

1. General

This Section covers items common to sections of Division 26. This Section supplements requirements of Division 1.

2. Codes and Standards

- .1 Do complete installation in accordance with CSA C22.1-2015, except where specified otherwise.
- .2 Do underground systems in accordance with CSA C22.3No.7-94 (R2000), except where specified otherwise
- .3 Abbreviations for electrical terms: to CSA Z85-1983.

3. Care, Operation and Start-up

- .1 Instruct Engineer and operating personnel in the operation, care and maintenance of equipment.

4. Voltage Ratings

- .1 Operating voltages: to CAN3-C235-83.

5. Permits, Fees and Inspection

- .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.
- .5 Bidders shall include, in their bids for the work, a lump sum \$5,000.00, (five thousand dollars) allowance for all cost levied by the power utility.
- .6 Utility invoices are to be submitted to the Departmental Representative as proof of payment.
- .7 All utility costs in excess of \$5,000.00 will be addressed as an "Extra"  
(change order to the contract)
- .6 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of work to Engineer.

6. Materials and Equipment .1 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.

7. Finishes .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

8. Equipment Identification .1 Identify electrical equipment with nameplates as follows:  
.2 Nameplates:  
.3 Lamicoid 3mm thick plastic engraving sheet, white face, black core, mechanically attached with self-tapping screws.

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   |
| Size 8 | 300 x 450 mm | 2 lines | 100 mm high letters |

- .4 Labels:  
.1 Embossed plastic labels with 6mm high letters unless specified otherwise.
- .5 Wording on nameplates to be approved by Engineer prior to manufacture.
- .6 Allow for average of twenty-five (25) letters per nameplate.
- .7 Identification to be English.
- .8 Nameplates for junction boxes to indicate system and/or voltage characteristics.

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| <u>9. Wiring Identification</u>         | .1 | Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.  |
|   | .2 | Maintain phase sequence and colour coding throughout.   |
|   | .3 | Colour code: to CSA C22.1.  |
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| <u>10. Wiring Terminations</u>          | .1 | Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.   |
|   |    |   |
| <u>11. Manufacturers and CSA Labels</u> | .1 | Visible and legible after equipment is installed.   |
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| <u>12. Warning Signs</u>                | .1 | As specified and to meet requirements of Electrical Inspection Department and Engineer.   |
|   |    |   |
| <u>13. Load Balance</u>                 | .1 | Measure phase current to panelboards with normal loads including lighting systems operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes. |
|   | .2 | Submit, at completion of work, report listing 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.                                |

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| 14. Conduit and<br><u>Cable Installation</u>         | .1 | Install conduit and sleeves prior to pouring of concrete.  |
| 15. Field Quality<br><u>Control</u>                  | .1 | Conduct and pay for following tests:<br>.1 Power distribution system including phasing, voltage, grounding and load balancing.<br>.2 Circuits originating from branch distribution panels.<br>.3 Lighting and its control. |
|  | .2 | Insulation resistance testing.<br>.1 Megger circuits, feeders and equipment up to 350V with a 500V instrument.   |
|  | .3 | Check resistance to ground before energizing.  |
|  | .4 | Carry out tests in presence of Engineer.   |
|  | .5 | Provide instruments, meters, equipment and personnel required to conduct tests during, and at conclusion of, project.  |
|  | .6 | Submit test results for Engineer's review.   |
| 16. Co-ordination<br>of Protective<br><u>Devices</u> | .1 | Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.   |

## PART 1 - GENERAL

- 1.1 References .1 CSA C22.2No.65 Wire Connectors.

## PART 2 - PRODUCTS

- 2.1 Materials
- .1 Pressure-type wire connectors: with current carrying parts of copper, copper alloy, sized to fit copper conductors as required.
  - .2 Fixture-type splicing connectors: with current carrying parts of copper alloy, sized to fit copper conductors #10 AWG or less.
  - .3 Clamps or connectors for flexible conduit, as required.

## PART 3 - EXECUTION

- 3.1 Installation
- .1 Remove insulation carefully from ends of conductors and:
    - .1 Install mechanical pressure-type connectors and tighten screws or compress with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
    - .2 Install fixture-type connectors and tighten. Replace insulating cap.

## PART 1 - GENERAL

- 1.1 Related Sections .1 Section 26 05 20 - Wire and Box Connectors 0 – 1000V
- 1.2 References .1 CSA C22.2 No.0.3-01, Test Methods for Electrical Wires and Cables.  
.2 CAN/CSA-C22.2 No.131-M89(R1999), Type TECK 90 Cable.

## PART 2 - PRODUCTS

- 2.1 TECK Cable .1 Cable: to CAN/CSA-C22.2 No.131.  
.2 Conductors:  
.1 Grounding conductor: copper.  
.2 Circuit conductors: copper, size as indicated.  
.3 Insulation:  
.1 Chemically cross-linked, thermosetting, polyethylene rated, type RW90, 1000V.  
.4 Inner jacket: polyvinyl chloride material.  
.5 Armour: interlocking aluminum.  
.6 Overall covering: thermoplastic, polyvinyl, chloride material.  
.7 Fastenings:  
.1 One hole aluminum straps to secure surface cables 50mm and smaller. Two hole stainless steel straps for cables larger than 50mm.  
.2 Channel type supports for two or more cables at 3000mm centers.  
.8 Connectors:  
.1 PVC coated watertight approved for TECK cable.
- 2.2 Building Wires .1 Conductors: stranded for 10 AWG and larger. Minimum size: #12 AWG.  
.2 Copper conductors: size as indicated, with 600V insulation of chemically cross-linked, thermosetting, polyethylene material rated RW90 or RWU90 as indicated on drawings.

PART 3 - EXECUTION

3.1 Installation of  
Building Wire

- .1 Install wire in conduit as indicated.

3.2 Installation  
of TECK Cable 0 -  
1000 V

- .1 Install cables.
- .2 Group cables wherever possible on channels.
- .3 Where Teck cables are run beneath wharf, provide support for cable with a maximum separation of 1000mm.

PART 1 – GENERAL

Not used

PART 2 - PRODUCTS

2.1 Connectors and  
Terminations

- .1 Copper, long barrel, crimp-type compression connectors as required, sized for copper conductors.

PART 3 - EXECUTION

3.1 Installation

- .1 Install terminations and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required.



PART 1 - GENERAL

PART 2 - PRODUCT

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| 2.1 Support<br><u>Channels</u> | .1 | U shape, size 41 x 41mm, 2.5mm thick, Type 316 stainless steel for use outdoors with stainless steel hardware and fittings.. |
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PART 3 - EXECUTION

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| <u>3.1 Installation</u> | .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, Type 316 stainless, as required. |
|                         | .3 | Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated, or as required to support conduit and cable runs.             |
|                         | .4 | Do not use wire lashing or perforated strap to support or secure raceways or cables.   |
|                         | .5 | Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.               |
|                         | .6 | Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.        |

## 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.
  - .2 CSA C22.2 No.211.2 Rigid PVC (Unplasticized) Conduit.

## PART 2 - PRODUCTS

### 2.1 Conduits

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

### 2.2 Conduit Fastenings

- .1 One hole, stainless steel straps to secure surface conduits 50mm and smaller. Two hole, stainless steel straps for conduits larger than 50mm.

### 2.3 Conduit Fittings

- .1 Fittings: manufactured for use with conduit specified.
- .2 Factory "ells" where 90<sup>0</sup> bends are required for 25mm and larger conduit.

## PART 3 - EXECUTION

### 3.1 Installation

- .1 Install underground ducts and conduits on surfaces or embedded in concrete as indicated.
- .2 Use rigid PVC conduit except as noted and in areas subject to mechanical injury.
- .3 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .4 Install fish cord in empty conduits.
- .5 Remove and replace blocked conduit sections.

## PART 1 - GENERAL

- 1.1 Shop Drawings .1 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

## PART 2 - PRODUCTS

- 2.1 Panelboards .1 Panelboards: product of one manufacturer.  
.1 Service Entrance Type where indicated.  
.2 Install circuit breakers in panelboards before shipment.  
.3 In addition to CSA requirements, manufacturer's nameplate must show fault current that panel, including breakers, has been built to withstand.
- .2 250V panelboards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity unless noted otherwise.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Copper bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked grey enamel as per colour schedule.
- 2.2 Breakers .1 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

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| <u>2.3 Equipment Identification</u> | <ul style="list-style-type: none"><li>.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results – Electrical.</li><li>.2 Nameplate for each panelboard size 4, engraved as indicated.</li><li>.3 Nameplate for each circuit in distribution panelboards size 7, engraved as indicated.</li><li>.4 Complete circuit directory with typewritten legend showing location and load of each circuit.</li></ul> |
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PART 3 - EXECUTION

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| <u>3.1 Installation</u> | <ul style="list-style-type: none"><li>.1 Mount panelboard as indicated on drawings.</li><li>.2 Connect loads to circuits.</li><li>.3 Connect neutral conductors to common neutral bus with respective neutral identified.</li></ul> |
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## PART 1 – GENERAL

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| <u>1.1 Product Data</u> | .1 | Include time-current characteristic curves for breakers with ampacity 225A and over or with interrupting capacity of 22,000A symmetrical (rms) and over at system voltage. |
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## PART 2 - PRODUCTS

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|--|----|---|
| <u>2.1 Breakers</u><br><u>General</u>          | .1 | Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation.   |
|  | .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.   |
| <u>2.2 Thermal</u><br><u>Magnetic Breakers</u> | .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. |

## PART 3 - EXECUTION

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| <u>3.1 Installation</u> | .1 | Install circuit breakers in new panelboards as indicated. |
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PART 1 - GENERAL

1.1 References

Not used.

1.2 Shop Drawings  
and Product Data

.1 Submit Shop Drawings.

PART 2 - PRODUCTS

2.1 Lamps

.1 LED as indicated on drawings.

2.2 Luminaires

.1 120V exterior marine grade fixtures, NEMA spread as indicated on drawings.

PART 3 - EXECUTION

3.1 Installation

.1 Locate and install luminaires as indicated.

3.2 Luminaire  
Alignment

.1 Align luminaires as indicated.