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| <u>1 Related Work</u> | .1 | Refer to other specification sections for related work. |
| | .2 | Refer to Section 01 33 00 for Shop Drawings/Submission requirements. |
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| <u>2 Codes and Standards</u> | .1 | Do complete installation to CSA C22.1-2012 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. |
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| <u>3 As-Built Drawings</u> | .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 Engineer. Refer to Section 01 33 00 for more specific requirements. |
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| <u>4 Work Included</u> | .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 following items, specification, and the accompanying drawings. |
| | .2 | The Contractor is to provide all materials and labour required to implement the work described below. The work is to include but not necessarily be limited to the following:
.1 Construction of new timber decking installed over existing concrete floats.
.1 Elevation of existing gangways and ramps including all tracks, anchors, brackets etc..
.2 Construction and installation of new electrical power centres on all floating docks; both timber and concrete construction.
.3 Supply and installation of new submersible Cabtire (type SOOW) cabling from the existing building mounted junction boxes, through the existing duct bank system, |
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| <u>4 Work Included</u>
(Cont'd) | .2 | (Cont'd) |
| | | .3 (Cont'd) |
| | | suspended under side of existing gangways to new power centres on the floats. Including all supports, brackets, channel, anchors , strain relief grips etc.. |
| | | .4 Supply and installation new circuit breakers in existing distribution panelboards. |
| | | .5 Installation of conduit and wire from existing distribution panelboards to existing building mounted junction boxes. |
| | | .6 Notification to; arrangement and coordination with the supplier / manufacturer of the existing customer submetering system for the activation and commissioning of that system. |
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| <u>5 Minimum Standards</u> | .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. |
| | .2 | As a "standard of quality" "acceptable manufacturers" catalogue designations are included in portions of this specification and on plans. These catalogue designations and descriptions are not necessarily listed in order of preference and all manufacturer's meeting this "standard of quality" may not be listed. |
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| <u>6 Supervision</u> | .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 Engineer, such personnel are not competent to carry out their work, the Contractor shall replace these men immediately upon written request of the Engineer. |
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7 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 special approval from the local Inspection Department.

8 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 Engineers review.
- .4 Megger line voltage circuits, feeders and equipment up to 350 V with 500 V instrument; feeders and equipment to to 600 V with 1000 V instruments.
- .5 Replace conductors that fail insulation test.

9 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.

10 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.
- .3 Identification to be English and French. Provide one nameplate for each language.

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| <u>10 Nameplates
(Cont'd)</u> | <p>.4 Size 2 nameplates for pull boxes and junction boxes to indicate circuit numbers contained within.</p> <p>.5 Affix Size 2 nameplates to junction boxes to identify load.</p> <p>.6 Affix Size 5 nameplates to backboards adjacent to receptacles according to receptacle designation and circuit number as indicated on drawing.</p> <p>.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".</p> |
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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

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| <u>11 Removals and
Relocations</u> | <p>.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.</p> <p>.2 Coordinate removals and relocations of utility owned equipment with local authority.</p> <p>.3 Pay all associated utility fees for removal, relocation, and/or temporary storage.</p> <p>.4 Relocate and/or install guy wires as required to meet utility standards.</p> |
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| <u>12 Cutting,
Patching & Painting</u> | .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 workmen. |
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| <u>13 Wiring
Identification</u> | .1 | Maintain phase sequence and colour coding throughout. |
| | .2 | Colour code to CSA C22.1 1998. |
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| <u>14 Wiring
Terminations</u> | .1 | Lugs, terminals, screws used for termination of wiring to be suitable for either copper conductors. |
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| <u>15 Manufacturers
and CSA Labels</u> | .1 | Manufacturers nameplates and CSA labels to be visible and legible after equipment is installed. |
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| <u>16 Completion of
Work</u> | .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, if required from the local inspection authority on completion of work to the Engineer. |

PART 1 - GENERAL

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| <u>1.1 Related Work</u> | .1 | General requirements: | Division 1 |
| | .2 | Common Works Results -
Electrical | Section 26 05 01 |

PART 2 - PRODUCTS

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| <u>2.1 Wire & Cable</u> | .1 | Wire and cable shall conform fully to the latest specifications of the Canadian Standards Association (CSA), Electrical & Electronic 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 rated 600 V. 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 75: to CSA C22.2 No. 75-M1983. | |
| | .4 | Teck Cable; Rated 90°C:
.1 Conductor: Class B stranded soft copper.
.2 Insulation: cross-linked polyethylene or ethylene propylene rubber, as approved by CSA on Types RW90 (X-LINK) Minus 40°C or RW90 (EP) Minus 40°C per CSA C22.2, No. 131 (and IPCEA).
.3 Identification: Surface color coding for sizes up to and including #2 AWG. For sizes larger than #2 AWG, number coding. | |
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2.1 Wire & Cable
(Cont'd)

- .4 Teck Cable; Rated 90°C:(Cont'd)
 - .4 Grounding Conductor: grounding conductor included in the cable assembly.
 - .5 Multiple conductor cables assembled with suitable fillers and binder tape.
 - .6 Inner Jacket: Polyvinyl Chloride (PVC) heat, flame and moisture resistant jacket, suitable for installation in temperatures down to Minus 40°C.
 - .7 Armour: Aluminum interlocking armour.
 - .8 Outer Jacket: Polyvinyl Chloride (PVC) heat, flame and moisture resistant jacket, black, suitable for installation in temperatures down to Minus 40°C.
 - .9 Size and number of conductors as indicated on the drawings.
- .5 Type SOOW Service Cord
 - .1 Designed for outdoor/ indoor use with marine dockside power and mining applications.

Completely Water Submersible.

 - .2 Multiconductor cables of bare annealed copper ASTM B-3 flexible bunch strands with colour coded synthetic rubber insulation.
 - .3 Temperature Range: -40C to +90C.
 - .4 Voltage rating: 600 V.
 - .5 Approvals: CSA C22.2 No.49 FT1/FT2, UL-62.
 - .6 Bond wire listed as a **conductor**, used for grounding purposes only.

2.2 Wire
Connections

- .1 Splices and joints in circuit wiring shall be made using: a) Mechanical split bolt connectors. Acceptable manufacturers - Thomas & Betts; Ilsco.
- .2 Strain Relief Grips; stainless steel wire mesh; high strength , corrosion resistant, sized to suit cable diameter. Hubbell - Kellems grips.
- .3 Stainless steel, liquid tight cable connectors c/w threaded lock nuts for entrance to junction boxes. Sized to suit individual cable diameters.

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 4-036 of the Canadian Electrical Code Part I.
- .3 Install flexible cable as indicated on the drawings.
- .4 Support flexible cable as indicated on drawings and according to requirements of the Canadian Electrical Code.
- .5 Flexible cables to be continuous with no splices.

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.
- .2 Install stainless steel liquid tight cable connectors at all flexible cable termination points ie wall mounted junction boxes.
- .3 Install stainless steel strain relief grips where cables drop down from gangways and where cables attach to the floating docks; one grip at each location for each cable.

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.

PART 2 - PRODUCTS

- 2.1 Conduits
- .1 Rigid pvc conduit: to CSA C22.2 No. 211.2.

- 2.2 Conduit Fastenings
- .1 PVC coated one hole steel pipe straps for surface conduits less than 50 mm and smaller. Two hole PVC coated 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.

- 2.4 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 Fish Cord
- .1 Polypropylene.
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PART 3 - EXECUTION

3.1 Conduit
Installation

- .1 All conduits and cables shall be kept parallel or perpendicular to building and wharf 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 Engineer.
- .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.

PART 1 - GENERAL

PART 2 - PRODUCTS

PART 3 - EXECUTION

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| <u>3.1 Cable
Installation in
Ducts</u> | <ul style="list-style-type: none">.1 Install cables as indicated in ducts..2 Do not pull spliced cables inside ducts..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. |
| <u>3.2 Field Quality
Control</u> | <ul style="list-style-type: none">.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..4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms..5 Pre-acceptance tests.<ul style="list-style-type: none">.1 After installing cable but before splicing and terminating, perform insulation resistance test with 500V megger on each phase conductor of the 120 /240 volt system and/ or the 120/208 volt system. |
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PWGSC
Meteghan Wharf
Floating Dock
Electrical Install
Digby Co., NS
PN R.074439.002

Installation of Cables in
Conduits

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3.2 Field Quality .5
Control
(Cont'd)

- (Cont'd)
- .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Provide Engineer with list of test results showing location at which each test was made, circuit tested and result of each test.
- .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

PART 1 - GENERAL

- 1.1 Related Work .1 Common Work Results - Electrical: Section 260501.

PART 2 - PRODUCTS

2.1 Receptacles

- .1 20 amp, 125 V, simplex, locking, female receptacle. CSA configuration L5 - 20 R.
.1 Approved for wet applications (marine environment); Corrosion Resistant.
.2 Yellow nylon face.
.3 Hubbell Cat.# HBL23CM10 or equal.
.4 Device Box - "Watertite" device box with hinged and gasketted, weatherproof coverplate. Both yellow in colour.
.5 Hubbell Cat. # HBL74CM25WOA or equal.
.6 Device box and receptacle to be products of the same manufacturer and to be a complete assembly.
- .2 30 amp, 125/250 V., simplex, locking, female receptacle. CSA configuration L14 - 30 R.
.1 Approved for wet applications, corrosion resistant, marine grade.
.2 yellow nylon face.
.3 Leviton Series 27CM-10 or equal.
.4 Device Box - "Watertite" device box with hinged and gasketted, weatherproof coverplate. Both yellow in colour.
.5 Device box and receptacle to be products of the same manufacturer and to be a complete assembly.

2.2 Junction/Pull Boxes

- .1 Cast PVC. Reinforced junction and/or pull boxes.
.1 With screw down gasketted cover.
.2 Stainless steel screws.
.3 Conduit hubs.
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- 2.2 Junction/Pull Boxes
(Cont'd)
- .1 (Cont'd)
 - .4 External mounting feet.
 - .5 Corrosion resistant.
 - .6 Approved for wet marine environments.
 - .7 Size as indicated or as per CEC.

ART 3 - EXECUTION

- .1 Mount junction/pull boxes on wheelguards as shown on drawings:
- .2 Install cabling from pull boxes to receptacles.
- .3 Mount receptacles on plywood backboard or pole as indicated.
- .4 make connections - using mechanical split bolt connectors and heat shrink boots inside JB/PB.
- .5 Ensure proper operation.

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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PART 3 - EXECUTION

3.1 Installation

- .1 The Electrical Shed houses three (3) existing Cutler-Hammer, Pow-R-Line 1a, 225 amp, 120/208 V., 3 phase, 4W, surface mounted, 42 circuits distribution panelboards. Each panelboard contains nine (9) 30 amp, 2 pole, type BAB branch breakers and ten (10) 15 amp, 1 pole, type BAB branch breakers.
- .2 The ten (10) 15 amp, 1 pole circuit are to be removed and to be turned over to the Harbour Authority.
- .3 Supply and install ten (10) new 20 amp., 120V., 1 pole circuit breakers, Cutler-Hammer type BAB, 10 KAIC interrupting capacity.
- .4 The existing nine (9) 30 amp, 2 pole circuit breakers are to be reused.
- .5 All three (3) existing distribution panelboards are to be reconfigured as per the new panel schedule as shown on the drawings.
- .6 All existing circuits for the electrical shed loads are to remain. These circuits are not to be reconfigured. The reconfiguration of the circuits identified in item # 5 above to be adjusted to suit.