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END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

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

.3 CSA Z462-12 Workplace Electrical Safety.

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

.1 Y1-2-1979 Performance Specifications for Finishing Systems for Outdoor Electrical Equipment.

.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 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.5 SUBMITTALS

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

.2 Submit to Electrical Inspection Services necessary number of drawings and specifications for examination and approval prior to commencement of work.

.3 Product Data: submit WHMIS MSDS in accordance with Section 01 35 30 – 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 – Quality Control.

- .1 Provide CSA certified equipment and material.
- .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
- .3 Submit test results of installed electrical systems and instrumentation.
- .4 Permits and fees: in accordance with General Conditions of contract.

.6 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 In accordance with Section 01 11 00 – Summary of Work – Schedule.

.2 Site Meetings: as part of Field Services described in Part 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.

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

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

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

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

.2 Construction/Demolition Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.8 SYSTEM STARTUP

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

.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 will aspects of its care and operation.

1.9 SITE VISIT

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

1.10 MEASUREMENT FOR PAYMENT

.1 Electrical will be measured by lump sum.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

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

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

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, 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.

.2 Decal signs, minimum size 175 mm 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 lamicoid 3 mm thick plastic engraving sheet, matt 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 6mm 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 panelboards shall indicate the following:

.1 Designated name of equipment.
.2 Overcurrent protection device rating
.3 Voltages, number of phases and wires.
.4 Designation of power source.
.5 The following is an example.

PANEL A – 60A
120/240V – 1PH – 3W

.7 Lamicoid nameplates installed on control panels, contactors and large junction and pull boxes shall contain the following information:

.1 Designated name of equipment.
.2 Designated name of power source.
.3 Voltage(s), number of phases and wires.
.4 Branch circuit breaker number(s) where possible.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, indicating panel and circuit number; i.e., A-1. Normal ground circuits to have ground, neutral and phase wires identified with black on white background tape. Tape to be pre-printed vinyl, self-adhesive. Circuits to be identified a both ends and at all pull and junction boxes.

.2 Use coloured plastic tapes to identify feeders on both ends of phase conductors and at junction and pull boxes if conductor insulation colours are other than red, black, blue, white and green.

.3 Maintain phase sequence and colour coding throughout.

.4 Colour coding: to CSA C22.1.

2.7 FINISHES

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

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

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

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit prior to pouring of concrete.

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

3.4 LOCATION OF OUTLETS AND EQUIPMENT

.1 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.

3.5 MOUNTING HEIGHTS

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

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

.3 Install electrical equipment at the following heights unless indicated otherwise.

.1 Panelboards: 1500 mm or as required by Code.

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

3.6 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 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.

.2 Carry out tests in presence of Departmental Representative.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

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 DESCRIPTION OF WORK

.1 In general, work of this Section consists of the complete removal of all electrical equipment on existing wharf.

1.2 RELATED SECTIONS

.1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

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

1.3 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 all costs in the total tendered price.

1.4 REFERENCE STANDARDS

.1 All removal and alteration work of electrical construction to be done in accordance with the safety standards outlined in the Canadian Electrical Code.

1.5 PROTECTION

.1 The contractor is responsible for any damages to existing structure as a result of the work.

1.6 COORDINATE WITH UTILITIES

.1 Coordinate and arrange with Utility for disconnection and removal of utility services.

.2 Pay any utility fee or charges.

Part 2 Products

Not Applicable

Part 3 Execution

3.1 GENERAL REMOVALS

.1 Remove all obsolete and abandoned electrical services including wire and conduit.

.2 Coordinate disconnection of existing services with Departmental Representative of services and the Utility.

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.2 Fold up metal banding, flatten and place in designated area for recycling.

.3 Do not dispose of preservative treated wood through incineration.

.4 Do not dispose of preservative treated wood with other materials destined for recycling or reuse. Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill as approved by Departmental Representative.

.5 Dispose of unused wood preservative material at official hazardous material collections site.

.6 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other location where they will pose health or environmental hazard.

Part 2 Products

2.1 WOOD PRODUCTS

.1 All wood products shall be cut from live timber and must be free from physical defects such as surface rot, heart rot and loose knots.

.2 Wood products to be pressure treated in accordance with CAN/CSA-080 Series-08(R2012). Use ACA or CCA treatment only.

.3 Pressure treatment to be AWPA category 4B with a CCA pcf of 0.60, suitable for marine use.

.4 Any field cuts to be treated in accordance with AWPA standard M4 with a preservative containing at least 2% copper.

.5 Posts to be 30 deg. roofed and 45 deg. beveled on the bottom prior to treatment.

.6 Rough hardware: bolts, nuts, washers, lags, pin, screws; hot dipped galvanized after fabrication.

.7 Wood products to be ordered to length to avoid field cuts.

Part 3 Execution

3.1 INSTALLATION

.1 Layout and install the work in the locations and arrangement shown on the drawings or as indicated by the Engineer.

.2 Pre-drill all anchor holes to prevent splitting of wood.

.3 Should field cuts be necessary, apply same preservative.

.4 All field cuts, holes and breaks in the preservative treatment shall be given two coats of preservative before assembly.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

.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.

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

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

.3 National Electrical Manufacturers Association (NEMA)

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper alloy sized to fit copper conductors as required.

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

- .1 Gel filled silicone sealant temperature -43 deg. C to 205 deg. C.
- .2 Suitable for use in damp, wet, rain tight and submersible locations.

.3 Acceptable manufacturer or approved equal:

.1 King Innovation: Dryconn waterproof connectors.

.2 Ideal "Underground" Connectors.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded round copper conductors.

.2 Clamp for stranded round copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors.

.5 Sized for conductors as indicated.

.4 Cold Weather Tape:

.1 Acceptable manufacturer or approved equal:

.1 Scotch Brand '88'.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

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

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

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

.4 Wrap connectors in lighting poles and junction boxes with double half lapped layer of cold weather tape.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 Section 26 05 20 – Wire and Box Connectors (0 - 1000 V).

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

1.2 REFERENCES

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

1.3 PRODUCT DATA

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

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 WIRES

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

.2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

.2 In underground ducts in accordance with Section 33 65 73 – Concrete Encased Conduits.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

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

.1 ANSI/IEEE 837-1989(R1996), Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International)

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required.

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

.3 Insulated grounding conductors: green, type RW90.

.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 Bolted type conductor connectors.

.3 Thermit welded type conductor connectors.

.4 Bonding jumpers, straps.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, 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.

3.2 SYSTEM AND CIRCUIT GROUNDING

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

3.3 EQUIPMENT GROUNDING

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

3.4 FIELD QUALITY CONTROL

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

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

.3 Perform tests before energizing electrical system.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 SPECIFIC PURPOSE SUPPORTS

.1 Specific purpose, corrosion resistant, heat treated, stainless steel fasteners to be used to support boxes from structures.

.2 One or two hole corrosion resistant PVC coated steel straps for conduits.

2.2 MOUNTING HARDWARE

.1 Stainless steel or hot dipped galvanized corrosion resistant mounting hardware to be used.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to poured concrete with expandable inserts.

.2 Secure surface mounted equipment with stainless steel fasteners.

.3 Fasten exposed conduit or cables to structures or support systems using corrosive resistant coated straps.

.1 One or two hole PVC coated steel straps complete with stainless steel hardware to secure surface conduits and cables 50 mm and smaller.

.4 Use wire lashing, perforated strap, nylon or plastic self locking cable ties to support or secure raceways to deck rebar.

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

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

1.3 SUBMITTALS

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

.2 Product Data:

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

.3 Provide shop drawings: in accordance with Section 01 33 00 – Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

.1 Construction: cast aluminum, CSA 4X rated.

.2 Covers Surface Mounted: cast aluminum, turned edge covers complete with neoprene gasket.

.3 Mounting feet.

.4 Mounting Plate: where indicated.

.5 Drilled and tapped conduit holes to suit.

.6 Acceptable manufacturer or approved equal:

.1 Appleton WYL.

2.2 DRAIN / BREATHER

.1 Drain and breather to accommodate pressure changes and allow moisture or condensation to drain from enclosure while maintaining CSA rating.

.2 Inner dust seal to prevent contaminants from entering enclosure.

.3 Constructed of fibre reinforced nylon with castellated locknuts.

.4 Acceptable manufacturer or approved equal:

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

Part 3 Execution

3.1 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in accessible locations as indicated.

.2 Install breather/drain on all junction and pull boxes.

3.2 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 – Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name voltage and phase or as indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

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

1.3 SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 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 Blank cover plates for boxes without wiring devices.

2.2 CONDUIT BOXES

.1 Cast aluminum FS or FD boxes with factory hubs and mounting feet for surface wiring of devices.

2.3 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 Provide correct size of openings in boxes for conduit and armoured cable connections. Do not install reducing washers.

.4 Vacuum clean interior of outlet boxes before installation of wiring devices.

.5 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 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45 - M1981(R2003), Rigid Metal Conduit.
- .3 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.

1.3 SUBMITTALS

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

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.3 Quality assurance submittals:

- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

- .1 Separate waste materials for reuse and recycling.
- .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 Blue urethane coating on threads.
.2 Minimum 40 mil PVC coating on exterior.
.3 Nominal 2 mil blue urethane on interior.
.4 Acceptable manufacturer or approved equal:
.1 Thomas & Betts OCAL-BLUE Conduit and Fittings.

2.2 CONDUIT FASTENINGS

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

.1 40 mil corrosion resistant PVC coating.
.2 Two hole steel straps for conduits larger than 50 mm.
.3 Acceptable manufacturer or approved equal:
.1 Thomas & Betts OCAL Pipe Straps.

2.3 CONDUIT FITTINGS

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

.2 Ensure factory elbows where 90 degrees bends are required.

2.4 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

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

.2 PVC 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.

.4 Minimum conduit size for lighting and power circuits: 21 mm.

.5 Use standard radius elbows for exposed PVC coated rigid steel conduit.

.6 Install fish cord in empty conduits.

.7 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.8 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to structure lines.

.2 Group conduits wherever possible on channels.

3.4 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel.

.1 Install in centre one 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 in slab to minimize cross-overs.

3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

3.6 CLEANING

.1 Touch up any damaged PVC coating on conduits and fittings with manufacturer's OCAL-Blue coating touch up compounds.

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

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

1.2 REFERENCES

.1 Canadian Standards Association, (CSA International)

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

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 CABLE MARKER TAPE

.1 Polyethylene marker tape: 75 mm wide for direct burial.

.2 Marker sheet red in colour with the following words printed in large black block letters: CAUTION CAUTION CAUTION ELECTRIC LINE BURIED BELOW.

Part 3 Execution

3.1 CABLE INSTALLATION IN DUCTS AND CONDUITS

.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 500 V megger on each phase conductor.

.6 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

.7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 PRODUCT DATA

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

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 PHOTOELECTRIC LIGHTING CONTROL

.1 Photoelectric Lighting Controls: to CSA C22.21.

- .1 Die cast aluminum body with threaded stem.
- .2 Capable of switching 2000 W tungsten and 1800 VA ballast of lighting at 120 V.
- .3 Voltage variation: plus or minus 10%.
- .4 Temperature range: minus 40 degrees C to plus 60 degrees C.
- .5 Light level slide adjustment.
- .6 Switching on lights at 10 to 50 lx.
- .7 Switching off lights at 30 to 150 lx.
- .8 Rated for 5000 operations.
- .9 Options:
  - .1 Lightning arrester.
  - .2 Fail-safe circuit completed when delay de-energized.
- .10 Switching time delay.
- .11 Colour coded leads: 152 mm long.
- .12 Acceptable manufacturer for approved equal:
  - .1 Tork #2115.

Part 3 Execution

3.1 INSTALLATION

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Service equipment and installation.

1.2 RELATED SECTIONS

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

.2 Section 26 05 28 – Grounding - Secondary.

.3 Section 26 05 31 – Junction and Pull Boxes.

.4 Section 26 24 16.01 – Panelboards Breaker Type.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 SUPPLY DATA

.1 Service equipment suitable for incoming power supply: 240 V, 60 A, 60 Hz, single phase, 3 wire grounded neutral.

2.2 EQUIPMENT

.1 Panelboard breaker type: in accordance with Section 26 24 16.01 – Panelboards Breaker Type rating as indicated.

2.3 METER SOCKET

.1 Single position meter socket:

.1 Rated 125 A, 250 V, 1 phase, 3 wire.

.2 CSA 3 enclosure constructed of corrosion resistant G90 galvanized rigid 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 manufacturer or approved equal:

.1 Millbank C5760-RL-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 load circuits.

.5 Make grounding connections in accordance with Section 26 05 28 – Grounding – Secondary and utility requirements.

.6 Make provision for power supply utility's metering to meet their requirements.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

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

1.4 SHOP DRAWINGS

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

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

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250 V panelboards: bus and breakers rated for 10K A (symmetrical) interrupting capacity or as indicated.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboard: main breaker, number of circuits, and number and size of branch circuit breakers as indicated. Suitable for service entrance use.

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

.6 Mains: suitable for bolt-on breakers.

.7 Stainless steel enclosure CSA 4X rated.

.8 Gasketted door with locking handle and piano hinge.

.9 Four keys for panelboard.

.10 Condensate drain in bottom of enclosure.

.11 Acceptable manufacturer or approved equal:

.1 Siemens.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 – Molded Case Circuit Breakers.

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

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 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

1.3 REFERENCES

.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).

1.4 SHOP DRAWINGS AND PRODUCT DATA

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

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 RECEPTACLES

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

.1 Corrosion resistant, marine grade, watertight 3R enclosure complete with cast aluminum weatherproof when in use cover. Receptacle is to be mounted in a common two device copper free cast aluminum FD box complete with mounting tabs. Boxes are to be drilled and tapped for 21mm bottom entry only.

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

.3 Triple wipe contacts and riveted grounding contacts.

.4 Acceptable manufacturer or approved equal:

.1 Box: Crouse Hinds #FD029.

.2 Receptacle: Hubbell #HBL52CM62.

.3 Cover: Hubbell #WP700.

2.2 GFI MODULE

.1 GFI Module rated 20 A, 120 V AC, 60 Hz with following features:

.1 Corrosion resistant, marine grade, watertight 3R enclosure complete with cast aluminum flip cover. Mounted in common cast aluminum FD box complete with duplex receptacle .

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

.3 Triple wipe contacts and riveted grounding contacts.

.4 Acceptable manufacturer or approved equal:

.1 GFI Module: Hubbell #GFM20.

.2 Cover: Hubbell #WPFS26.

Part 3 Execution

3.1 INSTALLATION

.1 Receptacles:

.1 Mount receptacle and outlets at heights indicated.

.2 Identification:

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials for molded-case circuit breakers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

.3 Section 26 24 16.01 – Panelboards Breaker Type.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5-02, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

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

.2 Include time-current characteristic curves for breakers with interrupting capacity of 10,000 A symmetrical (rms) and over at system voltage.

1.5 DLEIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Molded-case circuit breakers, to CSA C22.2 No. 5.

.2 Bolt-on molded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.5 Circuit breakers to have minimum 10KA symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS

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

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for aluminum lighting poles.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2No.206-13, Lighting Poles.

1.4 SUBMITTALS

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

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

1.6 WARRANTY

.1 Luminaires to have a full parts and replacement guarantee including all labour for three years.

.1 In addition, there shall be a 5-year limited warranty on electrical, including LEDs and driver and a 10 year warranty on luminaire finish.

.2 Pole to have a 3 year warranty on structure and finish.

Part 2 Products

2.1 ALUMINUM POLES

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

- .1 Seamless aluminum alloy extrusion with cast aluminum base welded top and bottom for mounting on concrete base.
- .2 Style: Square wall thickness 5 mm.
- .3 Straight with 75mm x 100 mm tenon for spider mount luminaire.
- .4 Access handhole 457 mm above pole base for wiring connections, with welded-on reinforcing frames bolted-on cover.
- .5 Size: 127 mm x 127 mm x 6.1 m.
- .6 Anchor bolts: 25 mm x 914 mm galvanized steel with shims, nuts, washers and covers, 279 mm BCD. Pole to be c/w base cover.
- .7 Finish: chemically pretreated with an iron phosphate conversion and finished with a polyester thermosetting powder coat minimum of 3mils. Internal surfaces coated with a thermoplastic hydrocarbon resin containing corrosion inhibitors.
- .8 Grounding lug.
- .9 Acceptable manufacturer or approved equal:
  - .1 Metal Pole-Lite Inc. SSA20-5C-0.188-BZ-3-BC.

2.2 LUMINAIRES

.1 Type 'A':

- .1 Luminaire with cast aluminum weatherproof housing and:
  - .1 Lamp type: LED, 120 LEDS, 16,645 lumens, 6000 k @ 525ma, 204 watts.
  - .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 V.
  - .5 Factory wired with optimized 525 ma power driver, 120 V terminated at terminal block.
  - .6 Thermal management using heat sinks.
  - .7 Spider mount with bird spikes.
  - .8 Die cast and extruded aluminum housing with baked on ultra-durable top coat, bronze finish, corrosion resistant suitable for coast environment. Complete luminaire to be IP66 rated.
  - .9 Acceptable manufacturer or approved equal:
    - .1 CREE #X-AR-F-5-12-D-U-Z-C c/w bird spikes # XA-BRDSPK.

.2 Type 'B':

.1 Luminaire with cast aluminum weatherproof housing and:

.1 Lamp type: LED, 80 LEDS, 10,026 lumens, 6000 k @ 525ma, 133 watts.

.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 III.

.5 Factory wired with optimized 525 ma power driver, 120 V terminated at terminal block.

.6 Thermal management using heat sinks.

.7 Spider mount with bird spikes.

.8 Die cast and extruded aluminum housing with baked on ultra-durable top coat, bronze finish, corrosion resistant suitable for coast environment. Complete luminaire to be IP66 rated.

.9 Acceptable manufacturer or approved equal:

.1 CREE #X-AR-F-3-08-D-U-Z-C c/w bird spikes # XA-BRDSPK.

2.3 FUSE KIT

.1 Inline watertight fuseholder c/w 2A class CC midget fuses, crimp connections.

.1 Acceptable manufacturer or approved equal:

.1 Thomas & Betts Style 65.

Part 3 Execution

3.1 INSTALLATION

.1 Install poles true and plumb in accordance with manufacturer's instructions.

.2 Install luminaires on pole tenon.

.3 Install SOW cable in pole from hand hole to luminaire support at top of pole using a suitable wire grip.

.4 Check luminaire orientation and level.

.5 Install fuse kit and fuse in handhole.

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

END OF SECTION