Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-15, Canadian Electrical Code (CEC), Part 1 (23rd Edition), Safety Standard for Electrical Installations.

.2 CAN/CSA-C22.3 No. 7-10, Underground Systems.

.3 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.4 CSA Z462-12, 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.

.2 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, 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 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.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: submit WHMIS MSDS in accordance with Section 01 35 29 – Health and Safety Requirements.

.3 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.

.4 Quality Control: in accordance with Section 01 45 00 – 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.

.5 Submit, upon completion of Work, load balance report as described in PART 3 – FIELD QUALITY CONTROL.

.5 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 20.01 Site Lighting Rev0.PDF" with resubmissions appended Rev1, Rev2, etc.

.3 Supplemental information not previously submitted to be identified as follows: "26 56 20.01 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.

.6 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 – 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 After delivery and storage of products, and when preparatory Work is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

.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 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.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.

1.8 SYSTEM STARTUP

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

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 item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.10 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.

1.11 MEASUREMENT FOR PAYMENT

.1 Electrical will be measured by lump sum.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Factory assemble control panels and component assemblies.

2.2 ELECTRIC EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to equipment and controls, as indicated. Verify size, location and wiring requirements of all equipment with appropriate trade and reviewed shop drawings prior to rough-in.

.2 Provide wiring and conduit.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction and Departmental Representative.

.2 Decal signs, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: plastic laminate lamacoid 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 Lamacoid nameplate installed on distribution panelboards, meter centers, circuit breaker enclosures and power modules 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 D1 – 400A 120/208V – 3PH – 4W FED FROM TRANSFORMER: TX1

.7 Lamacoid nameplates installed on manual starters, control panels, disconnect switches, large junction and pull boxes, service equipment and service modules 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.

.8 All junction and/or pull boxes (volume less than 8500 cu cm) shall have a lamacoid label installed designating the circuit number(s) of enclosed wiring, the designated panel name and electrical characteristics where applicable.

.9 Install an additional lamacoid nameplate on all, or any piece of electrical equipment, or apparatus, i.e. panelboards and fusible switches, etc. that may contain overcurrent devices, i.e. circuit breakers and/or fuses, that have been designed for, and incorporate an interrupting capacity sized "larger" than 10 KAIC.

Example:

Minimum interrupting capacity of breakers installed in this panel is to be not less than 14 KAIC	Minimum interrupting capacity of fuses installed in this fusible switch is to be not less than 100 KAIC

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, indicating panel and circuit number; i.e., D2-31. Normal ground circuits to have ground, neutral and phase wires identified with black on white background tape. Tape to be preprinted 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.

.5 Use colour coded wires in communication cables, matched throughout system.

2.7 FINISHES

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

.1 Paint distribution enclosures light grey to EEMAC 2Y-1.

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 CONDUIT AND CABLE INSTALLATION

.1 Install cables, conduits and fittings embedded in structure as indicated.

3.4 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, unless indicated otherwise, and information is given before installation.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from grade to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not indicated, verify before proceeding with installation.

.3 Refer to all detail drawings and confirm mounting of outlet boxes prior to roughing-in.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.7 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 – 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.

3.8 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).

.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 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.

Part 2 Products

2.1 Not Applicable

Part 3 Execution

3.1 GENERAL REMOVALS

.1 Remove all obsolete or abandoned electrical services, equipment and materials including device boxes, wire and conduit, except those designated for reuse. This includes any utility services identified to be removed.

.2 Pay any Utility fees for removal of Utility services.

.3 Schedule all removal work with the Departmental Representative. Do not disrupt wharf operations.

.4 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.

.5 Make alterations to existing electrical services as required and make good all circuits affected by remediation work.

.6 Any existing electrical circuits and/or equipment that are interrupted during construction to accommodate alterations but are to remain in service are to be reconnected and circuits made good.

.7 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.

3.2 IDENTIFICATION OF EXISTING CIRCUITS AND EQUIPMENT

.1 All circuits in existing panelboards are to be traced out to identify any devices not labeled on existing directories and to confirm all circuits indicated on directories are accurate. Provide typewritten circuit directories in all panelboards.

.2 Provide identification indicating circuit and panel number at all new and existing wiring devices.

.3 Provide equipment nameplates and labels for all new and existing equipment.

.4 Equipment identification, wiring identification and conduit and cable identification is to be in accordance with Section 26 05 00 – Common Work Results for Electrical.

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 CAN/CSA-C22.2No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2No.65-03 (R2008), Wire Connectors (Tri National Standard with UL 486A-486B and NMX-J-543-ANCE-03.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.3 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 01 61 00 – Common Product Requirements.

.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 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 or terminal blocks in suitable enclosure 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 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

- .1 Connector body and stud clamp for stranded round copper or aluminum conductors.
- .2 Clamp for stranded round copper conductors.
- .3 Stud clamp bolts.
- .4 Bolts for copper conductors.
- .5 Sized for conductors as indicated.

.6 Waterproof gel filled twist-on type wire connectors to: CAN/CSA-C22.2 No.65 and UL486D, with current carrying parts of copper alloy sized to fit copper conductors as required.

- .1 Suitable for use in damp, wet, raintight and submersible locations.
- .2 Temperature rating: 105 deg. C.
- .3 Silicone sealant temperature: -43 deg. C to 204 deg. C.
- .4 Acceptable materials:
  - .1 King Innovation: Dryconn waterproof connectors.
  - .2 Ideal "Underground" connectors.

.7 Splice block terminals for reducing wire size, sized to fit copper conductors as required.

- .1 Suitable for multiple size conductors.
- .2 Barrier and dead front terminal blocks sized as required.
- .3 Finger safe covers.
- .4 Acceptable materials:
  - .1 Cooper –Bussman type 14002.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.

.2 Install gel filled twist-on type connectors for lighting pole circuit splice locations and tighten.

.3 Install terminal blocks in junction boxes for reducing wire sizes #8AWG and larger.

.4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.2 RESTRICTIONS

.1 No splices are allowed in panelboards or in equipment enclosures unless noted otherwise.

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 – 1000 V).

.3 Section 26 05 34– Conduits, Conduit Fastenings and Conduit Fittings

1.2 REFERENCE STANDARDS

.1 CSA C22.2 No. 0.3-96, Test Methods for Electrical Wires and Cables.

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 01 61 00 – Common Product Requirements.

.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 WIRES

.1 Conductors: stranded for 8 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600V 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.

3.2 INSTALLATION OF FLEXIBLE POWER CORDS

.1 Install cables in accordance with C22.1-12.

.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.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE 837-02 Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International)

.1 CSA C22.2 No.41-07 (R2012), Grounding and Bonding Equipment (Bi-National Standard with UL 467).

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 01 61 00 – Common Product Requirements.

.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 EQUIPMENT

.1 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.

.2 Insulated grounding conductors: green, type RW90 minimum size #12AWG.

.3 Rod electrodes: copper clad steel 19 mm diameter by 3 m long.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.
.2 Protective type clamps.
.3 Bolted type conductor connectors.
.4 Compression type conductor connectors.
.5 Bonding jumpers, straps.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, rod electrodes, conductors, connectors, accessories. Install an insulated ground wire in all conduits.

.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 compression connectors.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Make grounding connections in radial configuration only, with connections terminating at a single point. Avoid loop connections.

3.2 ELECTRODES

.1 Install rod and/or plate electrodes and make grounding connections as indicated.

.2 Bond separate, multiple electrodes together.

.3 Use #3 AWG copper conductors for connection to electrodes.

.4 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, distribution 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 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.

1.3 DELIVERY STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.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 SUPPORTS

.1 U shape, size 41 x 41 x 2.5 mm, 316 stainless steel punched channel.

.2 9.5 mm dia stainless steel all-thread rods for supporting suspended channel.

.3 Specific purpose, 316 stainless steel fasteners to be used to support boxes, conduit and cable from support channel and/or directly from structure.

.4 Acceptable manufacturer:

.1 Thomas & Betts.

.2 B-Line.

2.2 MOUNTING HARDWARE

.1 316 stainless steel corrosion resistant concrete inserts and mounting hardware to be used.

2.3 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 cables to structure using support channels, surface mounted or suspended and pipe straps for strut.

.3 Secure surface mounted equipment with stainless steel fasteners.

.4 Fasten cables installed-vertically on structure using stainless steel two-hole straps complete with stainless steel hardware.

.5 Install fastenings and supports as required for each type of equipment and cable in accordance with manufacturer's installation recommendations.

.6 Install flexible cord support grips as indicated and in accordance with manufacturer's instructions. Install on SOW cables in pole mounted luminaires.

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 CSA C22.1-12, Canadian Electrical Code, Part 1, 22nd Edition.

.2 CSA C22.2 No. 40-M1989(R2009), Cut out, Junction and Pull 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 01 61 00 – Common Product Requirements.

.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 JUNCTION AND PULL BOXES

.1 Construction: 316 stainless steel, CSA 4X rated.

.2 Covers: lockable stainless steel removable hinged with stainless steel hasps and neoprene gasket and stainless steel screws.

.3 Mounting feet and mounting plate for terminal block installation.

.4 Sized as required with drilled conduit holes to suit.

.5 Acceptable materials:

.1 Hoffman.
.2 Hammond.
.3 Rittal.
.4 Crouse Hinds.

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 Constructed of fibre reinforced nylon with castellated locknuts and inner dust seal to prevent contaminants from entering enclosure.

.3 Acceptable materials:

.1 Appelton
.2 Crouse Hinds
.3 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 Size and install junction and pull boxes to CSA C22.1.

.3 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 01 61 00 – Common Product Requirements.

.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 gasketted 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 Leviton #FDBX1-Y (single gang).

.2 Leviton #FDBX2-Y (two gang).

2.3 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.

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 CSA C22.2 No. 18.04 (R2009) Hardware for the Support of Conduit, Tubing and Cable.

.2 CSA C22.2 No. 45-M1981(R2003) Rigid Metal Conduit.

.3 CSA C22.2 No. 211.2-06 (R2011), Rigid PVC (Unplasticized) Conduit.

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 01 61 00 – Common Product Requirements.

.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.

1.5 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 PVC coated rigid steel conduit to CSA C22.2 No. 45, hot dipped galvanized after fabrication:

.1 Urethane coating on threads.

.2 Minimum 40 mil PVC coating on exterior.

.3 Nominal 2 mil urethane on interior.

.4 Acceptable materials:

.1 T&B OCAL-BLUE Conduit and Fittings.

.2 Perma-Cote Conduit and Fittings

2.2 CONDUIT FASTENINGS

.1 One hole straps to secure surface conduits 50 mm and smaller.

.1 316 stainless steel with stainless steel mounting hardware.

.2 Two hole 316 stainless steel straps for conduits larger than 50 mm.

2.3 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.

.1 Coating: same as conduit.

.2 Ensure factory "ells" where 90 degree bends are required.

2.4 CONDUIT CEMENT

.1 Conduit cement and primer for PVC conduit.

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 Install conduits to cause minimum interference in spaces through which they pass.

.2 Use coated rigid steel 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 and where embedded in wharf deck. Install in accordance with manufacturer's recommendations.

.4 Use both primer and conduit cement for joining conduits and fittings.

.5 Minimum conduit size: 21 mm.

.6 Use standard radius elbows for 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 wharf.

.2 Group conduits wherever possible on channels.

3.4 CONDUITS IN CAST-IN PLACE CONCRETE

.1 Locate to suit reinforcing steel.

.1 Install in centre third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Conduits in slabs: minimum slab thickness 4 times conduit diameter.

.5 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.6 Organize conduits to minimize cross-overs.

3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Touch up any damaged PVC coating on conduits and fittings with manufacturer's coating touch up compounds.

.3 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 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Section 31 23 33 - Excavating, Trenching and Backfilling.

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

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association, (CSA International)

.2 Insulated Cable Engineers Association, Inc. (ICEA)

1.3 WASTE MANAGEMENT AND DISPOSAL

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

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 DUCTS

.1 Install cables as indicated in ducts and conduits.

.2 Do not pull spliced cables inside ducts and conduits.

.3 Install multiple cables in ducts and conduits simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 Before pulling cable into ducts and 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 duct and conduit ends with duct sealing compound.

3.2 MARKER TAPE

.1 Install cable marker tape 300 mm below grade, continuous over full length of cable ducts and 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 1000 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.

.2 Section 26 05 28 - Grounding - Secondary.

.3 Section 26 28 23 – Disconnect Switches - Fused.

.4 Section 26 24 16.01 – Panelboards Breaker Type

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.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.

1.4 UTILITY CHARGES

.1 Any fees or costs required by the utility for service and meter installations 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, 200A, 60 Hz, single phase, 3 wire grounded neutral.

2.2 EQUIPMENT

.1 Fused disconnect switch: in accordance with Section 26 28 23 - Disconnect Switches - Fused, rating as indicated.

.2 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 with the following features:

.1 Rated 200A, 250V, 1 phase, 3 wire.

.2 CSA3 enclosure constructed of corrosion resistant G90 galvanized steel with a polyester resin powder coat finish.

.3 Main lugs suitable for #6 to 350MCM copper conductors.

.4 Interchangeable hubs.

.5 Bottom entry.

.6 Sealing ring.

.7 Acceptable materials:

.1 Milbank U7018-XL-TG.

Part 3 Execution

3.1 INSTALLATION

.1 Install service equipment.

.2 Coordinate installation with Owners and Utility.

.3 Connect to incoming service.

.4 Connect to outgoing loads.

.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 01 33 00 – Submittal Procedures.

.2 Section 26 05 00 – Common Work Results for Electrical.

.3 Section 26 28 16.02 – Moulded Case Circuit Breakers.

1.3 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2No.29-M1989(R2000), Panelboards and enclosed Panelboards.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop 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 01 61 00 – Common Product Requirements.

.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 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 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: mains, number of circuits, and number and size of branch circuit breakers as indicated. Suitable for service entrance use.

.5 Aluminum bus with neutral of same ampere rating as mains.

.6 Mains: suitable for bolt-on breakers.

.7 316 Stainless steel enclosure CSA 4X rated.

.8 Gasketted door with locking handle and piano hinge.

.9 Maximum dimensions: 610 mm W x 1066 mm H x 165 mm D.

.10 Four keys for panelboard.

.11 Condensate drain in bottom of enclosure.

.12 Acceptable manufacturer or approved equal:

.1 Siemens.
.2 Schneider.
.3 Eaton.

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.

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.

Part 3 Execution

3.1 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.

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 CSA-C22.2 No.42-99(R2002), General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.3 CSA-C22.2 No. 55-M1986 (R2012), Special Use Switches.

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 01 61 00– Common Product Requirements.

.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 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15R, 125V, 15A, grounded, to: CSA-C22.2 No.42 with following features:

.1 Corrosion resistant, marine grade, CSA 4X enclosure complete with weatherproof cover. Mounted in corrosion resistant watertight PVC outlet box to Section 26 05 32, suitable for separately mounted devices.

.2 Suitable for No. 10 AWG back and side wiring.

.3 Triple wipe contacts and riveted grounding contacts.

.4 Acceptable materials for outlets:

.1 Receptacle: Leviton 52CM-62.

.2 Cover: Leviton M5979-GY.

.2 Single receptacles, CSA type L5-20R, 125V, 20A, grounded, to: CSA-C22.2 No. 42 with following features:

.1 Corrosion resistant, marine grade, CSA 4X enclosure complete with weatherproof cover. Mounted in corrosion resistant watertight PVC outlet box to Section 26 05 32, suitable for separately mounted devices.

.2 Suitable for No. 10 AWG back and side wiring.

.3 Triple wipe contacts and riveted grounding contacts.

.4 Acceptable materials for outlets:

.1 Receptacle c/w cover: Leviton #97W47-S.

2.2 WELDER OUTLETS

.1 Receptacle rated 60A, 240V, 2P, 3W pin and sleeve type as indicated.

.1 Mechanically interlocked to non fused disconnect switch.

.2 Watertight polyester and nylon enclosure.

.3 Padlockable switch handle.

.4 Acceptable materials:

.1 Leviton 360MI6W.

.2 Hubbell HBL360MI6W.

.2 Pin and sleeve watertight plug 60A, 2P, 3W to match receptacle. Supply quantity of (1) one plug for each welding outlet installed:

.1 Impact and corrosion resistant thermoplastic body.

.2 Colour coded front housing.

.3 Mechanical cord clamp with locking screw.

.4 Acceptable materials:

.1 Leviton 360P6W.

.2 Hubbell HBL360P6W.

2.3 GFI MODULE

.1 GFI Module rated 20A, 120VAC, 60 Hz with the following features:

.1 Corrosion resistant, marine grade, CSA 3R enclosure complete with weatherproof cover. Mounted in corrosion resistant watertight PVC outlet box to Section 26 05 32, complete with receptacle where noted.

.2 Suitable for No. 10 AWG back wiring.

.3 Acceptable materials for modules:

.1 GFI Module: Hubbell #GFM20.

.2 Cover: Killark #FCL-GF.

Part 3 Execution

3.1 INSTALLATION

.1 Receptacles:

.1 Install receptacles in corrosion resistant, marine grade, CSA 4X watertight PVC outlet boxes. Install boxes suitable for two separately mounted devices where indicated.

.2 Mount receptacles and outlets at heights indicated.

.2 Welder outlets:

.1 Install welder outlets as indicated.

.2 Turn plugs over to Departmental Representative.

.3 GFI Modules:

.1 Install GFI modules in corrosion resistant, marine grade, CSA 4X watertight PVC outlet boxes. Install boxes suitable for two separately mounted devices where indicated.

.2 Mount receptacles and outlets at heights indicated.

.4 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 56 20.01 – Site Lighting.

1.2 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.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.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.

1.4 MAINTENANCE MATERIALS

.1 Three spare fuses of each type and size installed up to and including 100 A.

Part 2 Products

2.1 FUSES - GENERAL

.1 Fuses: product of one manufacturer.

2.2 FUSE TYPES

.1 Type J2 fast acting or type R3, (UL Class RK1) fast acting Class R.

.2 Class CC fuses.

2.3 FUSE HOLDERS FOR LIGHT POLES

.1 Suitable for type CC fuses to Section 26 56 20.01 – Site Lighting.

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.

.3 Ensure correct fuse is fitted to assigned electrical circuit.

.4 Install Class CC fuses in inline watertight fuseholder in light poles.

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. 5-02, Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

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 01 61 00 – Common Product Requirements.

.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 BREAKERS GENERAL

.1 Moulded-case circuit breakers, 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 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 being installed in panelboards to be by the same manufacturer as the panelboard.

.7 Breakers must be new, complete with original factory warranty and supplied from an authorized manufacturer's distributor.

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.

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.

.2 Section 26 28 13.01 – Fuses – Low Voltage.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International).

.1 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-M1987 (R2007), Fuseholder Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product data: submit manufacturer's instructions, printed product literature and data sheets including characteristics, physical size, finish and limitations.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 DISCONNECT SWITCHES - FUSED

.1 Heavy duty, fusible, service entrance rated disconnect switch in 316 stainless steel CSA 4X Enclosure to CSA C22.2 No.4, size as indicated.

.2 Provision for padlocking in off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle is 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, relocateable and 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.

.8 Acceptable manufacturer or approved equal:

.1 Cutler-Hammer.

.2 Siemens.

.3 Square-D.

2.2 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 INSTALLATION

.1 Install disconnect switches complete with fuses as indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 Section 26 28 13.01 – Fuses – Low Voltage.

1.2 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.

1.3 DELIVERY STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.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.

1.4 WARRANTY

.1 Luminaires to have a full 5 year unlimited warranty including labour on electrical, including LEDs, driver and luminaire finish.

.2 Poles to have a 3 year warranty on components and finish.

Part 2 Products

2.1 LED LUMINAIRES

.1 Surge protection to: IEEE C.62.41 and UL8750.

.2 In situ temperature measurement test (ISTMT) provided by an OSHA or UL testing laboratory.

.3 LEDs

.1 LED lifetime projections to: IESNA TM-21.
.2 Performance measurement to: IESNA LM-79.
.3 Lumen maintenance testing to: IESNA LM-80.
.4 Minimum 50,000 hours.
.5 Colour bin size to: ANSI C78 377A.

.6 Minimum colour rendering index: 78.
.7 Colour temperature 5700K or as indicated.
.8 IESNA L70 minimum 50,000 hours at 25 degrees Celsius.

.4 LED Drivers
.1 Voltage as indicated.
.2 Solid-state electronic.
.3 Power factor: minimum 90% lagging or leading.
.4 Short circuit and overload protection.

2.2 LUMINAIRES

.1 Type A.

.1 Luminaire with die cast aluminum weatherproof housing and:
.1 Lamp type: LED, 7182 initial lumens, @ 350ma, 70 watts, 5700K.
.2 Versatile modular light bar.
.3 Optical assembly:
.1 For LED lamps:
.1 Refractor: direct contact type, minimizing light loss and providing control and uniformity.
.4 Light Distribution:
.1 IES distribution Type 5.
.5 Factory wired with optimized 350ma power driver, 120V terminated at terminal block.
.6 Less than 20% THD, PF greater than 0.9, integral 10kV surge protection.
.7 Thermal management using heat sinks.
.8 Metal deterrent metal bird spikes.
.9 76 mm diameter tenon for mounting on 6095 mm aluminum pole.
.10 Die cast and extruded aluminum housing, fade, abrasion resistant, corrosion resistant, natural finish, suitable for a marine environment. Complete luminaire to be IP 66 rated.
.11 Certified to ANSI C136.31 3G bridge and overpass vibration standards.
.12 Acceptable materials:
.1 GARDCO #SFRP-T3-5W-70LA-6453-CW-120-AR-NP-Metal Bird Spikes.

2.3 ALUMINUM POLES

.1 Aluminum poles: to CSA C22.2 No. 206 designed for underground wiring and:

.1 Mounting on concrete anchor base without transformer base.
.2 Style: round monotube, minimum 6.4 mm thick fabricated from aluminum alloy 6063 per ASTM B221. Finish rotary polish.
.3 Access handhole 500 mm above pole base for wiring connections, with welded on reinforcing frame and bolted-on cover.
.4 Size: 6095 mm long, tapered from 203 mm to 114 mm.

.5 Pole base: cast aluminum alloy, one piece construction, joined to shaft with circumferential welds at top and bottom of base.

.6 Anchor bolts: 19 mm x 609 mm steel with shims nuts, washers and covers, 292 mm BCD.

.7 Ground lug.

.8 76 mm dia. tenon for post top fixture.

.9 Vibration damper.

.10 Acceptable manufacturer:

.1 Aluminous Lighting Products.

2.4 FUSE KIT

.1 Inline watertight fuseholder c/w 3A class CC midget fuses.

.1 Acceptable manufacturer:

.1 GEC #CRS30H c/w 3A type C fuse.

Part 3 Execution

3.1 LUMINAIRE INSTALLATION ON ALUMINUM POLES

.1 Prior to ordering pole confirm base bolt pattern.

.2 Install poles and install luminaires as noted.

.3 Secure luminaire to pole tenon by tightening set screws. Install locktite on threads and tighten set screws by alternating from one side of hub to the other until all screws are tightened to manufacturers' torque specifications. Provide report indicating number of screws torqued per luminaire and torque values. Once plumbed and secured, drill through fixture and tenon and install a 9.5 mm stainless steel bolt and locking nut to secure luminaire to pole.

.4 Install SOW cables in poles from hand hole to luminaire support at top of pole using a suitable wire grip.

.5 Install fuses in fuse clips in poles.

.6 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

END OF SECTION