1 GENERAL

1.01 RELATED SECTIONS

.1 Division 01 – General Requirements.

1.02 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 C22.1-21, Canadian Electrical Code (CEC), Part 1 (25th Edition), Safety Standard for Electrical Installations.
  .2 C22.3 No. 7:20, Underground Systems.
  .3 C235:19, Preferred Voltage Levels for AC Systems up to 50,000 V.
  .4 Z462:21, 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 Engineers (IEEE)/National Electrical Safety Code Product Line (NESC)
  .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.03 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.

1.04 DESIGN REQUIREMENTS

.1 Operating voltages: to CSA 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 and in French.

.4 Use one nameplate for both.

1.05 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit to Technical Inspection Services, Department of Public Safety necessary number of drawings and specifications for examination and approval prior to commencement of work. Pay all associated fees.

.3 Product Data: submit WHMIS MSDS in accordance with Section 01 35 29.06 – 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.
- .5 Submit, upon completion of Work, load balance report as described in PART 3 – FIELD QUALITY CONTROL.
- .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.6 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

.7 Upon completion of project, submit as-built drawings and maintenance manuals.

1.06 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 As a minimum the site foreman is to be red seal certified.

.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 29.06 - Health and Safety Requirements.

1.07 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.

1.08 SYSTEM STARTUP

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

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.09 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.

2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

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

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.02 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.

2.03 WIRING TERMINATIONS

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

2.04 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:
  .1 Nameplates: plastic laminate lamicoid 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 Lamicoid 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 Lamicoid 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 be marked with an indelible ink marker to designate the circuit number of enclosed wiring, the designated panel name and electrical characteristics where applicable.

.9 Install an additional lamicoid 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

2.05 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.

2.06 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 indoor distribution enclosures light grey to EEMAC 2Y-1.

3 EXECUTION

3.01 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.

3.02 CUTTING AND PATCHING

.1 Provide cutting, coring and drillings as required for installation of electrical services. Hole sizes to be kept to a minimum. Restoration of damaged surfaces to preconstruction condition will be by this contractor.

3.03 NAMEPLATES AND LABELS

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

3.04 CONDUIT AND CABLE INSTALLATION

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

3.05 LOCATION OF OUTLETS AND EQUIPMENT

.1 Locate outlets and equipment where shown on drawings.

.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.

3.06 MOUNTING HEIGHTS

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

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

.3 Install electrical equipment as shown on electrical drawings.

3.07 COORDINATION OF PROTECTIVE DEVICES

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

3.08 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 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Provide upon completion of work, load balance report as directed in PART 1 - 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.

.5 Manufacturer's Field Services:
.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.10 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

1 GENERAL

1.01 RELATED SECTIONS

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

1.02 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals

1.03 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.

2 PRODUCTS

2.01 POWER PEDESTALS

.1 Power pedestals to be a self-contained enclosure housing terminal blocks and receptacles for separately metered marina shore power services and general power as indicated. Pedestals to include:
- .1 Main housing constructed of 16 gauge 316L stainless steel with a UV resistant white polyurethane finish and be 3R rated. Enclosure to be divided into 2 or 4 separate sections as indicated, each containing copper terminals capable of accepting #10 AWG to #2/0 AWG conductors for single phase 120/240V feed through capacity. Each pedestal to house 2 or 4 5-20R receptacles and associated breakers. Pedestal dimensions to be 1333mm H x 282mm W x 282mm D.
- .2 Pedestal to be c/w polycarbonate mounting base plate to isolate the bottom housing from the dock surface.
- .3 20A receptacles to be corrosion resistant marine grade, 120V, type 5-20R c/w lockable cover and 20A, 1P 5mA GFI breaker, quantity as indicated.
- .4 Fully assembled pedestals to be CSA certified and labeled.

.2 Acceptable materials:
.1 Marina Electrical Equipment Harbor Light SS series c/w receptacles as indicated.

2.02 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Size 4 lamacoid nameplate for each outlet. Example P31 where:
.1 P3 – indicates pedestal number.
.2 1 – indicates outlet on pedestal.

3 EXECUTION

3.01 INSTALLATION

.1 Mount power pedestals as indicated on new floats. Fasten base plates to float sub-structures as shown in details and as approved by Departmental Representative. Exact locations of pedestals to be reviewed with Departmental Representative prior to installation.

.2 Feed power cables through float wireways or structure and up into pedestal base.

.3 Install cable connectors and terminate on appropriate terminal blocks as per manufacturer's installation instructions. Each pedestal will be uniquely labeled and receptacles numbered.

.4 Megger all feeders prior to energizing.

.5 Test feeder and receptacles ground fault protection.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

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

1.02 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 C22.2 No.18.3-12 (R2017), Conduit, Tubing and Cable Fittings (Tri-National Standard with ANCE NMX-J-017 and UL 514B).
  .2 C22.2No. 65-18, Wire Connectors (Tri National Standard with NMX-J-543-ANCE and UL 486A-486B).

.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)

1.03 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals

1.04 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.

2 PRODUCTS

2.01 MATERIALS

.1 Crimp style wire connectors, nylon insulated, with current carrying parts of copper alloy, for conductors #16 AWG and smaller.

.2 Fork tongue, nylon insulated, crimp style terminals for connecting conductors #16 AWG and smaller to screw down terminals.

.3 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.

.4 Crimp style wire connectors, nylon insulated with current carrying parts of copper alloy, for connecting solid to stranded conductors.

.5 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.

.6 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.

.7 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.

.8 Waterproof gel filled twist-on type wire connectors up to #6 AWG to: CAN/CSA-C22.2 No.65 and UL486G, 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 -43deg. C to 204 deg. C.
- .4 Acceptable materials:
  - .1 King Innovation: Dryconn waterproof connectors.
  - .2 Ideal "Underground" connectors.
  - .3 Burndy Clear UNITAP inspectable.

.9 Insulated splicer/ reducer inline or offset connectors:
- .1 Aluminum construction suitable for copper and aluminum conductors.
- .2 Captive pressure screws.
- .3 Watertight touch safe.
- .4 Removable plugs, plastisol black cover.
- .5 Wire range size to suit.
- .6 Acceptable materials:
  - .1 Ilsco type PBTO.
  - .2 Penn Union Type IPBB.
  - .3 T & B.

.10 Insulated splicer/ reducer inline terminal blocks:
- .1 Aluminum construction suitable for copper and aluminum conductors.
- .2 Captive pressure screws.
- .3 Touch safe plastic covers.
- .4 Wire range size to suit.
- .5 Acceptable materials:
  - .1 Square D type 9080 LBA (#14-2/0).
  - .2 Merson type MPDB miniature (#14-2/0).
  - .3 Ilsco.

.11 Teck Connectors:
- .1 Watertight, copper free aluminum approved for TECK cable.
- .2 Acceptable materials:
  - .1 Thomas & Betts StarTeck.
  - .2 Iberville Tek Series.

.12 Flexible cord strain-relief connectors:
- .1 Watertight connector body with grip for strain relief. Approved for use with insulated flexible cord.
- .2 Aluminum connector body.
- .3 Stainless steel mesh grip.
- .4 Grip diameter range to match cable diameter.

.13 Flexible Cable Insulated Ferrules:
- .1 Ferrules for terminating flexible wire in screw clamp terminals.
- .2 Thin-walled copper tube throat construction.
- .3 Compression fit using manufacturer's recommended tool with colour coded die.

.14 Cold Weather Tape:
- .1 Acceptable materials:
  - .1 Scotch Brand '88'.

3 EXECUTION

3.01 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 splice/reducer connectors and terminal blocks for cables larger than #6 at field and panel ends terminating with #12 AWG conductors for 20A circuits.
- .3 Install gel filled twist-on type connectors for lighting and receptacle circuit splice locations and tighten.
- .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.
- .5 Install ferrules on all flexible wire connections in accordance with ferrule manufacturer's recommendations.
- .6 Wrap connectors in junction boxes with double half lapped layer of cold weather tape.

.2 Use waterproof silicone filled connectors for splices in damp or wet locations, including but not limited to, connections inside of exterior light fixtures, receptacles and junction boxes.

3.02 RESTRICTIONS

.1 No splices are allowed in panelboards or in equipment enclosures.

END OF SECTION

1 GENERAL

1.01 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 29 – Hangers and Supports for Electrical Systems.

1.02 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 C22.2 No. 0.3-09 (R2019), Test Methods for Electrical Wires and Cables.
- .2 C22.2 No. 96-17, Portable Power Cables.
- .3 C22.2 No. 131-17, Type TECK 90 Cable.

1.03 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals

1.04 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.

2 PRODUCTS

2.01 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.

2.02 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.

.3 Insulation:
- .1 Chemically cross-linked thermosetting polyethylene rated type RW90, 600V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: flat interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Fastenings:
- .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables at 1500 mm centers.
- .3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:
- .1 Watertight approved for TECK cable.

2.03 FLEXIBLE POWER CABLES

.1 Cable to: C22.2 No. 96-17.

.2 Conductors:
- .1 Type G-GC – two or three conductors plus ground, size as indicated, stranded tinned copper.

.3 Insulation:
- .1 Ethylene-propylene-rubber (EPR) rated 2kV.
- .2 Oil and moisture resistant.
- .3 Insulation rated 90 deg C.
- .4 Colour coded: red, black, white, bare ground, yellow ground check.

.4 Outer jacket:
- .1 Black heavy duty CPE thermoset compound.

3 EXECUTION

3.01 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Install cables, fastened in place at 1200mm intervals and 300mm from terminations..

.2 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors (0 - 1000 V).

3.02 INSTALLATION OF FLEXIBLE POWER CABLES

.1 Install cables in accordance with C22.1:21.

.2 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors (0 - 1000 V); use flexible cord strain relief connectors for all attachments to electrical enclosures.

.3 Support cables using flexible cord support grips.

3.03 RESTRICTIONS

.1 Installation of cables must be done in a manner to prevent damage from nor interfere with wharf activities.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

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

1.02 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
  .1 ANSI/IEEE 837-2014, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International)
  .1 C22.2 No.41-13 (R2017), Grounding and Bonding Equipment (Bi-National Standard with NMX-J-590-ANCE and UL 467).

1.03 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals

1.04 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.

2 PRODUCTS

2.01 EQUIPMENT

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

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

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

.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 Thermit welded type conductor connectors.
.5 Bonding jumpers, straps.

3 EXECUTION

3.01 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 connections to electrodes, using copper welding by thermit process.

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

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Connect metal door frame to ground by welding copper to steel.

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

3.02 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of 208 V systems.

3.03 EQUIPMENT GROUNDING

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

3.04 FIELD QUALITY CONTROL

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

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

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

1.02 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals

1.03 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.

2 PRODUCTS

2.01 SPECIFIC PURPOSE SUPPORTS

.1 U shaped , size 41 x 41mm, 2.5mm thick 316 stainless steel surface mounted or suspended as required.

.2 9.5 mm dia 316 stainless steel threaded 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 Two hole 316 stainless steel straps for cables and conduits.

2.02 MOUNTING HARDWARE

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

2.03 FLEXIBLE CORD SUPPORT GRIPS

.1 Heavy duty type.

.2 Double weave stainless steel mesh grip.

.3 Grip range to match cable diameter.

3 EXECUTION

3.01 INSTALLATION

.1 Secure cables directly to underside of structure with expandable inserts or use support channels, surface mounted or suspended.

.2 Secure surface mounted equipment with stainless steel fasteners.

.3 Fasten exposed conduit or cables to structures or support systems using two hole stainless steel straps.

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

.5 Install flexible cord support grips as indicated and in accordance with manufacturer's instructions.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

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

1.02 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 C22.1:21, Canadian Electrical Code (CEC), Part 1, 25th Edition.
  .2 C22.2 No. 40-17, Junction and Pull Boxes.

1.03 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals

1.04 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.

2 PRODUCTS

2.01 JUNCTION AND PULL BOXES

.1 Construction: 316 stainless steel, CSA 4X rated for exterior use unless noted otherwise.

.2 Covers Surface Mounted: Screw on overlapping ferroalloy iron alloy covers complete with neoprene gasket and stainless steel screws.

.3 Mounting feet.

.4 Mounting Plate where terminal blocks are installed.

.5 Drilled and tapped conduit holes to suit.

.6 Acceptable materials:
.1 Hoffman.
.2 Hammond.
.3 Rittal.
.4 Ralston.

2.02 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 Killark #DPE-40-50-S3

3 EXECUTION

3.01 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 exterior junction and pull boxes.

3.02 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

1 GENERAL

1.01 RELATED SECTIONS

.1 Section 26 05 21 – Wires and Cables (0-1000V).

1.02 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 C22.2 No.126.1-17, Metal Cable Tray Systems (Bi-National Standard with NEMA VE 1-2017).

.2 National Electrical Manufacturers Association (NEMA)
  .1 NEMA VE 1-2017, Metal Cable Tray Systems.
  .2 NEMA VE 2-2018, Cable Tray Installation Guidelines.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data: submit manufacturer's product data sheets for cable tray indicating dimensions, materials, and finishes, including classifications and certifications.

.3 Shop Drawings: submit shop drawings showing materials, finish, dimensions, accessories, layout, and installation details.

1.04 WASTE MANAGEMENT AND DISPOSAL

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

2 PRODUCTS

2.01 CABLE TRAY

.1 Cable tray and fittings: to NEMA VE 1 and CSA C22.2 No. 126.1.

.2 Ladder type, Class A to CSA C22.2 No.126.1.

.3 Trays: 316 stainless steel, 305 mm wide with depth of 100 mm.

.4 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cable tray supplied.
  .1 Radii on fittings: 305 mm minimum.

.5 Ground cable trays with #2 AWG bare copper conductor attached to each tray section in accordance with CEC requirements.

.6 Acceptable materials:
.1 ABB.
.2 Eaton.

2.02 SUPPORTS

.1 Provide splices and supports for a continuously grounded system as indicated.

.2 Supports to be 316 stainless steel, anchored to concrete structure as indicated. Design load rated for 680 kg. (1500 lbs).

.3 Acceptable materials:
.1 ABB S249-20SS6C.

3 EXECUTION

3.01 INSTALLATION

.1 Install cable tray in accordance with NEMA VE 2.

.2 Support cable tray on one side unless indicated otherwise.

.3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

3.02 CABLES IN CABLE TRAY

.1 Install cables individually.

.2 Lay cables into cable tray. Use rollers when necessary to pull cables.

.3 Secure cables in cable tray at 3 m centres with stainless steel cable clamps.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

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

.2 Section 26 05 21 – Wires and Cables (0-1000V).

1.02 REFERENCES

.1 Canadian Standards Association, (CSA International)

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

1.03 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.

2 PRODUCTS

2.01 NOT APPLICABLE

3 EXECUTION

3.01 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in conduits.
.1 Do not pull spliced cables inside conduits.

.2 Install multiple cables in conduits simultaneously.

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

.4 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.

.5 After installation of cables, seal conduit ends with duct sealing compound.

3.02 FIELD QUALITY CONTROL

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

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 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 500V megger on each 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

1 GENERAL

1.01 RELATED SECTIONS

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

1.02 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals

1.03 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.

2 PRODUCTS

2.01 PHOTOELECTRIC LIGHTING CONTROL

.1 Threaded stem mounting.

.2 Capable of switching 1800W tungsten and 1000VA ballast lighting at 120V.

.3 Voltage variation: plus or minus 10%.

.4 Temperature range: minus 40 °C to plus 70 °C.

.5 Switching on lights at 16 lx.

.6 Switching off lights at 48 lx.

.7 Rated for 10,000 operations.

.8 Options:
- .1 Integrated surge protection to 5,000A.
- .2 Fail-safe circuit completed when relay de-energized.

.9 Switching time delay of 30 s.

.10 Acceptable materials:
.1 Intermatic EK47365.

3 EXECUTION

3.01 INSTALLATION

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

.2 Wire photocell to lighting circuit.

.3 Demonstrate operation to Owner.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

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

.2 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.02 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 C22.2No.29-15 (R2019), Panelboards and Enclosed Panelboards.

1.03 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.04 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

2 PRODUCTS

2.01 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 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Four keys for each panelboard and key panelboards alike.

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

.7 Mains: suitable for bolt-on breakers.

.8 Trim with concealed front bolts and hinges.

.9 CSA 4X rated stainless steel enclosure. Type 316 Stainless Steel.

.10 Trim and door finish: brushed stainless steel.

.11 Minimum of 33% spare space unless indicated otherwise.

.12 Acceptable materials:
- .1 Square D
- .2 Cutler-Hammer
- .3 Siemens

2.02 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Lock-on devices for 10% of 15 A breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative.

2.03 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Complete circuit directory with typewritten legend showing location and load of each circuit.

.4 Arc flash hazard label installed on panel door.

3 EXECUTION

3.01 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 - Electrical or as indicated.

.3 Connect loads to circuits.

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

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

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

.2 Section 26 56 20.01 – Site Lighting.

1.02 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.03 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.

1.04 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

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

2 PRODUCTS

2.01 FUSES - GENERAL

.1 Fuses: product of one manufacturer.

2.02 FUSE TYPES

.1 Class J fuses.

.2 Class CC fuses.

2.03 FUSE HOLDERS FOR LIGHT POLES

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

3 EXECUTION

3.01 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

1 GENERAL

1.01 RELATED SECTIONS

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

.2 Section 26 24 16.01 – Panelboards Breaker Type.

1.02 REFERENCES

.1 Canadian Standards Association (CSA International).
  .1 C22.2 No. 5:16 (R2021), Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489 and NMX-J-266-ANCE-2016).

1.03 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.04 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.

2 PRODUCTS

2.01 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 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.

2.02 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.

2.03 OPTIONAL FEATURES

.1 Include ground fault interrupting capability (30mA maximum) where indicated.

3 EXECUTION

3.01 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

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

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

1.02 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.

.3 Operational and Maintenance Data: submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.03 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.

1.04 WARRANTY

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

.2 Poles to have a 5 year warranty on components and finish.

2 PRODUCTS

2.01 LUMINAIRES

.1 As per Luminaire Schedule.

2.02 LED LUMINAIRES

.1 Luminaires and all components (LEDs, driver, housing, etc.) to have a complete 5-year manufacturer warranty.

.2 LED luminaire performance to be in accordance with CSA C866.

.3 Luminaires to be DLC Standard version 4.4 listed.

.4 Luminaire efficacy: in accordance with DLC requirements.

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

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

.7 LEDs
- .1 LED lifetime projections to: IES TM-21.
- .2 Performance measurement to: IES LM-79.
- .3 Lumen maintenance testing to: IES LM-80.
- .4 Minimum 50,000 hours.
- .5 Colour bin size to: ANSI C78 377A.
- .6 Minimum colour rendering index (CRI): 80.
- .7 Colour temperature 4000K or as indicated.
- .8 IES L70 minimum 50,000 hours at 25 degrees Celsius.

.8 LED array to be field replaceable.

.9 LED Drivers
- .1 Voltage as indicated.
- .2 Solid-state electronic.
- .3 Power factor: minimum 90% lagging or leading.
- .4 Harmonics: 20% maximum THD.
- .5 Short circuit and overload protection.
- .6 0-10V dimming standard.

.10 Luminaires to be Restriction of Hazardous Substance Directive (RoHS) compliant.

.11 Compatibility: manufacturer to submit in writing compatible external control components for each luminaire used.

.12 Luminaire manufacturer shall be a company with a minimum of 5 years of success manufacturing LED light fixtures for the Canadian market. The agency representing the manufacturer shall be an established company that has had and currently maintains a locally run and operated business in New Brunswick for at least five years. A listing of five (5) projects shall be provided (if requested) where the manufacturer's similar products have been used in Canada, including location, contact person and telephone number.

2.03 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

.2 Baked enamel finish:
- .1 Conditioning for metal before painting:
  - .1 For corrosion resistance, conversion coating to ASTM F1137.
  - .2 For paint base, conversion coating to ASTM F1137.

.2 Metal surfaces of luminaire housing and reflectors finished with high gloss baked enamel to give smooth, uniform appearance, free from pinholes or defects.
.3 Reflector and other inside surfaces finished as follows:
.1 White: minimum reflection factor 85%.
.2 Colour fastness: yellowness factor not above 0.02 and after 250 hour exposure in Atlas fadeometer not to exceed 0.05.
.3 Film thickness: not less than 0.3 mm average and in no areas less than 0.025 mm.
.4 Gloss: not less than 80 units as measured with Gardner 60 degree glossmeter.
.5 Flexibility: withstand bending over 12 mm mandrel without showing signs of cracking or flaking under 10 times magnification.
.6 Adhesion: 24 mm square lattice made of 3 mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and pulled. Adhesion satisfactory if no coating removed.

2.04 ALUMINUM POLES

.1 Aluminum poles: to CSA C22.2 No. 206 designed for underground wiring and:
.1 Mounting on floating dock without transformer base.
.2 Style: round monotube, minimum 4.8 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: 3660 mm long, tapered from 152 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: 25mm x 609 mm steel with shims nuts, washers and covers, 279mm BCD.
.7 Ground lug.
.8 76mm dia. tenon for post top fixture.
.9 Vibration damper.
.10 Acceptable manufacturer:
.1 Aluminous Lighting Products.
.2 Valmont/Feralux.

2.05 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.

3 EXECUTION

3.01 INSTALLATION

.1 Prior to ordering pole confirm base bolt pattern.

.2 Install new poles and pole mounted 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 .95mm stainless steel bolt and locking nut to secure luminaire to pole

.4 Install SOW cables in poles from hand hole to luminaire supported 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