

Wharf Reconstruction**Chebogue (Town Point Hill)****Yarmouth County, NS****Project No. R.100885.001**

Common Work Results

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PART 1 - GENERAL

1.1 RELATED WORK

- .1 Refer to other specification sections for related work.
- .2 Refer to Section 01 33 00 for Shop Drawings/Submission requirements.

1.2 CODES AND STANDARDS

- .1 Do complete installation to CSA C22.1-2018 except where specified otherwise.
- .2 CSA Electrical Bulletins in force at time of tender submission, while not identified and specified by number in this Division, are to be considered as forming part of related CSA Part II standard and must be complied with.

1.3 PERMITS, FEES

- .1 Submit to Electrical Inspection Department and Supply Authority the necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay all fees levied by the Supply Authority for upgrade and extension of power to the site and/or connection of the project to their system; for existing redundant overhead power cable removals; for pole adjustments and removals, and all other costs levied by utility for completion project.

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1.3 PERMITS, FEES (Cont'd)

- .3 Utility invoices are to be submitted to the Departmental Representative as proof of payment.

1.4 AS-BUILT DRAWINGS

- .1 During progress of the work keep a record of all variations from the working drawings. At completion of the project submit a set of prints showing variations neatly marked in red to the Departmental Representative. Refer to Section 01 33 00 for more specific requirements.

1.5 WORK INCLUDED

- .1 Provide all labour and materials and everything that is required for a complete electrical installation, all in accordance with but not necessarily restricted to the specification and the accompanying drawings.
- .2 The work is to include but not necessarily be limited to the:
 - .1 The removal of all existing wharf electrical including: distribution equipment, lights, receptacles, junction boxes, shrouds, cable/wiring and conduits.

1.5 WORK INCLUDED (Cont'd)

- .2 Remove existing CCTV cameras and all associated cabling.
- .3 Construction of new electrical building as indicated on the

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- electrical drawings.
 - .4 The supply and installation of new equipment including: 3-gang meter base, service entrance rated circuit breaker, distribution panel, junction boxes and lighting controls in new electrical building.
 - .5 Wharf Power Centers (x7):
Supply and install new receptacles on treated timber posts with plywood backboards and all associated wiring, conduits and cabling as indicated on the electrical drawings.
 - .6 Supply and install 3 new treated timber poles with new LED luminaires and all associated wiring/cabling as indicated on the electrical drawings. In addition new LED luminaires will be installed on 3 existing poles.
 - .7 Supply and install 1 new LED floodlight and all associated wiring and cabling.
 - .8 The supply, installation and construction of a reinforced concrete encased duct bank.
 - .9 The supply and installation of rigid PVC conduit fastened to bottom of the pile-caps.
 - .10 The supply and installation of a distribution panel on the new segment of wharf.

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1.6 MINIMUM STANDARDS

- .1 The standard established by the drawings and specifications shall not be reduced by any of the codes referred to in 2, and in no instance, will a standard be accepted lower than that established by the Canadian Electrical Code.

1.7 SUPERVISION

- .1 The Contractor shall provide supervision and a sufficiently qualified foreman to insure that the job proceeds in a proper and efficient manner. If in the opinion of the Departmental Representative, such personnel are not competent to carry out their work, the Contractor shall replace these personnel immediately upon written request of the Departmental Representative.

1.8 MATERIALS AND EQUIPMENT

- .1 All material shall be new unless designated existing to be reused, of the best available quality and CSA/ULC approved for their respective use.
- .2 Where there is no alternative to supplying equipment which is not CSA certified, obtain and pay for special approval from an authorized and approved testing and certification agency.

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1.9 TESTS

- .1 Test all wiring, included in the contract, to ensure there are no shorts or grounded conductors and that insulation values are as required by the Canadian Electrical Code.
- .2 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .3 Submit test results for Departmental Representative review.
- .4 Megger line voltage circuits, feeders and equipment up to 350 V with 500 V instrument; feeders and equipment to 600 V with 1000 V instruments.
- .5 Replace conductors that fail insulation test.

1.10 PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as over-current trips, relays, and fuses are installed to values and settings as indicated, or required by the Canadian Electrical Code, Part I.

1.11 NAMEPLATES

- .1 Lamacoid nameplates shall be permanently fixed to loadcentre, junction and pull boxes, enclosures and receptacles.
- .2 Nameplates:
 - .1 Lamacoid 2 mm thick plastic engraving sheet, black face, white core, mechanically attached.

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1.11 NAMEPLATES (Cont'd)

- .3 Identification to be in English.
- .4 Size 2 nameplates for pull boxes and junction boxes to indicate circuit numbers contained within.
- .5 Affix Size 2 nameplates to enclosures to identify pole and circuit numbers.
- .6 Affix Size 5 nameplates to backboards adjacent to receptacles according to receptacle designation and circuit number as indicated on drawing.
- .7 Affix Size 5 nameplate, red face, white core, to junction boxes over receptacles to read "Receptacles for Ship to Shore Power Use Only. Improper use is extremely hazardous".

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

1.12 REMOVALS AND RELOCATIONS

- .1 Unless designated otherwise equipment designated for removal other than equipment belonging to the local utility, will become the property of the Contractor and be promptly removed from the site.
- .2 Coordinate removals and relocations of utility owned equipment with local authority.
- .3 Pay all associated utility fees for removal, relocation, and/or temporary storage.

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1.13 CUTTING, PATCHING & PAINTING

.1 The Contractor shall perform all cutting, patching, and painting necessary for the proper installation of the work and shall repair any damage done, employing only the services of skilled personnel.

1.14 WIRING IDENTIFICATION

.1 Maintain phase sequence and colour coding throughout.
.2 Colour code to CSA C22.1 1998.

1.15 WIRING TERMINATIONS

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

1.16 MANUFACTURERS AND CSA LABELS

.1 Manufacturers nameplates and CSA labels to be visible and legible after equipment is installed.

1.17 COMPLETION OF WORK

- .1 On completion of the project, the Contractor shall remove all debris, and equipment made redundant by new work, and leave the site neat and tidy. Equipment shall be checked for proper fitting and alignment, adjusted as required, cleaned and repainted where necessary.
- .2 Furnish a Certificate of Acceptance from the local inspection authority on completion of work to the Departmental Representative if required and if available.

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1.18 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS in accordance with Section 01 35 44 - Environmental Protection Procedure for Marine Work.
- .3 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Provinces of Nova Scotia, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated 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 Submit 4 numbers of copies drawings and product data to Departmental representative.
 - .6 If changes are required, notify Departmental Representative of these changes before they are made.

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1.18 SUBMITTALS (Cont'd)

- .4 Quality Control: in accordance with Section 01 45 00 - Testing and Quality Control.
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment is not available, submit such equipment to Departmental representative for approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental representative.
- .5 Manufacturer's Field Reports: submit to Departmental representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.
- .6 Submit for review updated single line electrical diagrams, drawing 600 x 600 mm minimum size, under Plexiglas and locate in Electrical Building.

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1.19 OPERATING INSTRUCTIONS

- .1 Three bound maintenance and operational manuals shall be reviewed and left with the Departmental Representative. These manuals shall be custom written for materials and systems supplied for this project.
- .2 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .3 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .4 Print operating instructions in approved laminated plastic.
- .5 Post instructions where directed.
- .6 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

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1.19 OPERATING INSTRUCTIONS (Cont'd)

- .7 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.
- .8 Refer also to Section 01 78 00 - Closeout Submittals.
- .9 Prior to final inspection, submit these manuals to the Departmental Representative for review.

END OF SECTION

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Wire, Cable and Connectors

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PART 1 - GENERAL

1.1 RELATED WORK

- .1 General Instructions: Division 1
- .2 Common Works Results - Section 26 05 01
Electrical

PART 2 - PRODUCTS

2.1 WIRE & CABLE

.1 Wire and cable shall conform fully to the latest specifications of the Canadian Standards Association (CSA), Electrical & Electronics Manufacturers Association of Canada, (EEMAC) the Insulated Power Cable Engineers Association (IPCEA), and the American Society of Testing Materials (ASTM).

.2 Wiring on circuits exceeding 50 V to ground shall be of solid copper of 98% conductivity and of full size AWG gauge, minimum #12. Insulation shall be cross linked polyethylene on 600 volt conductors smaller than No 8 and the same on 1000 volt conductors larger than No. 10. Wiring shall be colour coded as follows:

Phase A - Black

Phase B - Red

Neutral - White

Ground - Green

.3 Copper conductors sized as indicated with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW 90: to CSA C22.2 No. 75-M1983.

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2.2 WIRE CONNECTIONS

.1 Splices and joints in circuit wiring shall be made using: a) Mechanical split bolt connectors and heat shrink boots or tape.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRE & CABLE

.1 Identify wiring with permanent indelible identifying marks, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit.

.2 Maintain phase sequence and colour coding throughout in accordance with Item 4-032 of the Canadian Electrical Code Part I.

3.2 WIRE & CABLE CONNECTION

.1 All connections shall be made electrically and mechanically secure. Sizes of connectors shall be according to manufacturer's recommendations for each wire size and combination of wires.

3.3 VOLTAGE DROP

.1 Contractor shall wire all circuits so that the maximum voltage drop does not exceed 3%.

END OF SECTION

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Grounding - Secondary

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PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Common Works Results - Section 26 05 01
Electrical

1.2 REFERENCES

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

.2 Canadian Standards Association, (CSA
International)

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 System and circuit, equipment, grounding
conductors, bare stranded copper, un-tinned,
soft annealed, size as indicated.

.2 Insulated grounding conductors: green,
type RW90 to Section 26 05 21.

.3 Rod electrodes: copper clad steel, 19 mm
dia by 3000 mm long.

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

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Thermit welded type conductor
connectors.

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Grounding - Secondary

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2.1 EQUIPMENT (Cont'd)

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

.7 Ground bar (copper) size as indicated on drawings. Glass stand-off insulators.

.8 Copper grounding lug to ground bars. Double barrel size to accommodate various size ground wires.

PART 3 - EXECUTION3.1 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 Departmental Representative, and local authority having jurisdiction over installation. Where EMT is used, run separate ground wire in conduit.

.2 Install rod electrodes and make grounding connections.

.3 Install connectors in accordance with manufacturer's instructions.

.4 Protect exposed grounding conductors from mechanical injury.

.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 conduits, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw.

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Grounding - Secondary

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3.1 INSTALLATION GENERAL (Cont'd)

.8 Make connections to ground bar(s) and to ground bus in service board as shown on drawings.

3.2 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutrals of the secondary 208/120 V system.

3.3 EQUIPMENT GROUNDING

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

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01.

.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

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Conduits, Conduit Fastenings & Fittings

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PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

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

.2 CSA C22.2 No. 83-M1985 (R1999), Electrical Metallic Tubing.

PART 2 - PRODUCTS

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.2 Rigid PVC conduit: to CSA C22.2 No. 211.2.

2.2 CONDUIT FASTENINGS AND SUPPORTS

.1 One-hole rigid galvanized steel pipe straps for surface conduits less than 50 mm and smaller. Two-hole rigid galvanized steel pipe straps for conduits larger than 50 mm.

.2 Galvanized fastening hardware.

.3 Male and female threaded PVC adapters.

2.3 CONDUIT FITTINGS

.1 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

.2 Steel set screw connectors and couplings for EMT.

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2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted for suspended application.

.2 10 mm diameter threaded rods for supporting suspended channel.

.3 Specific purpose, corrosion resistant, heat treated, fasteners to be used to support boxes, conduit and cable from support channel and/or directly from structure.

.4 Two holes corrosion resistant straps for conduits.

.5 All support channels assembly installed indoor shall be galvanized.

.6 All support channels assembly installed outdoor including the wharf area shall be stainless steel 316.

.7 All pull and junction boxes, wire ways, and multiple conduits shall be supported by a steel channel support system with all components, hangers, wall supports, cable clamps, etc., specifically manufactured and approved for their application.

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Conduits, Conduit Fastenings & Fittings

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2.5 SUPPORT CHANNELS (Cont'd)

.8 Fastening devices for cabinets, boxes, supports etc., shall be nut and bolt, expansion shields, wedge anchors, or toggle bolts, size and number to suit the application or as detailed on the drawings. Toggle bolts may not be used in plasterboard construction.

.9 Fastening devices for outlet boxes shall be nut and bolt, expansion shields, wedge anchors or caddy clips, size and number to suit the application or as detailed on the drawings.

2.5 FISH CORD

.1 Polypropylene.

PART 3 EXECUTION3.1 CONDUIT INSTALLATION

.1 All conduits and cables shall be kept parallel or perpendicular to site lines. All conduits shall be securely held in place at intervals and with supports as required by the Canadian Electrical Code.

.2 Conduit openings shall be sealed with plugs or caps to prevent entrance of foreign materials. Where conduits pass through a waterproof membrane an oversize sleeve shall be installed and caulking applied to maintain the waterproof properties of the membrane.

.3 Conduit shall not pass through structural members without the permission of the Departmental Representative.

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3.1 CONDUIT INSTALLATION (Cont'd)

.4 Sufficient number of fittings shall be used to permit easy pulling of wires. Conduits shall be continuous. To ensure the conduit is clean and dry before conductors are pulled in, the conduit shall be swabbed out by using a drag consisting of tight rubber washers.

.5 Touch up all marked surfaces using manufacturer's recommended materials and methods.

3.2 FASTENINGS AND SUPPORTING DEVICES

.1 Secure all equipment in a manner, so as to not distort or cause undue stress on any components.

.3 Secure equipment to poured concrete with expandable inserts.

.4 Secure surface mounted equipment with fasteners.

.5 Secure equipment to hollow masonry walls with toggle bolts. Toggle bolts shall not be used to secure equipment to plasterboard, drywall, or acoustic tile surfaces.

.6 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.7 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole rigid galvanized steel straps to secure surface conduits and cables 53mm and smaller.

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3.2 FASTENINGS AND SUPPORTING DEVICES (Cont'd)

- .2 Two-hole rigid galvanized steel straps for conduits and cables larger than 53mm.
- .3 Beam clamps to secure conduit to exposed steel work.
- .8 Suspended support systems.
 - .1 Support individual cable or conduit runs with 12mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 12mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .9 For surface mounting of two or more conduits use channels at 1200mm (maximum) on centre spacing.
- .10 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .11 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .12 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .13 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Departmental Representative.

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Conduits, Conduit Fastenings & Fittings

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3.2 FASTENINGS AND SUPPORTING DEVICES (Cont'd)

.14 Do not support any electrical conduits, wire or equipment from ceiling system support cables.

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

.16 In addition to the C.E.C. conduit support requirements, all suspended conduit runs containing horizontal or vertical elbows shall have one additional support installed not greater than 300mm from the midpoint of the 90° bend.

END OF SECTION

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Concrete Encased Duct Banks

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PART 1 - GENERAL

1.1 REFERENCES

- .1 General Requirements: Division 1.
- .2 Common Work Results: Electrical
Section 26 05 01.
- .3 Excavation and Backfilling:
Section 31 23 10.

PART 2 - PRODUCTS

2.1 PVC DUCTS

- .1 PVC ducts, type DB2, encased in reinforced concrete.
- .2 Rigid PVC opaque solvent welded type couplings, bell end fittings, plugs, caps, adaptors as required to make complete installation.
- .3 Expansion joints.
- .4 Rigid PVC 5° angle couplings.

2.2 DIRECT BURIED CONDUITS

- .1 Rigid PVC conduit type II and fittings, solvents weld couplings, factory bends in sizes larger than 32 mm, field bends and offsets for sizes less than 32 mm.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

- .1 Install underground duct banks including formwork.

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Concrete Encased Duct Banks

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3.1 INSTALLATION GENERAL (Cont'd)

.2 Build duct bank on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.

.3 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.

.4 Install base spacers at maximum intervals of 1.5 m levelled to grades indicated for bottom layer of ducts.

.5 Lay PVC ducts with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than the spacing's shown on the drawings. Stagger joints in adjacent layers at least 150 mm and make joints watertight. Encase duct bank with 150 mm thick concrete cover as indicated on the drawings.

.6 Make transpositions, offsets and changes in direction using 5° bend sections, do not exceed a total of 20° with duct offset.

.7 Use bell ends at duct terminations through slabs or at buildings.

.8 Use conduit to duct adapters when connecting to conduits.

.9 Terminate duct runs with duct coupling set flush with the end of concrete envelope when dead ending duct bank for future extension.

.10 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.

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3.1 INSTALLATION GENERAL (Cont'd)

.11 Allow concrete to attain 50% of its specified strength before backfilling.

.12 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete. Tie ducts to spacers with twine or other non-metallic material. Remove weights or wood braces before concrete has set and fill voids.

.13 Clean ducts before laying. Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.

.14 Immediately after placing of concrete, pull through each duct a wooden mandrel not less than 300 mm long and of a diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Avoid disturbing or damaging ducts where concrete has not set completely. Pull stiff bristle brush through each duct immediately before pulling-in cables.

.15 Install reinforcing rods as shown on drawings.

.16 In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end.

3.2 MARKERS

.1 Mark location of duct runs under hard surfaced areas not terminating in manhole with railway spike driven flush in edge of pavement, directly over run. Place concrete duct marker at ends of such duct runs. Construct markers and install flush with grade.

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Concrete Encased Duct Banks

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3.2 MARKERS (Cont'd)

.2 Mark ducts every 150 m along straight runs and changes in direction.

.3 Where markers are removed to permit installation of additional duct, reinstall existing markers.

.4 Lay concrete markers flat and centered over duct with top 25 mm above earth surface.

.5 Provide drawings showing locations of markers.

3.3 INSPECTIONS

.1 Advise Departmental Representative so that he may inspect ducts prior to placing and be present during placement of concrete and clean-out.

END OF SECTION

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Installation of Cables in Ducts/Conduits

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PART 1 - GENERAL

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 CABLE INSTALLATION IN DUCTS/CONDUITS

- .1 Install cables as indicated in ducts/conduits.
- .2 Do not pull spliced cables inside ducts/conduits.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 Before pulling cable into ducts and until cables 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 ends with dust sealing compound.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 Common Work Results - Electrical.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.

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Installation of Cables in Ducts/Conduits

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3.2 FIELD QUALITY CONTROL (Cont'd)

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

3.3 PRE-ACCEPTANCE TESTS

.1 After installing cable but before splicing and terminating, perform insulation resistance test with a 1000 volt meggar on each phase conductor of the 600/347 volt system.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

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

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

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Service and Distribution Equipment

Page 1

PART 1 - GENERAL

1.1 RELATED WORK

.1 Complete service entrance to conform to Nova Scotia Power Inc. - Service Entrance Standards.

PART 2 - PRODUCTS

2.1 SUPPLY DATA

.1 Service equipment suitable for incoming supply: 120/208 volt, 200 amp, 60Hz, three (3) phase, four (4) wire, grounded neutral.

2.2 EQUIPMENT

- .1 Service Entrance Rated Main Breaker and Utility Metering:
 - .1 200 amp 7-Jaw Meter Stack.
 - .1 Service entrance rated main breaker module complete with 250MCM Ground Lug.
 - .1 Main circuit breaker: LSI 200 amp, 250 volt, 3 phase, 4-wire, solid neutral service entrance 100% rated.
 - .2 Tenant Main Breakers: 1-3 pole, 200 amp and 1-3 pole, 100 amp. Blanking plates as needed.
 - .4 Type 3R enclosure
 - .5 Main ampere rating - 250
 - .6 Line side lug & wire sizes 3/0-250kcmil
 - .8 CSA or cUL certified

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2.2 EQUIPMENT (Cont'd)

- .2 Meters supplied and installed by NSPI
- .3 Wall Mounted Copper Ground Bus:
 - .1 38.1 mm high X 3.2 mm thick X 450 mm long copper ground.
 - .2 Predrilled to accept lugs.
 - .3 Lugs to be copper. Size of lugs as required.
 - .4 Bus to be mounted 300 mm AFF on 25 mm glass insulators.
- .5 Panelboard 'A', 200 amp, 120/208 volt, 3 phase, 4 wire.
 - .1 K frame.
 - .2 IC. 22 Ka @ 250 volt.
 - .3 EEMAC 1 - General purpose enclosure - surface mounted.
 - .4 Copper bussing.
 - .5 200 amp lugs.
 - .6 30 circuit.
 - .7 Bolt on breakers; the number and rating of breakers is shown on the drawings.
 - .8 Copper ground bar.
- .6 Panelboard 'B', 100 amp, 120/208 volt, 3 phase, 4 wire.
 - .1 K frame.
 - .2 100 amp main breaker.
 - .3 IC. 22 Ka @ 250 volt.

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2.2 EQUIPMENT (Cont'd)

.4 CSA 4x - Stainless Steel enclosure to fit panel, 316L stainless steel- surface mounted.

.5 Copper bussing.

.6 100 amp lugs.

.7 18 circuit.

.8 Bolt on breakers; the number and rating of breakers is shown on the drawings.

.9 Copper ground bar.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install service and distribution equipment as indicated.

.2 Connect to incoming service.

.3 Ensure all circuit breakers are properly torqued.

.4 Make grounding connections.

.5 Meggar all circuits as required by Section 26 05 01 - Common Works Results - Electrical.

END OF SECTION

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Receptacles and Junction Boxes on Wharf

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PART 1 - GENERAL

1.1 RELATED WORK

.1 Common Work Results - Electrical:
Section 26 05 01.

.2 Division 1.

PART 2 - PRODUCTS

2.1 RECEPTACLES

.1 30 amp, 125 V, simplex, locking, female receptacle. CSA configuration L5 - 30 R.

.1 Approved for wet applications (marine environment); Corrosion Resistant.

.2 Yellow nylon face.

.3 Device Box - "Watertight" device box with hinged and gasketed, weatherproof coverplate. Both yellow in colour.

.4 Device box and receptacle to be products of the same manufacturer and to be a complete assembly.

.2 20 amp, 125 volt, duplex, ground fault circuit interrupter. Nylon construction. Female receptacle CSA configuration 5-20R. Weather and corrosion resistant

.1 Device box: surface mounted in a duplex - "Watertight" device box. Yellow in colour.

.2 Metal, hinged and gasketed "In-Use" cover.

.3 Receptacle device box and "In-Use" cover to be products of the same manufacturer.

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2.2 JUNCTION BOXES

- .1 Moulded PVC. Reinforced junction boxes.
 - .1 With screw down gasketted cover.
 - .2 Stainless steel screws.
 - .3 Conduit hubs
 - .4 External mounting feet.
 - .5 EEMAC 4X rating.
 - .6 Sized as per Canadian Electrical Code.

PART 3 - EXECUTION

- .1 Install junction boxes on power shrouds, poles and walls of electrical building as indicated on drawings.
- .2 Install conduit and wiring and/or cabling from junction boxes to receptacles.
- .3 Install conduit and wiring and/or cabling from junction boxes to lights.
- .4 Mount receptacles on power shrouds as indicated.
- .5 Make connections - use split bolt mechanical connectors with heat shrink boots inside junction boxes.
- .6 Ensure proper operation.

END OF SECTION

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Moulded Case Circuit Breakers

Page 1

PART 1 - GENERAL

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Shop drawings and Other Submittal Procedures.

.2 Include time-current characteristic curves for breakers with ampacity as indicated in drawing with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

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 value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 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 and instantaneous tripping for short circuit protection.

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Moulded Case Circuit Breakers

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PART 3 EXECUTION

3.1 INSTALLATION

.1 Install as indicated on panel schedules.

END OF SECTION

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LED Luminaires, Timber Poles
and Lighting Control Devices

Page 1

PART 1 - GENERAL

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Shop drawings and Other Submittal Procedures.

PART 2 - PRODUCTS

2.1 AREA LIGHTING

- .1 Marine Rated, LED luminaires.
 - .1 Light input: 168 watt, 120 volt, R3 Roadway Type III distribution
 - .2 1000 ma driver.
 - .3 4000k colour temperature.
 - .4 Optical enclosure to be sealed and gasketted to IP66 rating.
 - .5 Die-cast aluminum; polyester powder coat finish. Gray in colour.
 - .6 Enhanced corrosion resistant finish rated at 5000 hour exposure to salt spray.
 - .7 UL standard 1598A (salt water) marine outside tested.
 - .8 Galvanized steel mounting brackets and hardware suitable for mounting on timber poles.

2.2 FLOOD LIGHTING

- .1 Marine grade LED flood light.
 - .1 Light input: 177 watt (400W equivalent), 120 volt, vertical distribution. NEMA 4x4 beam pattern. Minimum 20,000 lumens.

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2.2 FLOOD LIGHTING (Cont'd)

.2 Die-cast aluminum with copper alloy housing. Epoxy primer, grey finished coat.

.3 4000k colour temperature with a 70 CRI (minimum).

.4 1000 ma driver.

.5 Enhanced corrosion resistant finish rated at 5000 hour exposure to salt spray.

.6 UL standard 1598A (salt water) marine outside tested.

.7 Optical enclosure to be sealed and gasketed to IP66 rating.

.8 Galvanized steel mounting brackets and hardware suitable for mounting on timber poles.

2.3 TREATED TIMBER POLES

.1 Timber poles to be Jack Pine, to CSA 015-15 'Wood utility poles and reinforcing stubs'.

.2 Timber treatment to CSA 080-15 'Wood Preservation'.

.3 Poles to be Class 3, 10.7M in total length.

.4 Handle treated material to avoid damage causing alteration in original treatment.

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2.4 PHOTOELECTRIC LIGHTING CONTROLS

1. Conduit wired photo control.
2. Top lens.
3. Plastic housing.
4. Fit standard 16mm knockouts.
5. Stem and Swivel Mount.
6. Voltage variation: plus or minus 10%.
7. Temperature range: minus -40°C to +70°C
8. Rated for 10000 operations.
9. 255 Joule MOV surge protection component.
10. Fail-safe circuit completed when relay de-energized.
11. Turn OFF to ON ratio 1.5:1 with 2-5 second delay.
12. Manually adjustable level slide.
13. 120V, 16.5 amps, 2000 watts.
14. Light levels: ON at 1.5 F.C. (15 lx) -
OFF at 10 F.C. (100 lx)
15. CSA or cUL certified.

2.5 LIGHTING CONTACTORS

1. Contactors: to CSA C22.2 No.14.
2. Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Minimum 4 pole, 20A rating. Half size contactors not accepted.

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2.5 LIGHTING CONTACTORS (Cont'd)

3. Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.
4. Mount in CSA Enclosure 4x stainless steel for contactor installed outdoors.
5. Mount in CSA Enclosure Type 1 for contactor installed indoors.
6. Include following options in cover:
 1. Red LED indicating lamp.
 2. H-O-A selector switch.
7. Contactors from the same manufacturer as the electrical distribution equipment.

PART 3 - EXECUTION3.1 INSTALLATION1. Poles

- .1 Install poles as indicated and to utility standards.

2. Luminaires

- .1 Install luminaires as indicated and connect to lighting circuits and controls.
- .2 Ensure proper operation.
- .3 Luminaires and mounting brackets to be products of one manufacturer.

3. Contactors

- .1 Install contactors and connect auxiliary control devices.
- .2 Install surface mounted contactors on plywood backboards. Where practical, group on common backboard.

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LED Luminaires, Timber Poles
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3.1 INSTALLATION (Cont'd)

.3 Identify contactors with nameplates or labels indicating panel and circuit number.

.4 Test contactors in accordance with 26 05 00 - Common Work Results for Electrical.

4. Photoelectric Controls

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

.2 Wire photocell to lighting contactor control circuit.

.3 Demonstrate operation to Departmental representative.

3.2 HANDLING TREATED TIMBER

.1 Handle treated material to avoid damage causing alteration in original treatment.

.2 Treat in field, spike holes, boreholes, plugged holes, cuts and any damage to treated material, using Copper naphthenate, as specified herein, regardless of plant treatment type.

.3 Provide methodology pertaining to heating and application. Apply to dry surfaces, wherever possible.

.4 Treat boreholes, using a pressurized container with an extension rod, to produce a fine spray in the holes with one application. Alternately a cylindrical brush may be used.

.5 Treat field cuts and any abrasions with minimum of two liberal applications, using either spray or brush.

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3.2 HANDLING TREATED TIMBER (Cont'd)

.6 In addition, field cuts and underwater damaged areas will receive a coating of plastic compound, capped with lead flashing secured with galvanized roofing nails. Plastic compound not to be water soluble and is subject to approval.

.7 Environmental Concern: Ensure no spillage or excess application of field preservative. Provide workmen with sufficient training and protective gear to properly and safely handle the treated materials and to apply field treatment, so as to prevent undue hazard to themselves, others, or the environment.

.8 Contain all debris and leachates (films on water surface) within the area of the work by using containment facilities such as floating booms or screens.

END OF SECTION