicating panel and circuit number; i.e., MS0-9. Normal ground circuits to have ground, neutral and phase wires identified with black on white background tape. Tape to be pre-printed vinyl, self-adhesive. Circuits to be identified at both ends and at all pull and junction boxes.
- .2 Use coloured plastic tapes to identify feeders on both ends of phase conductors and at junction and pull boxes if conductor insulation colours are other than red, black, blue, white and green.
- .3 Maintain phase sequence and colour coding throughout.
- .4 Colour coding: to CSA C22.1.

2.6 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 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 LOCATION OF OUTLETS AND EQUIPMENT
- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
 - .2 Change location of outlets and equipment at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- 3.4 MOUNTING HEIGHTS
- .1 Mounting height of equipment is from wharf deck to centreline of equipment unless specified or indicated otherwise.
 - .2 If mounting height of equipment is not indicated, verify before proceeding with installation.
 - .3 Install electrical equipment at the following heights unless indicated otherwise.
 - .1 Panelboards: 1500 mm or as required by Code.
 - .4 Refer to all detail drawings and confirm mounting of outlet boxes prior to roughing-in.
- 3.5 CO-ORDINATION OF PROTECTIVE DEVICES
- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.
- 3.6 FIELD QUALITY CONTROL
- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS: phase and neutral currents on panelboards, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

- .2 Conduct following tests in accordance with Section 01 45 00 – Testing and Quality Control.
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Check resistance to ground before energizing.
 - .3 Carry out tests in presence of Departmental Representative.
 - .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- 3.7 CLEANING
 - .1 Clean and touch up surfaces of shop-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 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Section 26 05 00 – Common Work Results for Electrical.
- 1.2 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 C22.1-15, Canadian Electrical Code (CEC), Part 1 (23rd Edition), Safety Standard for Electrical Installations.
 - .2 Z462-15, Workplace Electrical Safety.
- 1.3 DESCRIPTION OF WORK
 - .1 In general, work of this Section consists of the complete removal of all obsolete or abandoned electrical services, equipment and materials in the areas to be remediated. It also covers alterations to existing electrical services affected by remediation work.
 - .2 All removal or alteration work of electrical construction to be done in accordance with the safety standards outlined in the Canadian Electrical Code and CSA Z462.
- 1.4 SITE SURVEY
 - .1 Prior to Tender submission, visit the site and survey and quantify the extent of the removals/alterations required for this contract and include for all costs in the total tendered price. Any existing conditions information indicated on the drawings is for general guidance only.
 - .2 In conjunction with site visit, review electrical, civil, and structural drawings and include all costs due to existing conditions in total tendered price.
- 1.5 PROTECTION
 - .1 The contractor is responsible for any damages to existing structure as a result of the work.
- 1.6 WASTE MANAGEMENT AND DISPOSAL
 - .1 Remove from site and dispose of all materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Comply with all Federal, Provincial and Municipal laws and regulations when disposing of waste.
- 1.7 COORDINATION WITH UTILITIES
 - .1 Coordinate and arrange with Utility for disconnection and removal of obsolete utility services.

Part 2 Products

Not Applicable

Part 3 Execution

3.1 GENERAL REMOVALS

- .1 Remove all obsolete or abandoned electrical services, equipment and materials including metering equipment, wire and conduit, except those designated for reuse. This includes any utility services identified to be removed.
- .2 Any existing conduit, wiring, boxes or equipment that is to remain in service is to be properly supported as required by the CEC. Any additional hangers, straps or fasteners required are to be supplied under this contract and must be 316 stainless steel.
- .3 Make alterations to existing electrical services as required and make good all circuits affected by remediation work.
- .4 Any relocating of existing equipment and any rerouting of existing wire and conduit to coordinate with new work to be included in total tendered price.
- .5 Schedule all removal work with the Departmental Representative. Do not disrupt wharf operations.
- .6 Coordinate disconnection of existing services with Departmental Representative of services and the Utility.
- .7 Pay any Utility fees for removal of Utility services.
- .8 Some outages and removal work may be required prior to installation of new due to space limitations. Where required, coordinate extended outages with Departmental Representative.
- .9 All removal work must be done after fishing season ends.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .2 Fold up metal banding, flatten and place in designated area for recycling.
- .3 Do not dispose of preservative treated wood through incineration.
- .4 Do not dispose of preservative treated wood with other materials destined for recycling or reuse. Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill as approved by Departmental Representative.
- .5 Dispose of unused wood preservative material at official hazardous material collections site.
- .6 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other location where they will pose health or environmental hazard.

Part 2 Products

2.1 WOOD PRODUCTS

- .1 All wood products shall be cut from live timber and must be free from physical defects such as surface rot, heart rot and loose knots.
- .2 Wood products to be pressure treated in accordance with CAN/CSA-080 Series-08(R2012). Use ACA or CCA treatment only.
- .3 Pressure treatment to be AWWA category 4B with a CCA pcf of 0.60, suitable for marine use.
- .4 Any field cuts to be treated in accordance with AWWA standard M4 with a preservative containing at least 2% copper.
- .5 Posts to be 30 deg. roofed and 45 deg. beveled on the bottom prior to treatment.
- .6 Rough hardware: bolts, nuts, washers, lags, pin, screws; hot dipped galvanized after fabrication.
- .7 Wood products to be ordered to length to avoid field cuts.

Part 3 Execution

3.1 INSTALLATION

- .1 Layout and install the work in the locations and arrangement shown on the drawings or as indicated by the Departmental Representative.
- .2 Pre-drill all anchor holes to prevent splitting of wood.
- .3 Should field cuts be necessary, apply same preservative.
- .4 All field cuts, holes and breaks in the preservative treatment shall be given two coats of preservative before assembly.

END OF SECTION

- Part 1 General
- 1.1 RELATED SECTIONS
- .1 Section 26 05 00 – Common Work Results for Electrical.
- 1.2 REFERENCE STANDARDS
- .1 CAN/CSA W59.2-M1991 (R2013) – Welded Aluminum Construction.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- 1.4 DELIVERY, STORAGE AND HANDLING
- .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
- 2.1 SERVICE MODULES
- .1 Fabricate service modules utilizing 9 mm thick aluminum plate, Type A82C 5052-H32 as indicated.
- .2 Fabricate using sound, continuous full penetration welds conforming to CSA W59.2.
- .3 After fabrication, all parts shall be cleaned; welds ground smooth.
- 2.2 ANCHORAGE
- .1 16 mm diameter 316 stainless steel Anchor bolts and washers.
- Part 3 Execution
- 3.1 INSTALLATION
- .1 Install service module and secure in place. Provide 16mm gap between service module and concrete light base for fasteners, adjust gap as required.
- .2 Install corrosion resistant electrical components as indicated in service module.

END OF SECTION

- Part 1 General
- 1.1 SECTION INCLUDES
- .1 Materials and installation for wire and box connectors.
- 1.2 RELATED SECTIONS
- .1 Section 26 05 00 – Common Work Results for Electrical.
- 1.3 REFERENCE STANDARDS
- .1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-C22.2No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
- .2 CSA C22.2No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
- .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)
- 1.4 DELIVERY, STORAGE AND HANDLING
- .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
- 2.1 MATERIALS
- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper alloy sized to fit copper conductors as required. Use twist-on connectors for #14 AWG to #8 AWG wires.
- .2 Crimp style wire connectors, nylon insulated with current carrying parts of copper alloy, for connecting solid to stranded conductors.
- .3 Compression type connectors for connecting #6 AWG conductors and larger, unless indicated otherwise. Compression type connectors to have a temperature rating of 90 deg. C.

- .4 Fixture type splicing connectors to: CAN/CSA-C22.2 No. 65, with current carrying parts of copper alloy sized to fit copper conductors 10 AWG or less.
- .5 Mechanical connectors for reducing wire size, sized to fit copper conductors as required.
 - .1 Environmentally sealed.
 - .2 Watertight encapsulated with high dielectric strength polymer.
 - .3 Suitable for multiple size conductors.
 - .4 Manufactured from high strength aluminum alloy.
 - .5 Suitable for use with copper conductors.
 - .6 Finger safe covers.
 - .7 Acceptable materials:
 - .1 ILSCO type PEDSS.
- .6 Waterproof gel filled twist-on type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper alloy sized to fit copper conductors as required.
 - .1 Gel filled silicone sealant temperature -43 deg. C to 205 deg. C.
 - .2 Suitable for use in damp, wet, rain tight and submersible locations.
 - .3 Acceptable manufacturer or approved equivalent:
 - .1 King Innovation: Dryconn waterproof connectors.
 - .2 Ideal "Underground" Connectors.
- .7 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for stranded round copper conductors.
 - .2 Clamp for stranded round copper conductors.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper conductors.
 - .5 Sized for conductors as indicated.
- .8 Cold Weather Tape:
 - .1 Acceptable manufacturer or approved equivalent:
 - .1 Scotch Brand '88'.

Part 3 Execution

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install mechanical pressure type connectors and tighten with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.
 - .2 Install gel filled twist-on type connectors for lighting and receptacle splice locations and tighten where wire sizes permit, otherwise use mechanical connectors for reducing wire size.
 - .3 Install mechanical connectors for reducing wire size in junction boxes.
 - .4 Install fixture type connectors and tighten to CAN/CSA-C22.2 No. 65.
 - .5 Install bushing stud connectors in accordance with EEMAC 1Y-2.
 - .6 Wrap connectors in lighting poles and junction boxes with double half lapped layer of cold weather tape.

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 - 1000V).
 - .3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
 - .4 Section 33 65 73 – Concrete Encased Conduit Banks
 - 1.2 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition, Safety Standard for Electrical Installations.
 - .2 C22.2 No .0.3-09, Test Methods for Electrical Wires and Cables.
 - 1.3 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
 - 2.1 WIRES
 - .1 Conductors: stranded for # 8 AWG and larger. Minimum size: # 12 AWG.
 - .2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.
 - 2.2 FLEXIBLE POWER CORDS
 - .1 Cable to: C22.2 No.49.
 - .2 Conductors:
 - .1 SOW – Three conductor #14 AWG, stranded copper.

- .3 Insulation:
 - .1 Ethylene-propylene-rubber (EPR) rated 600V.
 - .2 Oil and moisture resistant.
 - .3 Insulation rated 90 deg C.
 - .4 Colour coded.
- .4 Outer jacket:
 - .1 Black Hypalon or Neoprene oil resistant and flame retardant.

Part 3 Execution

3.1 INSTALLATION OF WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
 - .2 In underground conduits in accordance with Section 33 65 73 – Concrete Encased Conduit Banks.
- .2 Terminate wires in accordance with Section 26 05 20 – Wire and Box Connectors (0 - 1000 V).

3.2 INSTALLATION OF FLEXIBLE POWER CORDS

- .1 Install cables in accordance with C22.1-15.
- .2 Use SOW cables to connect luminaires. Provide a strain relief connector or cable grip to support cable.
- .3 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors (0 - 1000 V).

END OF SECTION

- Part 1 General
 - 1.1 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - .2 Section 26 05 21 – Wires and Cables (0-1000V).
 - 1.2 REFERENCE STANDARDS
 - .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE 837-2014, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.
 - .2 Canadian Standards Association, (CSA International)
 - 1.3 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate and recycle waste materials.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
 - 2.1 EQUIPMENT
 - .1 Clamps for grounding of conductor: size as required.
 - .2 Rod electrodes: copper clad steel, 19 mm diameter by 3 m long.
 - .3 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
 - .4 Insulated grounding conductors: green, Type R90, copper conductors, size as indicated, in accordance with Section 26 05 21 – Wires and Cables (0-1000V).
 - .5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Bolted type conductor connectors.
 - .3 Thermit welded type conductor connectors.
 - .4 Bonding jumpers, straps.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 Service main ground to consist of two rod electrodes installed as indicated. Existing rod electrodes may form part of new grounding system as applicable.
- .2 Install complete permanent, continuous grounding system including, conductors, connectors, accessories. Install an insulated ground wire in all conduits.
- .3 Install green insulated bonding conductor in all conduit.
- .4 Install connectors in accordance with manufacturer's instructions.
- .5 Protect exposed grounding conductors from mechanical injury.
- .6 Make connections to electrodes, using copper welding by thermit process.
- .7 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .8 Soldered joints not permitted.

3.2 ELECTRODES

- .1 Install rod 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.

3.3 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of secondary 240 V systems.

3.4 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Service equipment, panels, outdoor lighting.

3.5 FIELD QUALITY CONTROL

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

END OF SECTION

- Part 1 General
 - 1.1 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - 1.2 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
 - 2.1 SUPPORT CHANNELS
 - .1 U shape, size 41 x 41 mm, 2.5 mm thick, stainless steel punched channel.
 - 2.2 SPECIFIC PURPOSE SUPPORTS
 - .1 Specific purpose, corrosion resistant, heat treated, stainless steel fasteners to be used to support boxes, conduits and cables from structures.
 - .2 One or two hole corrosion resistant PVC coated steel straps for conduits.
 - 2.3 ACCEPTABLE MANUFACTURER
 - .1 Acceptable manufacturer or approved equal:
 - .1 B-Line.
 - .2 Caddy.
 - .3 Commander.
 - .4 Erico.
 - .5 Iberville.
 - .6 Thomas & Betts.
 - 2.4 MOUNTING HARDWARE
 - .1 316 stainless steel corrosion resistant concrete inserts and mounting hardware to be used.

2.5 FLEXIBLE CORD SUPPORT GRIPS

- .1 Heavy duty type.
- .2 Double weave stainless steel mesh grip.
- .3 Grip range to match cable diameter.

Part 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to poured concrete with expandable inserts.
- .2 Secure surface mounted equipment with stainless steel fasteners.
- .3 Fasten exposed conduit or cables to structures or support systems using corrosion-resistant coated straps.
 - .1 One or two hole PVC coated steel straps complete with stainless steel hardware to secure surface conduits and cables 50 mm and smaller.
- .4 Install fastenings and supports as required for each type of equipment in accordance with manufacturer's installation recommendations.
- .5 Install flexible cord support grips as indicated and in accordance with manufacturer's instructions. Install SOW cables to pole-mounted luminaires.
- .6 Use wire lashing, perforated strap, nylon or plastic self locking cable ties to support or secure raceways to deck rebar.

END OF SECTION

- Part 1 General
- 1.1 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
- 1.2 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition, Safety Standard for Electrical Installations.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
 - .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Provide shop drawings: in accordance with Section 01 33 00 – Submittal Procedures.
- 1.4 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
- 2.1 JUNCTION AND PULL BOXES
 - .1 Stainless Steel Junction and Pull Boxes
 - .1 Construction: 316 stainless steel, CSA 4X rated.
 - .2 Covers: stainless steel, lockable, removable, hinged with stainless steel hasps and neoprene gasket and stainless steel screws.
 - .3 Sized as required with drilled conduit holes to suit.
 - .4 Mounting feet.

- .5 Acceptable materials:
 - .1 Hoffman.
 - .2 Hammond.
 - .3 Rittal.
 - .4 Crouse Hinds.
- .2 PVC Junction and Pull Boxes
 - .1 Construction: PVC, CSA 4X rated.
 - .2 Covers: PVC, screw-tight, complete with neoprene gasket.
 - .3 Sized as required with drilled conduit holes to suit.
 - .4 Mounting feet.
- 2.2 DRAIN / BREATHER
 - .1 Drain and breather to accommodate pressure changes and allow moisture or condensation to drain from enclosure while maintaining CSA rating.
 - .2 Inner dust seal to prevent contaminants from entering enclosure.
 - .3 Constructed of fibre reinforced nylon with castellated locknuts.
 - .4 Acceptable manufacturer or approved equivalent:
 - .1 Killark #DPE-40-50-S3.
- Part 3 Execution
 - 3.1 JUNCTION AND PULL BOXES INSTALLATION
 - .1 Install pull boxes in accessible locations as indicated.
 - .2 Install breather/drain on all junction and pull boxes.
 - 3.2 IDENTIFICATION
 - .1 Equipment Identification: to Section 26 05 00 – Common Work Results for Electrical.
 - .2 Identification Labels: size 2 indicating system name voltage and phase or as indicated.

END OF SECTION

- Part 1 General
 - 1.1 RELATED SECTIONS
 - .1 Section 26 05 00 - Common Work Results for Electrical.
 - 1.2 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 C22.1-15, Canadian Electrical Code (CEC), Part 1, 23rd Edition.
 - .2 C22.2 No.18.1-13, Metallic Outlet Boxes (Tri-National Standard with UL 514A and ANCE NMX-J-023/1).
 - .3 C22.2 No.18.2-06 (R2011), Nonmetallic Outlet Boxes.
 - 1.3 ACTION AND INFORMATIONAL SUBMITTALS
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Shop Drawings to include manufacturer’s instructions, printed product literature and data sheets including characteristics, physical size, finish and limitations.
 - 1.4 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- 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 Provide gasketed covers for exterior boxes.

2.2 WATERTIGHT OUTLET BOXES

- .1 CSA 4X watertight corrosion resistant, marine grade, yellow rigid PVC surface mount device boxes suitable for separately mounted devices as indicated.
- .2 Acceptable manufacturer or approved equal:
 - .1 Single Gang: Leviton #FDBX1-Y, Hubbell #HBL60CM83A.
 - .2 Two Gang: Leviton #FDBX2-Y, Hubbell #HBL60CM83A (two per location).

2.3 FITTINGS - GENERAL

- .1 Bushings and connectors with nylon insulated throats.
- .2 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

Part 3 Execution

3.1 INSTALLATION

- .1 Install rigid PVC outlet boxes as indicated.
- .2 Support boxes independently of connecting conduits using 316 stainless steel mounting hardware.
- .3 Fill boxes with sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .4 Provide correct size of openings in boxes for conduit and cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

- Part 1 General
 - 1.1 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - 1.2 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 C22.2 No. 45 - M1981(R2003), Rigid Metal Conduit.
 - .3 C22.2 No. 211.2-06(R2011), Rigid PVC (Unplasticized) Conduit.
 - 1.3 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - 1.4 LOCATION OF CONDUITS
 - .1 Drawings do not show all conduits. Those shown are in diagrammatic form only.
- Part 2 Products
 - 2.1 CONDUITS
 - .1 Rigid PVC conduit: to CSA C22.2 No. 211.2.
 - 2.2 CONDUIT FASTENINGS
 - .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 40 mil corrosion resistant PVC coating.
 - .2 Two hole steel straps for conduits larger than 50 mm.
 - .3 Acceptable manufacturer or approved equivalent:
 - .1 Thomas & Betts OCAL Pipe Straps.
 - 2.3 CONDUIT FITTINGS
 - .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.
 - .2 Use factory elbows where 90 degrees bends are required.

- 2.4 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 Install conduits to cause minimum interference in spaces through which they pass.
- .2 Rigid PVC conduit, fittings and straps, for all surface and exposed work to services, devices and equipment on wharf. Install in accordance with manufacturer's recommendations.
- .3 Use rigid PVC conduit underground.
- .4 Minimum conduit size for lighting and power circuits: 21 mm.
- .5 Use standard radius elbows for PVC conduit.
- .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 conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to structure lines.
- .2 Group conduits wherever possible on channels.

3.4 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.

3.5 CLEANING

- .1 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 SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - .2 Section 31 23 33 – Excavation, Trenching and Backfilling.
 - 1.2 REFERENCE STANDARDS
 - .1 Canadian Standards Association, (CSA International)
 - .2 Insulated Cable Engineers Association, Inc. (ICEA)
 - 1.3 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
 - 2.1 CABLE MARKER TAPE
 - .1 Polyethylene marker tape: 75 mm wide for direct burial.
 - .2 Marker sheet red in colour with the following words printed in large black block letters:
CAUTION CAUTION CAUTION ELECTRIC LINE BURIED BELOW.
- Part 3 Execution
 - 3.1 CABLE INSTALLATION IN CONDUITS
 - .1 Install cables as indicated in conduits.
 - .2 Do not pull spliced cables inside conduits.
 - .3 Install multiple cables in conduits simultaneously.
 - .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
 - .5 Before pulling cable into conduits and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

- .6 After installation of cables, seal conduit ends with sealing compound.
- 3.2 MARKER TAPE
- .1 Install cable marker tape 300 mm below grade, continuous over full length of conduits.
- 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. Provide 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. 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 500 V megger on each phase conductor.
 - .6 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
 - .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

- Part 1 General
 - 1.1 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - 1.2 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 C22.1-15, Canadian Electrical Code (CEC), Part 1 (23rd Edition), Safety Standard for Electrical Installations.
 - 1.3 PRODUCT DATA
 - .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.4 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
 - 2.1 PHOTOELECTRIC LIGHTING CONTROL
 - .1 Photoelectric Lighting Controls: to CSA C22.1.
 - .1 Weather resistant die cast aluminum housing and base.
 - .2 Cadmium sulfide, epoxy conformal coated 13 mm diameter sensor.
 - .3 Normally closed contacts (fail in ON position).
 - .4 Voltage variation: plus or minus 10%.
 - .5 Temperature range: minus 40 degrees C to plus 60 degrees C.
 - .6 Switching on lights at 10 to 50 lx, OFF at 30 to 150 lx.
 - .7 Two minute time delay ON and OFF.
 - .8 Colour coded leads: 152 mm long.
 - .9 Rated for 2000W at 120V.
 - .10 Acceptable manufacturer or approved equal:
 - .1 Tork #2115.

Part 3 Execution

3.1 INSTALLATION

.1 Install photoelectric controls in accordance with manufacturer's instructions.

END OF SECTION

- Part 1 General
 - 1.1 SECTION INCLUDES
 - .1 Service equipment and installation.
 - 1.2 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - .2 Section 26 05 28 – Grounding - Secondary.
 - .3 Section 26 24 16.01 – Panelboards Breaker Type.
 - 1.3 ACTION AND INFORMATIONAL SUBMITTALS
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Shop drawings to include Meter Socket.
 - 1.4 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - 1.5 UTILITY CHARGES
 - .1 Any fees or costs required by the utility for service and meter installation to be paid for by contractor as part of contract price.
- Part 2 Products
 - 2.1 SUPPLY DATA
 - .1 Service equipment suitable for incoming power supply: 240V, 60 Hz, single phase, 3 wire grounded neutral.
 - 2.2 EQUIPMENT
 - .1 Panelboard breaker type: in accordance with Section 26 24 16.01 – Panelboards Breaker Type rating as indicated.

2.3 METER SOCKET

- .1 Single position meter socket:
 - .1 400A, 120/240V single phase.
 - .2 Configured for 5-jaw utility meter.
 - .3 Pre-wired current transformers and switch.
 - .4 Weatherproof type 3R enclosure.
 - .5 Installed in accordance with utility standards.
 - .6 Side entry.
 - .7 Sealing ring.
 - .8 Acceptable manufacturer or approved equivalent:
 - .1 MICROELECTRIC JS4 SERIES.

Part 3 Execution

3.1 INSTALLATION

- .1 Install service equipment.
- .2 Coordinate installation with Owner and Utility.
- .3 Connect to incoming service.
- .4 Connect to outgoing load circuits.
- .5 Make grounding connections in accordance with Section 26 05 28 – Grounding – Secondary and utility requirements.
- .6 Make provision for power supply utility's metering to meet their requirements.

END OF SECTION

- Part 1 General
- 1.1 SECTION INCLUDES
- .1 Materials and installation for standard and custom breaker type panelboards.
- 1.2 RELATED SECTIONS
- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 28 16.02 – Molded Case Circuit Breakers.
- 1.3 REFERENCE STANDARDS
- .1 Canadian Standards Association (CSA International)
- .1 C22.2 No.29-15, Panelboards and Enclosed Panelboards.
- 1.4 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.
- 1.5 DELIVERY, STORAGE AND HANDLING
- .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
- 2.1 PANELBOARDS
- .1 Panelboards: to CSA C22.2No.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 10K A (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 Panelboard: main breaker, number of circuits, and number and size of branch circuit breakers as indicated. Suitable for service entrance use where required.
- .5 Aluminum bus with neutral of same ampere rating as mains.
- .6 Mains: suitable for bolt-on breakers.
- .7 Stainless steel enclosure CSA 4X rated.
- .8 Gasketed door with locking handle and piano hinge.
- .9 Four keys for panelboard.
- .10 Condensate drain in bottom of enclosure.
- .11 Acceptable manufacturer or approved equivalent:
 - .1 Siemens.
 - .2 Square D.
 - .3 Eaton.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.02 – Molded 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.

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 Complete circuit directory with typewritten legend showing location and load of each circuit.
- .4 Arc flash hazard label installed on panel door.

2.4 DRAIN / BREATHER

- .1 Drain and breather to accommodate pressure changes and allow moisture or condensation to drain from enclosure while maintaining CSA rating.
- .2 Inner dust seal to prevent contaminants from entering enclosure.
- .3 Constructed of fibre reinforced nylon with castellated locknuts.

.4 Acceptable manufacturer or approved equivalent:

.1 Killark #DPE-40-50-S3.

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.

.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Mount panelboards to height specified in Section 26 05 00 – Common Work Results for Electrical or as indicated.

.3 Connect loads to circuits.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

.5 Conduits to enter/exit through sides and bottom of panelboards only.

3.3 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 SECTION INCLUDES
 - .1 Receptacles, wiring devices, cover plates and their installation.
- 1.2 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
- 1.3 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 C22.2 No.42-10(R2015), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 C22.2 No.42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard with UL 514D).
 - .3 C22.2 No. 111-10 (R2015), General-Use Snap Switches (Bi-national standard, with UL 20).
- 1.4 ACTION AND INFORMATIONAL SUBMITTALS
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Shop drawings to include manufacturer’s instructions, printed product literature and data sheets including characteristics, physical size, finish and limitations.
- 1.5 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

Part 2 Products

2.1 RECEPTACLES

- .1 Single receptacles, CSA type L5-20R, 125V, 20A, grounded, to: CSA-C22.2 No. 42 with following features:
 - .1 Corrosion resistant, marine grade with weatherproof cover and stainless steel mounting hardware.
 - .2 Suitable for No. 10 AWG back and side wiring.
 - .3 Triple wipe contacts and riveted grounding contacts.
 - .4 Acceptable materials:
 - .1 Receptacle c/w cover: Leviton #97W47-S, Hubbell #HBL67W47.
- .2 Single receptacles, CSA type L6-30R, 240V, 30A, grounded, to: CSA-C22.2 No. 42 with following features:
 - .1 Corrosion resistant, marine grade with weatherproof cover and stainless steel mounting hardware.
 - .2 Suitable for No. 10 AWG back and side wiring.
 - .3 Triple wipe contacts and riveted grounding contacts.
 - .4 Acceptable materials:
 - .1 Receptacle c/w cover: Leviton #99W48-S, Hubbell #HBL69W48.
- .3 Single receptacles, 240V, 50A, grounded, to: CSA-C22.2 No. 42 with following features:
 - .1 Corrosion resistant, marine grade, CSA 4X enclosure complete with weatherproof cover and stainless steel mounting hardware. Mounted in corrosion resistant rigid PVC outlet box suitable for separately mounted devices.
 - .2 Suitable for No. 6 AWG back and side wiring.
 - .3 Triple wipe contacts and riveted grounding contacts.
 - .4 Acceptable materials for single outlets:
 - .1 Receptacle c/w cover: Hubbell #CS8269 c/w HBL77CM74WO.

2.2 GFI MODULE

- .1 GFI Module rated 20A, 120VAC, 60 Hz with the following features:
 - .1 Suitable for No. 10 AWG back wiring.
 - .2 Acceptable materials for GFI and cover:
 - .1 GFI Module: Hubbell #GFM20A.
 - .2 Cover: Killark #FCL-GF.

Part 3 Execution

3.1 INSTALLATION

.1 Receptacles:

- .1 Install receptacles in outlet boxes as noted. Install in gang type outlet box when installed in conjunction with GFI Module.
- .2 Mount receptacles and outlets at heights indicated.

.2 GFI Modules:

- .1 Install GFI modules in outlet boxes as indicated. Install in two gang tandem outlet box alongside associated receptacle where indicated.
- .2 Mount GFI modules at heights indicated.

.3 Identification:

- .1 Provide identification indicating circuit and panel number at all wiring devices using lamacoid plates.

END OF SECTION

- Part 1 General
- 1.1 RELATED SECTIONS
- .1 Section 26 05 00 – Common Work Results for Electrical.
 - .2 Section 26 24 16.01 – Panelboards Breaker Type.
- 1.2 REFERENCE STANDARDS
- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 5-13, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489 and NMX-J-266-ANCE-2013).
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Shop drawings to include manufacturer's instructions, printed product literature and data sheets including characteristics, physical size, finish and limitations.
- 1.4 DELIVERY, STORAGE AND HANDLING
- .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
- 2.1 BREAKERS GENERAL
- .1 Molded-case circuit breakers, to CSA C22.2 No. 5.
 - .2 Bolt-on molded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
 - .3 Common-trip breakers: with single handle for multi-pole applications.
 - .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .5 Circuit breakers to have minimum 10KA symmetrical rms interrupting capacity rating.

- .6 Circuit breakers to be supplied by the same manufacturer as the panelboard or distribution board in which they are being installed.
- .7 Circuit breakers to be new, complete with original factory warranty and supplied from an authorized manufacturer's distributor.
- .8 Mini circuit breakers, twin or tandem breakers are not acceptable.

2.2 THERMAL MAGNETIC BREAKERS

- .1 Molded 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 Circuit breaker manufacturer to match associated panelboard.

Part 3 Execution

3.1 INSTALLATION

- .1 Install circuit breakers as indicated.

END OF SECTION

- Part 1 General
 - 1.1 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - 1.2 REFERENCE STANDARDS
 - .1 CSA International
 - .1 C22.2 No.14-13, Industrial Control Equipment.
 - .2 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 2-2000 (R2005), Controllers, Contactors and Overload Relays Rated 600 V.
 - 1.3 ACTION AND INFORMATIONAL SUBMITTALS
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Shop Drawings to include manufacturer’s instructions, printed product literature and data sheets including characteristics, physical size, finish and limitations.
 - 1.4 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- Part 2 Products
 - 2.1 CONTACTORS
 - .1 Contactors: to CSA C22.2 No.14.
 - .2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.
 - .3 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.
 - .4 Mounted in a 316 stainless steel CSA 4 Enclosure unless otherwise indicated.
 - .5 Rated for a 30A lighting load.
 - .6 Control coil rated 120V with fused primary.

- .7 Acceptable manufacturers or approved equal:
 - .1 Allen-Bradley.
 - .2 Cutler-Hammer.
 - .3 Square-D.
 - .4 Siemens.

- 2.2 EQUIPMENT IDENTIFICATION
 - .1 Identify equipment in accordance with Section 26 05 00 – Common Work Results for Electrical.

 - .2 Size 4 nameplate indicating equipment tag, name of load controlled, panel and circuit number.

- Part 3 Execution

- 3.1 INSTALLATION
 - .1 Install contactors and connect power wires and photocell control.

 - .2 Identify contactors with lamacoid plate engraved ‘Marginal Wharf Lighting’.

 - .3 Test contactors in accordance with Section 26 05 00 – Common Work Results for Electrical.

- 3.2 PROTECTION
 - .1 Protect installed products and components from damage during construction.

END OF SECTION

- Part 1 General
 - 1.1 SECTION INCLUDES
 - .1 Materials and installation for site luminaires.
 - 1.2 RELATED SECTIONS
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - 1.3 REFERENCE STANDARDS
 - .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2No.206-13, Lighting Poles.
 - 1.4 ACTION AND INFORMATIONAL SUBMITTALS
 - .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
 - 1.5 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - 1.6 WARRANTY
 - .1 Luminaires to have a full parts and replacement guarantee including all labour for three years.
 - .1 In addition, there shall be a 5-year limited warranty on electrical, including LEDs and driver and a 10 year warranty on luminaire finish.
 - .2 Pole to have a 3 year warranty on structure and finish.
- Part 2 Products
 - 2.1 ALUMINUM POLES
 - .1 Aluminum poles: to CSA C22.2 No.206 designed for underground wiring and:
 - .1 Pole/luminaire assembly to be designed for 100 MPH wind speed with gust factor of 1.3.
 - .2 Mounting on concrete anchor base without transformer base.
 - .3 Style: tapered round, minimum wall thickness: 4.0 mm.

- .4 7.62 m nominal height, mounted on 1.2 m high concrete base.
- .5 Straight for 3 luminaire mounting brackets.
- .6 Post top cap.
- .7 Access handhole 450 mm above pole base for wiring connections, with welded-on reinforcing frame and bolted-on cover.
- .8 Size: 203 mm at base tapered to 114 mm at top.
- .9 Anchor bolts: 4 per pole, galvanized steel, sized as per manufacturer's recommendation with shims, nuts and washers.
- .10 Snap on aluminum bolt covers or base cover.
- .11 Finish: Rotary polished aluminum.
- .12 Grounding lug.

2.2 LUMINAIRES

.1 Type 'A':

- .1 Luminaire with cast aluminum weatherproof housing and:
 - .1 Lamp type: LED, 80 LEDS, 13,370 lumens, 5700K @ 530mA, 127 watts.
 - .2 Optical assembly:
 - .1 For LED lamps:
 - .1 Refractor: direct contact type, minimizing light loss and providing control and uniformity.
 - .3 Light Distribution:
 - .1 IES distribution Type IV.
 - .4 Factory wired with optimized 530 mA power driver, 120 V terminated at terminal block.
 - .5 Thermal management using heat sinks.
 - .6 Terminal Block.
 - .7 Standard Arm mount to aluminum Pole, 3 @ 90 degrees.
 - .8 Metal Bird spikes on light engine and housing.
 - .9 Die cast and extruded aluminum housing with baked on ultra-durable top coat, natural paint finish, corrosion resistant suitable for coast environment.
 - .10 Complete luminaire rated to IP66.
 - .11 3G vibration rating.
 - .12 Acceptable manufacturer or approved equivalent:
 - .1 GARDCO # P21-A1-3-4-130LA-CW-120-NP-TB-BD.

- .2 Type 'B':
 - .1 Luminaire with cast aluminum weatherproof housing and:
 - .1 Lamp type: LED, 80 LEDS, 18,349 lumens, 5700K @ 800mA, 206 watts.
 - .2 Optical assembly:
 - .1 For LED lamps:
 - .1 Refractor: direct contact type, minimizing light loss and providing control and uniformity.
 - .3 Light Distribution:
 - .1 IES distribution Type IV.
 - .4 Factory wired with optimized 800 mA power driver, 120 V terminated at terminal block.
 - .5 Thermal management using heat sinks.
 - .6 Mast Arm mounted on wood pole using mounting bracket.
 - .7 Metal Bird spikes on light engine and housing.
 - .8 Built-in photo-cell.
 - .9 5-Amp fuse.
 - .10 Terminal block.
 - .11 Die cast and extruded aluminum housing with baked on ultra-durable top coat, natural paint finish, corrosion resistant suitable for coast environment.
 - .12 Complete luminaire rated to IP66.
 - .13 3G vibration rating.
 - .14 Acceptable manufacturer or approved equivalent:
 - .1 GARDCO # P21-MA-1-4-200LA-CW-120-NP-F-PCB-TB.
- 2.3 MOUNTING BRACKET
 - .1 Round aluminum arm 76mm tapered to 60 mm diameter, 152mm rise.
 - .2 Length: 610 mm.
 - .3 Aluminum plate for mounting to wooden pole.
 - .4 Post-weld heat treated.
 - .5 Acceptable manufacturer or approved equivalent:
 - .1 Metal Pole-Lite #TE-2-6-3125.
- 2.4 FUSE KITS
 - .1 Inline watertight fuseholder with crimp connections and 2 A class CC midget fuses, installed in handhole of pole.
 - .2 Acceptable manufacturer or approved equal:
 - .1 Thomas & Betts Style 65.

Part 3 Execution

3.1 INSTALLATION OF LUMINAIRES – ALUMINUM POLES

- .1 Fasten luminaires directly to round aluminum pole in configuration indicated.
- .2 Drill pole as per luminaire manufacturer's instructions.
- .3 Install bolster plate, bolts, nuts, lock washers and flat washers as per manufacturer's instructions.
- .4 Install metal bird deterrent spikes.
- .5 Install SOW cable in pole from hand hole to luminaire support at top of pole using a suitable wire grip.
- .6 Install fuse kits and fuses in handhole.
- .7 Make electrical connections to terminal block on luminaire, splices inside pole other than at hand hole are not permitted.
- .8 Install pole-top cap.

3.2 INSTALLATION OF LUMINAIRES – WOOD POLE

- .1 Mount bracket to wooden pole as per manufacturer's instructions.
- .2 Install luminaire on mounting bracket as indicated and route wiring through mounting bracket to existing junction box. Provide drip loop.
- .3 Mounting height to be as close as possible to that of existing luminaire on same pole. Adjust as required.
- .4 Install metal bird deterrent spikes.
- .5 Wire to branch circuit as indicated in existing junction box.
- .6 New and existing luminaires mounted on wood pole are both equipped with photo-electric control, verify correct operation.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies requirements for the excavating, trenching and backfilling for the underground electrical services associated with the wharf renovations as shown on the drawings and specified herein.

1.2 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 33 65 73 – Concrete Encased Conduit Banks.

1.3 REFERENCE STANDARDS

- .1 ASTM C117-90, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136-92, Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D698-78(1990), Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 2.49 kg Rammer and 304.8 mm Drop.
- .4 ASTM D1557-78(1990), Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 4.54 kg Rammer and 457 mm Drop.
- .5 CAN/CGSB-8.1-M88, Sieves, Testing, Woven Wire, Inch Series.
- .6 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.4 PROTECTION OF EXISTING FEATURES

- .1 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing any excavation work, notify applicable owner or authorities having jurisdiction to establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
 - .3 Confirm locations of buried utilities by careful test excavations.
 - .4 Maintain and protect from damage any water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .5 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such work to be paid by the Owner.
 - .6 Record location of maintained, re-routed and abandoned underground lines.

- .2 Existing structure and surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, service poles, wires, paving, survey bench marks and monuments which may be affected by work.
 - .2 Protect existing structure and surface features which may be affected by work from damage while work is in progress. In the event of damage, immediately make repair to approval of Departmental Representative.
 - .3 Where existing asphalt is removed to install underground electrical within existing paved areas, patch asphalt per existing construction to match adjacent surfaces. Minimum finished asphalt thickness 100mm.

1.5 SAFETY

- .1 Construction methods and procedures employed by the Contractor in carrying out the excavation must safeguard public and private property and must be carried out in strict compliance with Section 21 of Regulation 77-1 of the Occupational Health and Safety Act of the Province of New Brunswick.

Part 2 Products

2.1 MATERIALS

- .1 Backfill materials:
 - .1 Type 1 fill: selected materials from excavations, suitable to Departmental Representative for use intended, free from frozen materials, cinders, ashes, sods, organic materials, refuse or other deleterious substances.
 - .2 Type 2 fill:
 - .1 Granular sub-base to be durable, non-friable, well graded pit run sand and gravel having a maximum particle size of 75 mm and a maximum of 5% by weight passing the number 200 mesh sieve (0.075 mm size).
 - .2 Other properties as follows:
 - .1 Los Angeles Abrasion ASTM C131-81 (AASHTO T96-77) Gradation "A" Max. % Los by Weight 40.
 - .2 Minimum CBR requirements of 40 (ASTM D1883).
 - .3 Bedding material: well graded natural sand or crushed rock screenings to following grading requirements:

<u>ASTM Sieve Size</u>	<u>Percent Passing</u>
9.50 mm	100
4.75 mm	50-100
2.00 mm	30-90
425 µm	0-0.1

Part 3 Execution

3.1 STOCKPILING

- .1 Stockpile fill materials in areas designed by Departmental Representative. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Stockpile excavated materials suitable for backfill in designated locations.
- .4 Separate materials containing sods, muck, frozen lumps, cinders, ashes, organic or other deleterious substances not suitable for backfill.
- .5 Dispose of unsuitable and surplus material at locations in a manner to approval of Departmental Representative.

3.2 DEWATERING

- .1 Provide pumps and other equipment and materials necessary to keep excavations free of water while work is in progress.
- .2 Do not pump during placing of concrete, or for a period of at least 24 hours thereafter, unless from a pump separated from concrete work by a watertight wall or other effective means.
- .3 Dispose of water in a manner not detrimental to public health, environment, public and private property, or any portion of work completed or under construction.

3.3 TRENCHING

- .1 Excavate to lines, grades, elevations and dimensions indicated or as directed by Departmental Representative.
- .2 Excavation must not interfere with normal 45° splay of bearing from bottom of any footing.
- .3 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 open more than 15 m at end of days operation.
- .4 Dispose of surplus and unsuitable excavated material off-site.
- .5 Do not obstruct flow of surface drainage or natural watercourses.
- .6 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .7 Notify Departmental Representative when soil at bottom of excavation appears unsuitable and proceed as directed by Departmental Representative.
- .8 Obtain Departmental Representative's approval of completed excavation.

- .9 Remove unsuitable material from trench bottom to extent and depth directed by Departmental Representative.
 - .10 Where required due to unauthorized over-excavation, correct as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with granular sub-base compacted to minimum of 95% of maximum dry density, ASTM D1557-78 modified Proctor Density.
 - .11 Hand trim, make firm and remove loose material and debris from excavations immediately prior to placing concrete. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
 - .12 Do not commence further work until Departmental Representative has inspected, measured and approved excavated surfaces.
- 3.4 BACKFILLING AROUND SERVICES
- .1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved installations.
 - .2 Areas to be backfilled to be free from debris, snow, ice, water or frozen ground.
 - .3 Do not use backfill material which is frozen or contains ice, snow or debris.
 - .4 Backfilling around installations.
 - .1 Place bedding and surrounding material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing.
 - .3 Place layers simultaneously on both sides of installation work to equalize loading.
 - .4 Place material by hand under, around and over installations in 100 mm lifts until 300 mm of cover is provided. Dumping material directly on installations will not be permitted. Compact to 95% of maximum dry density ASTM D1557-78, Modified Proctor Density.

END OF SECTION

- Part 1 General
 - 1.1 RELATED SECTIONS
 - .1 Section 03 30 00 – Structural Concrete.
 - .2 Section 26 05 00 – Common Work Results for Electrical.
 - .3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
 - 1.2 QUALITY ASSURANCE
 - .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning on-site installation, with Departmental Representative in accordance with Section 01 45 00 – Testing and Quality Control to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Review manufacturer's installation instructions and warranty requirements.
 - 1.3 DELIVERY, STORAGE AND HANDLING
 - .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- Part 2 Products
 - 2.1 SUSTAINABLE REQUIREMENTS
 - .1 Materials and products in accordance with Division 01 – General Requirements.
 - .2 Do verification requirements in accordance with Division 01 – General Requirements.
 - 2.2 PVC CONDUITS
 - .1 PVC conduits, type DB2, encased in reinforced concrete: to Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
 - 2.3 PVC CONDUIT FITTINGS
 - .1 Rigid PVC type couplings, bell end fittings, plugs, caps, adaptors as required to make complete installation.
 - .2 Rigid PVC 90 deg. and 45 deg. bends as required.

- .3 Rigid PVC 5 degree angle couplings.
- .4 Base and intermediate plastic spacers as required.
- 2.4 SOLVENT WELD COMPOUND
 - .1 Solvent weld compound and cleaner for PVC conduit joints.
- 2.5 CABLE PULLING EQUIPMENT
 - .1 Pull rope: 6 mm stranded nylon, tensile strength 5 kN, continuous throughout each conduit run with 3 m spare rope at each end.
- 2.6 WARNING TAPE
 - .1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW".
- 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 GENERAL
 - .1 Coordinate installation of underground conduit banks with civil / structural drawings. Coordinate installation with reinforcing shop drawings and civil contractor's formwork drawings.
 - .2 Install underground conduit banks including formwork.
 - .3 Use steel plates in all instances over open trenches across all streets and roadways to permit continuous flow of vehicular traffic.
 - .4 Build conduit bank on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.
 - .5 Open trench completely before conduits are laid and ensure that no obstructions will necessitate change in grade of conduits.
 - .6 Prior to laying conduits, construct "mud slab" not less than 75 mm thick.
 - .7 Install conduits at elevations and with slope as indicated and minimum slope of 1 to 400.
 - .8 Install base spacers at maximum intervals of 1.5 m levelled to grades indicated for bottom layer of conduits.

- .9 Lay PVC conduits with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between conduits at not less than 75 mm horizontally.
 - .1 Stagger joints in adjacent layers at least 150 mm and make joints watertight.
 - .2 Encase conduit bank with 75 mm thick concrete cover.
 - .3 Use rigid PVC long sweep bends for sections extending above finished grade level.
 - .10 Make transpositions, offsets and changes in direction using 5 degree bend sections, do not exceed a total of 20 degree with conduit offset.
 - .11 Cut, ream and taper end of conduits in field in accordance with manufacturer's recommendations, so that conduit ends are fully equal to factory-made ends.
 - .12 Form conduit banks prior to pouring concrete. Sides of trench are not acceptable forms. Do not install excess concrete in trenches. Where concrete encasement is poured in sections, provide 4 x 10M rebar connections between sections, 1 in each corner of concrete encasement, extending at least 1.0 m into each section.
 - .13 Allow concrete to attain 50% of its specified strength before backfilling.
 - .14 Use anchors, ties and trench jacks as required to secure conduits and prevent moving during placing of concrete.
 - .1 Tie conduits to spacers with twine or other non-metallic material.
 - .2 Remove weights or wood braces before concrete has set and fill voids.
 - .15 Clean conduits before laying:
 - .1 Cap ends of conduits during construction and after installation to prevent entrance of foreign materials.
 - .16 Conduit cleaning:
 - .1 Pull 300 mm long x diameter 6 mm less than internal diameter of conduit wooden mandrel through each conduit, immediately after placing of concrete.
 - .2 Then pull stiff bristle brush through conduit; avoid disturbing or damaging conduits where concrete has not set completely.
 - .3 Pull stiff bristle brush through each conduit immediately before pulling-in cables.
 - .17 Install pull rope continuous throughout each conduit run with 3 m spare rope at each end.
- 3.3 MARKER TAPE
- .1 Install marker tape continuously over entire conduit run.
- 3.4 FIELD QUALITY CONTROL
- .1 Site Tests/Inspections:
 - .1 Inspection of conduit will be carried out by Departmental Representative prior to placing.
 - .2 Placement of concrete and conduit cleanout to be done when Departmental Representative present.

3.5 CLEANING

- .1 Proceed in accordance with General Requirements.
- .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 SECTIONS
- .1 Section 26 05 00 – Common Work Results for Electrical.
 - .2 Section 26 05 21 – Wires and Cables (0-1000V).
 - .3 Section 26 05 28 – Grounding – Secondary.
 - .4 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
- 1.2 QUALITY ASSURANCE
- .1 Regulatory Requirements:
 - .1 Perform Work to comply with applicable regulations.
 - .2 Co-ordinate and meet requirements of power supply authority.
 - .1 Ensure availability of power when required.
- 1.3 DESCRIPTION OF SYSTEM
- .1 Incoming service cables from service pole to conductors/weatherhead at top of main electrical service pole at MSO.
 - .2 Removal of existing aerial service cables once made obsolete.
- 1.4 COORDINATION WITH SERVICE AUTHORITY
- .1 Coordinate with NB Power to ensure availability of services. Prior to installation of aerial services, arrange an on-site meeting with NB Power to obtain their approval for layout and construction details.
 - .2 Arrange for utility installation and energization. Ensure availability of power when required.
- 1.5 UTILITY COSTS
- .1 Include a \$5,000.00 cash allowance to cover any NB Power costs for installation of new and removal of existing services. Expend cash allowance as directed. Allowance will be adjusted to actual cost supported by invoices from the utility. No Contractor Mark-ups will be accepted on this item.

Part 2 Products

2.1 MATERIALS

- .1 Rigid PVC conduit and fittings: to Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors from weatherhead to meter socket: copper, type RW-90, to Section 26 05 21 – Wires and Cables (0-1000V), size and number of conductors as indicated.
- .3 Metering to NB Power's requirements.

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 Relocate existing conduits on service pole as required.
- .2 Install weatherhead, conduit and meter socket as indicated.
- .3 Install cables in conduit.
- .4 Allow adequate conductor length for connection to supply.
- .5 Allow adequate conductor length for connection to meter socket.
- .6 Make grounding connections in accordance with Section 26 05 28 - Grounding – Secondary and Utility requirements.

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.
- .2 Submit written test results to Engineer-Architect for review.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION