

**Part 1 General**

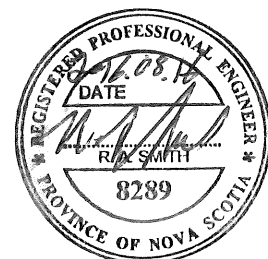
1.1 THIS SECTION COVERS ITEMS COMMON TO SECTIONS OF DIVISION 26. THIS SECTION SUPPLEMENTS REQUIREMENTS OF DIVISION 01.

**1.2 DESCRIPTION OF WORK****Work to be completed under this Contract includes the following:**

- .1 Remove old service and all electrical equipment off the entire wharf.
- .2 Provide new NS Power overhead services at utility pole on south side of Route 359 c/w enclosed service circuit breaker and meter socket and new U/G feeder to new Pole P1 and Panel 'A' enclosure.
- .3 Provide new feeder from Pole P1 Panel 'A' to relocated Pole P2 and enclosure.
- .4 Provide under and above wharf conduit and wire.
- .5 Provide three (3) 30A, 1P, 120V receptacles c/w electrical equipment and power.
- .6 Provide one (1) new pole, lights, wire, conduit and lighting controls and two (2) lights on relocated existing pole.
- .7 Rewire camera and WIFI as per existing conditions.
- .8 Provide electrical testing, commissioning, as-built drawings and O&M manuals.

**1.3 CODES AND STANDARDS**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Comply with CSA Certification Standards and Electrical Bulletins in force at time of tender submission.
- .3 Do overhead and underground systems in accordance with CSA C22.3 No. 1M except where specified otherwise.
- .4 Abbreviations for electrical terms: to CSA Z85.



**1.4 CARE, OPERATION AND START-UP**

- .1 Instruct Engineer and operating personnel in the operation, care and maintenance of equipment.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.
- .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 all aspects of its care and operation.

**1.5 VOLTAGE RATINGS**

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standards. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

**1.6 PERMITS, FEES AND INSPECTIONS**

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Engineer will provide drawings and specifications required by Electrical Inspection - Department and Supply Authority at no cost.
- .4 Notify Engineer of changes required by Electrical Inspection Department prior to making changes.

**1.7 MATERIALS AND EQUIPMENT**

- .1 Provide materials and equipment in accordance with Division 01.
- .2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.
- .3 Factory assembly control panels and component assemblies.

**1.8 ELECTRIC MOTORS EQUIPMENT AND CONTROLS**

- .1 Supplier, installer & wiring responsibility is indicated on electrical drawings.
- .2 Coordinate final connection to all equipment and controls.

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**1.9 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 outdoor electrical equipment "equipment green" finish to EEMAC Y1-1.
  - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.
- .2 Clean and touch up surfaces on shop-painted electrical equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean, prime and paint exposed painted non-galvanized hangers, racks and fastenings to prevent rusting.

**1.10 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with nameplates as follows:
  - .2 Nameplates:
    - .1 Lamicoid 3mm thick plastic engraving sheet, white face, black core, mechanically attached unless specified otherwise.
- | 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  |
- .3 Wording on nameplates to be approved by Engineer prior to manufacture.
  - .4 Allow for average of twenty-five (25) letter per nameplate/language.
  - .5 Identification to be English and French.
  - .6 All switchboards, panels, disconnect switches, transformers, control panels, magnetic starters, and time clocks are to be provided with 'lamicoid' nameplates. Nameplates are to be affixed to all metal surfaces with metal type "pop-rivets" if possible.
  - .7 Nameplates are to be affixed to other surfaces with contact type cement. Contact type cement is to be applied to complete backside of plate, as opposed to several points or locations on same.
  - .8 Nameplates are to be affixed to building exterior surfaces with nylon inserts and self-tapping screws unless specifically indicated otherwise.
  - .9 Lamicoid nameplates installed on distribution panelboards, motor control centres, splitter troughs, transformers, 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.

Example:

**PANEL N - 150A  
120/208V - 3PH - 4W  
FED FROM MAIN SWITCHBOARD #CDP-A**

- .10 All junction and/or pull boxes 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.
- .11 Install an additional 'Lamicoid' nameplate on all, or any piece of electrical equipment, or apparatus, ie. Main Switchboard, CDP panels, panelboards, motor control centres, 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 10kAIC.

Examples:

**Minimum interrupting capacity of breakers  
installed in this  
panel is to be not less than 22 kAIC.**

**Minimum interrupting capacity of fuses  
installed in this MCC is to be not less than  
100 kAIC.**

### **1.11 WIRING IDENTIFICATION**

- .1 Identify feeder and branch circuit wiring including neutral conductors at both ends, including in all junction and outlet boxes located in between, with permanent indelible identifying markings, indicating panel and circuit number. (i.e. A1-25).
- .2 Maintain phase sequence and colour coding throughout. (Red, black, blue, white). No colour taping of wires is allowed.
- .3 Colour code: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

### **1.12 CONDUIT AND CABLE IDENTIFICATION**

- .1 Colour code conduits and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall or floor, and at 15m intervals.

- .3 Colours to be 25mm wide prime colour and 20mm wide auxiliary colour.

<u>Prime</u>	<u>Auxiliary</u>
up to 250V	yellow
up to 600V	yellow green
Telephone	white

### **1.13 DEVICE IDENTIFICATION**

- .1 All receptacles, light poles, welder/winch and shore power outlets are to have its panel and circuit identified with a lamicoid nameplate. White letters on white background, 6mm high x 25mm long (i.e. A-3 or A-2,4,6). Nameplates to be properly secured to outlet box with screws. Receptacle number, light pole number, shore power and welder/winch number to also be identified (i.e. Recept. #1, Light #1, Shore Power #1).

### **1.14 WIRING TERMINATIONS**

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for copper conductors.

### **1.15 MANUFACTURERS AND CSA LABELS**

- .1 Visible and legible after equipment is installed.

### **1.16 WARNING SIGNS**

- .1 As specified and to meet requirements of Inspection Department and Engineer.
- .2 Use decal signs, minimum 175 x 250mm size.
- .3 "DANGER HIGH VOLTAGE" signs to be installed on each of the new and existing enclosures.

### **1.17 LOCATION OF OUTLETS**

- .1 Change location of outlets at no extra cost or credit, providing distance does not exceed 3.0m, and information is given before installation.
- .2 Locate light switches on latch side of doors.

### **1.18 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 at the following heights unless indicated otherwise.
- .1 Receptacles:
    - .1 General: in shrouds.
  - .2 Panelboards: 1500mm or as required by Code.

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- .3 Local Switches: 1250mm
- .4 Telephone Outlets: 300mm
- .5 Thermostats: 1250mm

- .4 Generally, masonry outlet boxes are to be installed in bottom of concrete blocks to approximate heights indicated.
- .5 Refer to all detail drawings and confirm mounting of outlet boxes prior to roughing-in.

**1.19 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 Submit, at completion of work a report listing all phase and neutral currents on panelboards operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

**1.20 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit, and sleeves, prior to pouring of concrete. Sleeves through concrete: sheet metal, sized for free passage of conduit, and protruding 50mm.
- .2 Install cables, conduits and fittings to be embedded or plastered over neatly and close to structure so furring can be kept to a minimum.

**1.21 FIELD QUALITY CONTROL**

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specified tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specified duties. The work of this division to be carried out by a contractor who holds a valid Electrical contractor license as issued by the Province of Nova Scotia.
- .2 Conduct and pay for tests of the following:
  - .1 Power distribution system, including phasing, voltage, grounding and load balancing;
  - .2 Circuits originating from branch distribution panels;
  - .3 Lighting and its control;
  - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable;
  - .5 Systems: communications, etc.
- .3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

- .4 Insulation resistance testing:
  - .1 Megger circuits, feeders and equipment up to 350V with a 500V instrument.
  - .2 Megger circuits, feeders and equipment between 350V and 600V with a 1000V instrument.
  - .3 Check resistance to ground before energizing.
- .5 Notify Engineer three days in advance, of equipment and system testing and verification. Carry out tests in presence of Engineer.
- .6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .7 Submit test results for Engineer's review.

## **1.22 COORDINATION OF PROTECTIVE DEVICES**

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

## **1.23 SITE VISIT**

- .1 Contractor to visit the site and familiarize himself with the job and all conditions which may affect his costs. Ignorance of existing conditions will not be considered as basis for extra claims.

## **1.24 AS-BUILTS DOCUMENTS**

- .1 At completion of project and prior to final inspection, the electrical contractor, at his own expense, shall mark all changes in red on blueprint record drawings.

## **1.25 SHOP DRAWINGS, PRODUCT DATA & SAMPLES**

- .1 Submit shop drawings, product data and samples in accordance with Division 01 30 00.
- .2 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
- .3 Where applicable, include wiring, single line and schematic diagrams.
- .4 Include wiring drawings or diagrams showing interconnection with work of other Sections.

## **1.26 OPERATION AND MAINTENANCE DATA**

- .1 Provide operation and maintenance data for electrical work for incorporation into maintenance manual specified in Division 01 70 00.
- .2 Include in operations and maintenance data:
  - .1 Details with respect to design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

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- .2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items and parts lists. Advertising or sales literature not acceptable.
- .3 Wiring and schematic diagrams and performance curves.
- .4 Names and addresses of local suppliers for all items included in maintenance manual.

**1.27 MAINTENANCE MATERIALS**

- .1 Provide maintenance materials in accordance with Division 01.

**1.28 PROTECTION**

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark all live parts "LIVE 120 VOLTS" or with appropriate voltage in English & French.

**1.29 CLEANING**

- .1 At time of final cleaning, clean lighting reflectors, lenses and other lighting surfaces that have been exposed to construction dust, dirt and fingerprints.

**1.30 COORDINATION WITH OTHER TRADES**

- .1 The Electrical Contractor shall totally review all architectural, structural and mechanical drawings and specifications to coordinate and determine work associated with electrical work prior to submitting tender price. Also, review all Addendums associated with all trades.
- .2 After review of all documents associated with other trades, forward any questions and obtain answers by Addendum, prior to tender submission.
- .3 Submission of tender by Electrical Contractor acknowledges coordination with other trades as part of these contract documents

**1.31 PROJECT WASTE MANAGEMENT**

- .1 Contractor must adhere to project waste management guidelines as detailed in Section 01 77 00 - Closeout Procedures.

**1.32 PROJECT RECORD DOCUMENTS**

- .1 Provide Project Record Documents to Division 01.

**1.33 SCHEDULE**

- .1 Overtime work and work outside normal work hours as deemed necessary to accomplish scheduling are the responsibility of the contractor and must meet the requirements of the Department of Labour. All costs resulting from such overtime must be included in the contractor's estimated total tender price.



**1.34 COORDINATION OF EXISTING AND NEW**

- .1 In order to install new services while maintaining existing, coordination between old and new must be provided. This may restrict installation of new services and how the work is carried out.
- .2 All costs for this coordination must be included in the total tendered price.

**1.35 MEASUREMENT FOR PAYMENT**

- .1 Measurement for payment for Division 26 is lump sum.

**1.36 SINGLE LINE ELECTRICAL DIAGRAMS**

- .1 Provide single line electrical diagram in laminated plastic sleeve as follows:
  - .1 Electrical distribution systems: Adhesive tape to inside of panel 'A' enclosure door.
- .2 Drawings: 600 x 600mm minimum size.

**END OF SECTION**



**Part 1 General****1.1 DESCRIPTION OF SYSTEM**

- .1 In general, work of this Section consists of the complete removal of all existing electrical equipment and materials on the wharf to be renovated.

**1.2 RELATED WORK**

- .1 Electrical General Provisions: Section 26 05 00.
- .2 Wharf Removals.

**1.3 SITE SURVEY**

- .1 Prior to Tender submission, visit the site and survey the extent of the removals/modifications required for this contract and include for all costs in the total tendered price. Any existing conditions information indicated on the drawings is for general guidance only.
- .2 In conjunction with site visit, review structural, mechanical and electrical drawings and include all costs due to existing conditions in total tendered price.

**1.4 REFERENCE STANDARDS**

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

**1.5 PROTECTION**

- .1 Be responsible for any damages to existing structure as a result of the work.

**1.6 SALVAGE MATERIAL**

- .1 Materials and equipment identified on the drawing as being reused are to be taken down, stored, reinstalled, etc. as required to allow for new construction.
- .2 Contractor must identify any damaged equipment or materials intended for reuse prior to demolition and point out deficiencies to the Engineer at that time.

**1.7 DISPOSAL**

- .1 Prior to demolition Departmental Representative will identify any items of electrical equipment which are to be set aside as directed for future use by Departmental Representative.

- .2 All other materials and equipment removed under work of this Section becomes the property of the Contractor for disposal off of property.
- .3 Comply with all municipal, provincial and federal bylaws and standards when disposing of waste.

## 1.8 SCHEDULE

- .1 The Contractor is to note that the Departmental Representative intends to carry on business as usual and work activities must be coordinated to maintain electrical services in occupied areas. Provide any required temporary work.
- .2 Overtime work and work outside normal work hours as deemed necessary to accomplish this scheduling are the responsibility of the Contractor and must meet the requirements of the Department of Labour. All costs resulting from such overtime must be included in the Contractor's Estimated Total Tender Price.
- .3 Coordinate with NB Power to remove all equipment, poles, lines, services, etc. from the site.

## Part 2 Products

Not applicable.

## Part 3 Execution

### 3.1 GENERAL REMOVALS

- .1 Remove all existing electrical services including exposed wire and conduit, except those designated for reuse.
- .2 Remove electrical services associated with existing systems.
- .3 Coordinate work of this Section with other trades.
- .4 Schedule all removal work with the Departmental Representative. Do not disrupt operations except as permitted by the Schedule.

### 3.2 CUTTING

- .1 Cutting required for removals and alterations to be to the approval of the Engineer and performed with appropriate power tools.

**3.3 CLEANING**

- .1 Reused existing equipment to be cleaned in accordance with 26 05 00.

**END OF SECTION**



**Part 1 General**

Not applicable.

**Part 2 Products****2.1 MATERIALS**

- .1 Pressure-type wire connectors: with current-carrying parts of copper sized to fit copper conductors as required. Use twist-on connectors for #14 and smaller.
- .2 In-line insulated compression connectors for #12 conductors and larger.
- .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 Steel clamps or connectors for flexible conduit, as required.
- .5 Crimp style wire connectors, nylon insulated, with current carrying parts of copper alloy, for conductors #16 and smaller.
- .6 Fork tongue, nylon insulated, crimp style terminals for connecting conductors #16 and smaller to screw down terminals.
- .7 Crimp style wire connectors, nylon insulated with current carrying parts of copper alloy, for connecting solid to stranded conductors.
- .8 Heavy wall shrinkable tubing with 600V insulation: 3M "Cold Shrink Splice" or approved equal.
- .9 Use in-line insulated compression connectors for splices in panelboards to reduce from oversize conductors (due to voltage drop) to smaller conductors that will fit on circuit breakers.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Install mechanical pressure type connectors and tighten. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65.
  - .2 Install fixture type connectors and tighten.
  - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

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WIRE AND BOX CONNECTORS

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**3.2 RESTRICTION**

- .1 No splices are allowed in underground cables or panelboards (distribution, lighting and power) or in equipment enclosures, unless indicated otherwise.

**END OF SECTION**



**Part 1 General****1.1 PRODUCT DATA**

- .1 Submit product data in accordance with Section 26 05 00.

**Part 2 Products****2.1 BUILDING WIRES**

- .1 Conductors: minimum size 12 AWG (solid) for power and lighting; stranded for size 8 AWG and larger except as noted.
- .2 Copper conductors sized as indicated with 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 for all work.

**2.2 TECK CABLE**

- .1 Conductors:
  - .1 Grounding conductor: copper
  - .2 Circuit conductors: copper size as indicated.
- .2 Insulation:
  - .1 Chemically cross-linked thermosetting polyethylene rated type RW90 1000V.
- .3 Inner jacket: polyvinyl chloride material.
- .4 Armour: flat interlocking aluminium.
- .5 Overall covering: thermoplastic polyvinyl chloride material, FT4 rated.
- .6 Fastenings:
  - .1 One-hole steel straps to secure surface cables 50mm and smaller.
  - Two-hole steel straps for cables larger than 50mm.
- .7 Connectors:
  - .1 Watertight, approved for TECK cable.

**2.3 FIXTURE WIRING**

- .1 Temperature rating of fixture wiring entering ballast compartment of fixtures to meet manufacturer's recommendations.
  - .1 For 90°C, use R90
  - .2 For 105°C, use TEW
  - .3 For 125°C, use GTF

**2.4 COLOUR CODING**

- .1 All conductors to be colour coded in accordance with Section 26 05 00.1.11.

**2.5 CCTV SIGNAL AND POWER CABLE**

- .1 Reuse existing CCTV signal and 24V power cables. If additional length of cable is required, allow for up to 20 meters of new cable to be installed without splices.

**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.
  - .2 In underground ducts in accordance with Section 26 05 44.
  - .3 In trenches in accordance with Section 26 05 41.
  - .4 In surface and lighting fixture raceways in accordance with Section 26 50 00.
  - .5 In wireways and auxiliary gutters in accordance with Section 26 50 00.

**3.2 INSTALLATION OF TECK CABLE 0 - 1000V**

- .1 Install cables as indicated.
- .2 Group cables wherever possible on channels.
- .3 Install cables in trenches in accordance with Section 26 05 41.
- .4 Terminate cables in accordance with Section 26 05 20.

**3.3 WIRE & CONDUIT METHODS**

- .1 Use standard building wire and PVC conduits or TECK cables for all branch circuits.
- .2 All wire shall be #12 minimum from panel.

**3.4 SITE LIGHTING**

- .1 Install conductors on light poles in PVC conduit from base to top of pole.
- .2 Terminate PVC conduit in PVC junction boxes and fasten PVC conduit on pole every 300mm with PVC straps and stainless steel screws.
- .3 Install conductors from junction box at top of pole to luminaire in TECK cable.

**END OF SECTION**

**Part 1 General****1.1 STANDARDS**

- .1 All grounding and bonding requirements shall be in accordance with the Canadian Electrical Code, Part 1.

**Part 2 Products****2.1 EQUIPMENT**

- .1 Rod electrodes, copper clad steel 19 mm dia. by 3.0m long.
- .2 Plate electrodes for grounding locations on harbour bottom.
- .3 System and circuit, equipment, grounding conductors, bare stranded copper, untinned, soft annealed, size as indicated.
- .4 Insulated grounding conductors: green, to Section 26 05 21.
- .5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings
  - .2 Protective type clamps
  - .3 Bolted type conductor connectors
  - .4 Thermit welded type conductor connectors
  - .5 Bonding jumpers, straps
  - .6 Pressure wire connectors
- .6 Clamps for grounding of conductor, size as required to electrically conductive underground water pipe.

**2.2 ACCEPTABLE MATERIALS**

- .1 Burndy Corp.
- .2 Erico Inc. Cadweld Division
- .3 Eaton Electric

**Part 3 Execution****3.1 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including electrodes, conductors, connectors, accessories, as indicated, to conform to requirements of Engineer and local authority having jurisdiction over installation.
- .2 Install connectors to manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, 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 an integral bonding wire in all flexible conduit connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw.
- .8 Install separate ground conductor, to outdoor lighting standards.
- .9 Connect building structural steel to ground by welding copper to steel.
- .10 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .11 Bond single conductor, metallic armoured cables to cabinet at supply end and load end.

### **3.2 ELECTRODES**

- .1 Install ground plate electrodes and make grounding connections as indicated.
- .2 Bond separate, multiple electrodes together.
- .3 Use size #8 AWG copper conductors for connections to electrodes.

### **3.3 SYSTEM & CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections to neutral of secondary 208V and 600V system.

### **3.4 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to, the following list: Service equipment, duct systems, control panels, steel work, distribution panels, outdoor lighting.

### **3.5 FIELD QUALITY CONTROL**

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

**END OF SECTION**

**Part 1 General**

Not applicable.

**Part 2 Products****2.1 SUPPORT CHANNELS**

- .1 U shape, size 41 x 41mm, 2.5mm thick, 316 grade stainless steel, surface mounted, suspended as required.

**2.2 CHANNEL FINISH**

- .1 All support and fastening devices to be 316 grade stainless steel.

**2.3 SPECIFIED PURPOSE SUPPORTS**

- .1 Specified purpose stainless, spring steel fasteners, as manufactured by Caddy, B-line or approved equal, for interior support of boxes, conduit and cable from main structures and channels.

**2.2 ACCEPTABLE MATERIALS**

- .1 Burndy Corp.
- .2 Electrovert Ltd.
- .3 Unistrut Ltd.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Secure equipment to poured concrete with expandable inserts.
- .2 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .3 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole stainless steel straps to secure surface conduits and cables 53mm and smaller.
  - .2 Two-hole stainless steel straps for conduits and cables larger than 53mm.
- .4 Provide stainless steel metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .5 Do not use wire lashing or perforated strap to support or secure raceways or cables.

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HANGERS AND SUPPORTS

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- .6 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trades and approval of Engineer.
- .7 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendation.
- .8 For surface mounting of two or more conduits, use channels at 1.5m oc spacing.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

**END OF SECTION**

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SPLITTERS, JUNCTION, PULL

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BOXES AND CABINETS

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**Part 1 General****1.1 SHOP DRAWINGS & PRODUCT DATA**

- .1 Submit shop drawings and product data for cabinets in accordance with Section 26 05 00.

**Part 2 Products****2.1 JUNCTION & PULL BOXES**

- .1 PVC waterproof construction with screw-on overlapping covers, complete with gasket, for surface mounting. IPEX type JB or equivalent. Use stainless steel screws/bolts for mounting.
- .2 Stainless steel type 316 junction box as indicated complete with stainless screws/bolts for mounting.

**2.2 PANEL 'A' ALUMINUM ENCLOSURE**

- .1 NEMA Type 4X, 4.5mm thick ASTM 6061 salt water rated aluminum enclosure with all seams welded on both sides, hinged door and return flange overlapping sides, handle and catch, painted white steel inner panel for surface mounting, complete with heavy-duty padlock and two (2) keys.
- .2 Cabinet to be 1219mm (H) x 904mm (W) x 305mm (D).

**2.3 GALVANIZED CABLE GUARD**

- .1 Galvanized utility cable/conduit guard to be designed to protect 1-103mm PVC conduit or 4-53mm PVC conduits under one (1) cable guard. Cable guards to be fastened to side of existing wood wharf or underside of existing concrete wharf with 316 grade stainless steel clamps and 316 grade stainless steel lug bolts in wood or concrete insert bolts in concrete.

**Part 3 Execution****3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible locations. Location must be coordinated with other trades.
- .2 Mount cabinets, with top not higher than 610mm above finished floor.
- .3 Size and install cabinets to CEC requirements.
- .4 Only main junction and pull boxes are indicated. Provide pull boxes so as not to exceed 30.0 m of conduit run between pull boxes.

**3.2 IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

**END OF SECTION**



**Part 1 General****1.1 PRODUCT DATA**

- .1 Submit product data in accordance with Section 26 05 00.

**Part 2 Products****2.1 OUTLET & CONDUIT BOXES - GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 PVC (150 x 150 x 100)mm and (200 x 200 x 100)mm and (300 x 300 x 200)mm outlet boxes, or sized as required, for special devices and requirements.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

**2.2 CONDUIT BOXES**

- .1 Cast FS or FD ferrous alloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.

**2.3 FITTINGS - GENERAL**

- .1 PVC bushing and connectors (watertight).
- .2 Knockout fillers to prevent entry of foreign materials or water.
- .3 Conduit outlet bodies for conduit up to 32mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.
- .5 Set-screw type steel bushings and connectors for EMT fittings unless indicated otherwise. Nylon insulated throats for 25mm conduits and larger.

**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. Reducing washers not allowed.

END OF SECTION

**Part 1 General****1.1 LOCATION OF CONDUIT**

- .1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

**Part 2 Products****2.1 CONDUITS**

- .1 Rigid PVC conduit: size as indicated.
- .2 Rigid steel conduit, hot dipped galvanized after fabrication.
- .3 Electrical metallic tubing (EMT), with steel set screw couplings and connectors.
- .4 Flexible metal conduit and liquid-tight flexible metal conduit.

**2.2 CONDUIT FASTENINGS**

- .1 One-hole PVC straps to secure surface conduits 50mm and smaller. Two-hole PVC straps for conduits larger than 50mm. Use stainless steel screws/bolts for mounting hardware.
- .2 Channel type supports for two or more conduits at 1.5 oc.
- .3 6mm diameter threaded rods to support suspended channels.

**2.3 CONDUIT FITTINGS**

- .1 Fittings manufactured for use with conduit specified. Coating: same as conduit. "O" ring expansion joints and watertight junction box adapters/couplings. Provide PVC expansion joints at all structural expansion joints and at all locations where PVC conduit exits underground.
- .2 Factory "ells" where 90 degree bends are required for conduits larger than 40mm.
- .3 Steel set screw connectors and couplings for EMT unless indicated otherwise.
- .4 Steel watertight connectors and couplings for EMT where indicated.
- .5 Acceptable materials:
  - .1 Ipex-Scepter Cat. #SE-J-35
  - .2 Canon
  - .3 Eaton Electric

**2.4 FISH CORD**

- .1 Polypropylene.

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AND CONDUIT FITTINGS

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**Part 3 Execution****3.1 INSTALLATION**

- .1 Install conduits to conserve space in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Use rigid PVC conduit under ground floor slab and in poured concrete unless indicated otherwise. Install an integral ground wire in all PVC conduit.
- .3 Use liquid tight flexible metal conduit for connections to exterior light fixtures unless indicated otherwise and to equipment in damp or wet locations.
- .4 Install fish cord in empty conduits.
- .5 Where conduits become blocked, remove and replace blocked section.
- .6 Dry conduits out before installing wire.
- .7 Conduit sizing, where indicated, is based on copper conductors and PVC conduit. NUAL is not to be used.
- .8 Use EMT for interior feeders and branch circuit work except in poured concrete, underground and where subject to mechanical damage, unless indicated otherwise. When used for panel feeders, install a separate integral ground wire sized in accordance with the CEC.
- .9 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10<sup>th</sup> of its original diameter.
- .10 Mechanically bend steel conduit over 19mm diameter.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

**3.2 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to construction lines.
- .2 Run conduits in center portion of concrete wharf deck.
- .3 Group conduits wherever possible.
- .4 Do not pass conduits through structural members.

**3.3 CONDUITS IN CAST-IN-PLACE CONCRETE**

- .1 Locate to suit reinforcing steel. Install in centre one-half of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Where conduits pass through waterproof membrane, provide oversized sleeve before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Encase conduits completely in concrete.

**3.4 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE**

- .1 Run conduits 25mm and larger below slab. Provide 50mm of sand over conduits below floor slab.

**3.5 CONDUITS UNDERGROUND**

- .1 Slope conduits to provide drainage.
- .2 Conduits rising up from below grade to penetrate the floor/wharf at 90° angles. Slanted conduits not permitted.

**3.6 CONDUIT SEALANT**

- .1 All conduit terminations entering buildings or enclosures, to be sealed to prevent entrance of water and condensation.
- .2 Sealant to be a two-part polyurethane conduit, sealing compound installed as per manufacturer's instructions.
- .3 Standard of acceptance:
  - .1 Multi-urethanes Multi-Paste.

**END OF SECTION**



**Part 1 General****1.1 RELATED STANDARDS**

- .1 NS Service Entrance Standard.

**1.2 COORDINATION WITH POWER SUPPLY AUTHORITY**

- .1 Coordinate and meet requirements of local power supply authority. Ensure availability of power when required.
- .2 Arrange for primary line extensions, utility installation and energization.

**1.3 UTILITY COST**

- .1 The installation of the primary and secondary service to be included in the Contract Price.
- .2 Any fees or costs required by the Utility to remove existing and provide new service is to be paid for by the Contractor as part of the Contract Price.

**Part 2 Products****2.1 MATERIALS**

- .1 PVC conduit, necessary fittings: to Section 26 05 34.
- .2 Meter sockets: to NS Power requirements.
- .3 Electrical contractor to carry lump sum amount as detailed in Section 01 21 00 in his tendered price to pay for all charges by NS Power based on NS Power invoice amount with no contractor mark-up. Unused amount will be returned to the Departmental Representative.
- .4 Acceptable materials:
  - .1 Eaton Cat. #TCC5-4-TS
  - .2 Schneider
  - .3 Siemens

**Part 3 Execution****3.1 INSTALLATION**

- .1 Fit-up service pole to NS Power Standard Construction Practice. Terminate communications and power ducts on opposite sides of pole.
- .2 Install primary ducts as indicated.
- .3 Install meter sockets.
- .4 Install secondary ducts, conduit and wire as indicated.

- .5 Allow adequate conductor length for connection to supply by power supply authority.
- .6 Make grounding connections in accordance with Section 26 05 28.
- .7 Install secondary conduits as indicated.
- .8 Install cables in underground ducts and conduit as indicated.

**END OF SECTION**



**Part 1 General****1.1 RELATED STANDARDS**

- .1 Complete service entrance to conform to NS Power Service Entrance Standards and as detailed on drawings.

**1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 26 05 00.

**Part 2 Products****2.1 SUPPLY DATA**

- .1 Service equipment suitable for incoming power supply:
  - .1 200A, 120/240V, 1Ø, 3W, 60Hz grounded neutral as indicated on drawings.

**2.2 EQUIPMENT**

- .1 Main enclosed circuit breaker to Section 26 28 21.
- .2 Meter socket cabinet for utility revenue metering to Utility Standards.
- .3 Meter socket cabinet to be similar construction as cabinet in Section 26 05 31.2.3 c/w hinged door c/w hasp for padlock.
- .4 Acceptable materials:
  - .1 Eaton Cat. #TCC5-4-TS
  - .2 Schneider
  - .3 Siemens

**Part 3 Execution****3.1 INSTALLATION**

- .1 Install service equipment as indicated.
- .2 Connect to incoming service as indicated.
- .3 Connect to outgoing load circuits as indicated.
- .4 Make grounding connections in accordance with Section 26 05 28 and Utility Service Entrance Standards.
- .5 Make provision for power supply authority's metering to meet their requirements.

**END OF SECTION**



**Part 1 General****1.1 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 26 05 00.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

**1.2 PLANT ASSEMBLY**

- .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.

**Part 2 Products****2.1 PANELBOARDS**

- .1 Panelboards: to CSA C22.2 No. 29.
- .2 Panelboards to be product of one manufacturer.
- .3 250V panelboards: bus and breakers rated for 22,000A symmetrical interrupting capacity or as indicated.
- .4 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.
- .5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated on drawings c/w 200A, 2P main circuit breaker.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating as mains.
- .8 Mains: suitable for bolt-on breakers c/w 200A, 2P main circuit breaker.
- .9 Trim and door finish: baked grey enamel.
- .10 Panelboards to have a minimum of 33% spare space unless indicated otherwise.

**2.2 BREAKERS**

- .1 Breakers to Section 26 28 21.
- .2 Breakers with thermal magnetic tripping in panelboards except as indicated.

**2.3 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory and typewritten legend showing location and load of each circuit.

**2.4 ACCEPTABLE MATERIALS**

- .1 Siemens
- .2 Cutler-Hammer
- .3 General Electric
- .4 Schneider

**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 given in Section 26 05 00 or as indicated.
- .3 Connect loads to circuits as indicated.
- .4 Connect neutral conductors to common neutral bus with respective neutral identified.
- .5 Commission metering.

**END OF SECTION**

**Part 1 General****1.1 SHOP DRAWINGS & PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 26 05 00.

**Part 2 Products****2.1 SWITCHES**

- .1 15A, 120V, single pole, as indicated.
- .2 Manually operated general purpose ac switches as indicated and with the following features:
  - .1 Terminal holes approved for No. 10 AWG wire.
  - .2 Silver alloy contacts.
  - .3 Urea or melamine moulding for parts subject to carbon tracking.
  - .4 Suitable for back and side wiring.
  - .5 Black toggle.
  - .6 Marine grade.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamp, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.
- .5 Acceptable materials:
  - .1 For 15A, 120V almond switches:
    - .1 Arrow Hart
    - .2 Bryant
    - .3 Hubbell #CS115BK c/w HBL1795 coverplate
    - .4 Leviton
    - .5 Pass & Seymour

**2.2 RECEPTACLES**

- .1 Marine grade duplex receptacles as indicated, CSA Type 5-20 R, 125V, 20A, U ground, with the following features:
  - .1 Yellow urea moulded housing, nylon front.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Break-off links for use as split receptacle.
  - .4 Eight back wired entrances, four side wiring contacts.
  - .5 Double wipe contacts and riveted grounding contacts.
  - .6 Install receptacle in marine grade backbox.
- .2 Acceptable materials:
  - .1 Hubbell #HBL53CM62/RW57350/HBL60CM83
  - .2 Leviton
  - .3 Pass & Seymour
- .3 Single marine grade 20A 120V receptacle twist-lock c/w in-use coverplate and backbox:
  - .1 Hubbell #HBL23CM10/RW57350/HBL60CM83
  - .2 Leviton
  - .3 Pass & Seymour

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- .4 Single Marine Grade 30A 120V receptacle twist-lock c/w coverplate and backbox:
  - .1 Hubbell #HBL26CM10/HBL77CM74WO/HBL60CM83
  - .2 Leviton
  - .3 Pass & Seymour

**2.3 COVERPLATES**

- .1 Coverplates for wiring devices.
- .2 Coverplate from one manufacturer throughout project.
- .3 One-gang weatherproof in-use coverplate for wiring devices mounted on a surface mounted outlet box.
- .4 Acceptable materials:
  - .1 Hubbell #RW57350 or #HBL77CM74WO
  - .2 Leviton
  - .3 Pass & Seymour

**2.4 PLYWOOD, WOOD POSTS AND POLES - SUPPLIED AND INSTALLED BY GENERAL CONTRACTOR**

- .1 Plywood to be 20mm thick marine grade.
- .2 Wood posts to be 200 x 200 x 4000mm pressure treated.
- .3 Wood poles to be Class 3 Jack Pine, 15 meters long, pressure treated.
- .4 All bolts, washers, lock washers and nuts for wood connections to be hot dipped galvanized steel.

**2.5 EXPANSION JOINTS**

- .1 Acceptable materials:
  - .1 IPEX Cat. #EJ35
  - .2 Canon
  - .3 Eaton

**2.6 STAINLESS STEEL 316 GRADE BIRD SPIKES**

- .1 Stainless steel 316 grade bird spikes 100mm long and fastened to metal with stainless steel banding; and to wood with 100mm stainless steel nails/screws.

**2.7 ALUMINUM CHANNEL & SHROUD**

- .1 Aluminum channel and shroud for 30A, 120V receptacle to be made from ASTM 6061 saltwater rated 3mm thick aluminium with all joints welded on both sides.

**2.8 ELECTRICAL BOLLARDS**

- .1 Electrical bollards are supplied and installed by the General Contractor.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Switches:
  - .1 Install single throw switches with handles in "UP" position when switch closed.
  - .2 Install switches in gang type outlet box when more than one switch is required in one location.
  - .3 Mount toggle switches at height specified in Section 26 05 00 or as indicated.
- .2 Receptacles:
  - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
  - .2 Mount receptacles at height specified in Section 26 05 00 or as indicated.
- .3 Cover plates:
  - .1 Protect cover plate finish with paper or plastic film until painting and other work is finished.
  - .2 Do not use cover plates meant for flush outlet boxes on surface mounted boxes.
  - .3 Install suitable common cover plates where wiring devices are grouped.

**3.2 IDENTIFICATION**

- .1 Identify all outlets with size 5 nameplate indicating source, circuit number, voltage, ampacity and phasing.

**END OF SECTION**





**Part 1 General****1.1 SHOP DRAWINGS & PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 26 05 00.

**1.2 MAINTENANCE MATERIALS**

- .1 Provide maintenance materials in accordance with Section 26 05 00.
- .2 Three spare fuses of each type and size installed up to and including 600A.

**1.3 DELIVERY & STORAGE**

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed.
- .3 Store fuses in original containers in storage cabinet.

**Part 2 Products****2.1 FUSES - GENERAL**

- .1 HRC fuses: to have interrupting capability of 200,000 A symmetrical.
- .2 Fuses: product of one manufacturer.

**2.2 FUSE TYPES**

- .1 HRC-1 fuses (formerly Class L):
  - .1 Type L2, fast acting, plus two spares.
- .2 100% rates fuses where indicated (Type J).
- .3 Fuses in junction box at bottom of wood pole to be GEC #CRS30H fuse fitted with 6 Amp Type C fuse for camera disconnect; and GEC #CRS30H fuse fitted with 8 Amp Type C fuse for 2-353W LED light fixtures.

**2.3 ACCEPTABLE MATERIALS**

- .1 English Electric
- .2 GEC Canada Ltd.
- .3 Gould-Shawmut Company
- .4 Littelfuse

**Part 3      Execution**

**3.1          INSTALLATION**

- .1    Install fuses in mounting devices immediately before energizing circuit.
- .2    Ensure correct fuses fitted to physically matched mounting devices.
- .3    Ensure correct fuses fitted to assigned electrical circuit.

**END OF SECTION**

**Part 1 General****1.1 PRODUCT DATA**

- .1 Submit product data in accordance with Section 26 05 00.
- .2 Include time current characteristic curves for breakers with ampacity of 400A and over.

**Part 2 Products****2.1 BREAKERS GENERAL**

- .1 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .2 Common-trip breakers with single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3 - 10 times current rating.
- .4 Circuit breakers with interchangeable trips as indicated.

**2.2 THERMAL MAGNETIC BREAKERS**

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping.

**2.3 OPTIONAL FEATURES**

- .1 Include ground fault interrupting capability (5ma maximum) where indicated.
- .2 Provide service entrance rated 316 grade, enclosed circuit breaker rated 200A, 120/240V, 2P, 1Ø, 3W lockable.

**2.4 ACCEPTABLE MATERIALS**

- .1 Siemens
- .2 Cutler-Hammer
- .3 General Electric
- .4 Schneider

**Part 3      Execution**

**3.1          INSTALLATION**

- .1    Install circuit breakers as indicated.

**END OF SECTION**

**Part 1 General****1.1 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 26 05 00.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires specified, for review by Engineer.

**1.2 EQUIVALENT MANUFACTURERS**

- .1 The manufacturer and catalogue numbers used herein are to establish an acceptable standard of quality. Equivalent products by the listed luminaire manufacturers may be used as alternatives subject to verification of photometric data and construction material at the shop drawing stage.
- .2 Acceptable materials:
  - .1 Holophane
  - .2 Appleton
  - .3 Crouse-Hinds

**Part 2 Products****2.1 LED LIGHT ENGINE**

- .1 Light engine to have 353W of high powered LED's with nine (9) modules.
- .2 CRI to be 70 with colour temperature of 4000K.
- .3 LED driver to be rated for 100,000 hours.
- .4 Delivered lumens to be 29,456 with current of 1050ma @ 120V.
- .5 BUG rating of B3-U3-G3.
- .6 Acceptable materials:
  - .1 Holophane Cat. #PLLED-9-4K-10A
  - .2 Appleton
  - .3 Crouse-Hinds

**2.2 FINISHES**

- .1 Baked enamel finish:
  - .1 Conditioning for metal before painting:
    - .1 For corrosion resistance conversion coating to CGSB 31-GP-103M.
    - .2 For paint base, conversion coating to CGSB 31-GP-105M, CGSB 31-GP-106A.
  - .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 Inside surfaces finished as follows:
    - .1 White, minimum reflection factor 85%.
    - .2 Colour fastness: yellowness factor not above 0.02 and after 250 hr. exposure in Atlas fadeometer not to exceed 0.05.

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- .3 Film thickness, not less than 0.3mm average, and in no areas less than 0.025mm.
  - .4 Gloss not less than 80 units as measured with Gardner 60 deg. glossmeter.
  - .5 Flexibility: withstand bending over 12mm mandrel without showing signs of cracking or flaking under 10 times magnification.
  - .6 Adhesion: 24mm square lattice made of 3mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and bulled. Adhesion satisfactory if no coating removed.
- .2 Alzak finish:
- .1 Aluminium sheet fabricated from special aluminium alloys and chemically brightened, subsequently anodically treated to specifications established by Alcoa, to produce:
    - .1 Finish for mild commercial service, minimum density of coating 0.8 mg/sq.cm., minimum reflectivity 83% for specular and 75% for diffuse.
    - .2 Finish for regular industrial service, minimum density of coating 1.2 mg/sq.cm., minimum reflectivity 82% for specular and 73% for diffuse.
    - .3 Finish for heavy duty service, minimum density of coating 1.5 mg/sq.cm. minimum reflectivity 78% for specular 65% for diffuse.

**2.3 LUMINAIRE - TYPE A**

<b>ITEM</b>	<b>DESCRIPTION</b>	<b>LED</b>	<b>MOUNTING</b>
1.	ROADWAY LIGHT WITH 353 WATTS OF LED'S	NINE (9) LED MODULES 4000°K 10 AMPS	1. MOUNTED ON 600mm GALVANIZED STEEL LIGHTING ARM ATTACHED TO WOOD POLE WITH GALVANIZED BOLTS, WASHERS, AND NUTS. SUPPLY AND INSTALL STAINLESS STEEL BIRD SPIKES ON TOP OF FLOOD LIGHT, ARM AND WOOD POLE. BIRD SPIKES TO BE BIRD-X TYPE C/W EPOXY ADHESIVE IN CASES WHERE S/S BANDING OR S/S NAILS/SCREWS ARE NOT PRACTICAL.
2.	SEALED OPTICAL SYSTEM IP65 RATED		
3.	EPA RATED AT 0.125 SQ. METERS		
4.	WEIGHT 19.1 KG		
5.	REDUCED GLARE WITH REFLECTOR AND INTERNAL PRISM REFRACTORS		

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<b>ITEM</b>	<b>DESCRIPTION</b>	<b>LED</b>	<b>MOUNTING</b>
6.	LED's TO HAVE INDIVIDUAL PRE-ORIENTED LENS TO PROVIDE TYPE 2 ASYMETRICAL DISTRIBUTION		
7.	LUMINAIRE TO BE CUSTOM PAINTED WITH CLEAR COAT		
8.	ACCEPTABLE MATERIALS: .1 HOLOPHANE CAT. #PLLED-9-4K-10A-AS-45-5-L-GP-05-23-08657-GP .2 APPLETON .3 CROUSE-HINDS		

**2.4 BIRD SPIKES**

- .1 Stainless steel bird spikes are to be installed on the top of the light fixtures, arms and wood poles.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Locate and install luminaires as indicated.
- .2 Supply and install all material required for proper mounting of all luminaires.

**3.2 WIRING**

- .1 Connect luminaires to lighting circuits.

**3.3 LUMINAIRE ALIGNMENT**

- .1 Align luminaires mounted individually parallel or perpendicular to building grid lines.
- .2 Align luminaires at night-time under direction of Engineer. Allow for four hours time with three men and bucket truck so that alignment can be made to satisfaction of client.

**END OF SECTION**

