TENDER DOCUMENTS

SUBSECTION 6.52

ELECTRICAL CABLES

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SUBSECTION 6.52 ELECTRICAL CABLES

6.52.1 GENERAL

6.52.1.1 This subsection sets out the requirements related to the supply and installation of electrical cables under this Contract.

6.52.1.2 Any specific requirements related to the supply and installation of electrical cables under this Contract are set out in Section 4 *Special Technical Conditions* and on the drawings.

6.52.1.3 The general requirements related to the supply and installation of conduit, junction boxes and pull boxes are set out in subsection 6.51 *Conduit, Junction Boxes and Pull Boxes.*

6.52.2 REFERENCE STANDARDS

6.52.2.1 The **Contractor** shall perform all work related to the supply and installation of electrical cables in accordance with the requirements of the following standards and documents to which the provisions of the Contract are added:

6.52.2.1.1 (CSA) Canadian Standards Association

- CAN/CSA-C22.2 NO. 0-M91 (R2006*) General Requirements – Canadian Electrical Code, Part II*;
- CAN/CSA C22.2 NO. 0.3-01 (R2005) *Test Methods for Electrical Wires and Cables*;
- CAN/CSA-C22.2 NO. 38-05 *Thermoset-Insulated Wires and Cables (Tri-National standard, with UL 44 and ANCE NMX-J-451)*;
- CAN/CSA-C22.2 NO. 65-03 *Wire Connectors (Tri-National standard, with UL 486A-486B and NMX-J-543-ANCE-03)*;
- CAN/CSA C22.2 NO. 131-07 *Type TECK 90 Cable;*
- CSA C22.10-07 *Québec Construction Code - Chapter V, Electricity - Canadian Electrical Code, Part I (Twentieth Edition) with Québec Amendments*

6.52.2.1.2 (EEMAC) Electrical Equipment Manufacturers Association of Canada

- 1Y-2, 1961, *CEMA Standard for Bushing Stud Connectors and Aluminium Adapters (1200 amp. max. rating)*.

6.52.2.1.3 National Electrical Manufacturers Association (NEMA)

- WC7-1988 *Cross-Linked Thermosetting-Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electric Energy*.

6.52.2.1.4 (MTQ) Ministère des Transports du Québec

- MTQ – *Cahier des charges et devis généraux (CCDG)*.

6.52.3 MATERIALS

6.52.3.1 GENERAL

6.52.3.1.1 Electrical cables shall be CSA approved.

6.52.3.2 ELECTRICAL CABLES TO BE INSTALLED IN CONDUIT

6.52.3.2.1 Electrical cables to be installed in conduit shall comprise multiple-strand copper conductors, the number and gauge of which meet the requirements set out on the drawings and in the *Special Technical Conditions*, in cross-linked thermo-set polyethylene insulation designed to carry 1,000 V. The cables shall be type RWU90 - XLINK -40^{o}C conforming to standards CAN/CSA-C22.2 NO. 38, CAN/CSA-C22.2 NO. 0, CAN/CSA C22.10 and NEMA WC7.

6.52.3.3 TECK ELECTRICAL CABLES

6.52.3.3.1 TECK electrical cables shall conform to standard CAN/CSA C22.2 No. 131.

6.52.3.3.2 TECK cables shall comprise multiple-strand copper conductors, the number and gauge of which meet the requirements set out on the drawings and in the *Special Technical Conditions*, in cross-linked thermo-set polyethylene insulation designed to carry 1,000 V. The cables shall be type RWU90 - XLINK -40^{o}C conforming to standards CAN/CSA-C22.2 NO. 0, CAN/CSA C22.10 and NEMA WC7.

6.52.3.3.3 TECK cables shall be covered with polyvinyl chloride inner and outer protective sheaths reinforced with metal armour made up of lock-formed aluminum tape.

6.52.3.4 CONNECTORS

6.52.3.4.1 Connectors shall be pressure connectors for 0-1,000V cables of a gauge appropriate to the copper conductors used; they shall meet the requirements set out on the drawings and in the *Special Technical Conditions* and shall conform to standards CAN/CSA-C22.2 NO. 65 and CEMA 1Y-2.

6.52.3.4.2 The connectors for TECK cables shall be watertight, approved by the manufacturer and suitable for TECK cables.

6.52.3.5 MARKING OF ELECTRICAL CABLES

6.52.3.5.1 Electrical cables shall be marked in indelible ink on the jacket at regular intervals not less than one metre. The following information shall appear: CSA logo, manufacturer's name or trademark, type of cable (RWU or TECK), 90ºC, -40ºC, 1,000 V, gauge and number of conductors.

6.52.4 EQUIPMENT AND TOOLS

6.52.4.1 Where a mechanical pulling device is needed to install electrical cables in conduit, the device shall be equipped with a dynamometer and a tension recorder.

6.52.5 EXECUTION OF WORK

6.52.5.1 PLANNING

6.52.5.1.1 At least fourteen (14) days before installation of cables begins, the **Contractor** shall submit to the Engineer for review and comment technical data sheets for the electrical cables, connectors and supports.

6.52.5.1.2 At least seven (7) days before installation of cables begins, the **Contractor** shall submit to the Engineer for review and comment the procedure for installing cables in conduit or TECK cables.

6.52.5.2 INSTALLATION OF ELECTRICAL CABLES IN CONDUIT

6.52.5.2.1 Before the electrical cables are installed, the conduit shall be cleaned with a brush.

6.52.5.2.2 At no time during installation shall the bend radius of the electrical cables exceed the maximum value recommended by the cable manufacturer. If pulleys have to be used, the diameter of the pulleys and the diameter of the "U" shall conform to the recommendations of the manufacturer of the electrical cables.

6.52.5.2.3 Where a mechanical pulling device is needed to install electrical cables in conduit, the tension shall not exceed the maximum tension recommended by the cable manufacturer. If necessary, intermediate pull points shall be planned.

6.52.5.2.4 Spliced electrical cables shall not be pulled through conduit.

6.52.5.2.5 All electrical cables running through the same conduit shall be pulled at the same time.

6.52.5.2.6 To reduce the pulling tension, the **Contractor** shall use CSA approved lubricants compatible with the jacket of the electrical cable in accordance with the cable manufacturer's recommendations.

6.52.5.2.7 A 6 mm twisted nylon pull cord with a tensile strength of 5 kN shall be left in each conduit after the electrical cables are installed.

6.52.5.3 INSTALLATION OF TECK ELECTRICAL CABLES

6.52.5.3.1 The **Contractor** shall attach the TECK cables securely to the structure using a fastening system as specified on the drawings and in the *Special Technical Conditions.*

6.52.5.4 IDENTIFICATION OF ELECTRICAL CABLES

6.52.5.4.1 The **Contractor** shall identify the ends of the conductors corresponding to the distribution of circuits in the junction and pulling boxes. The ends of the conductors shall be identified with numbered or coloured plastic tape with permanent indelible markings for each main line and each bypass circuit.

6.52.5.4.2 The colour code for identifying conductors shall be as follows:

6.52.5.4.2.1 green for the ground cable;

6.52.5.4.2.2 white or grey for the neutral cable;

6.52.5.4.2.3 black for L1 and red for L2 where the voltage is 120/240 V;

6.52.5.4.2.4 red for phase A, black for phase B and blue for phase C where the voltage is 347/600 V.

6.52.5.5 CONNECTORS

6.52.5.5.1 The ends of the conductors shall be carefully stripped and, if necessary, pressure connectors installed. The **Contractor** shall tighten the connector screws using a compression tool recommended by the manufacturer of the connectors. Installation shall conform to tightening tests carried out in accordance with standard CAN/CSA C22.2 NO. 65.

6.52.6 QUALITY CONTROL

6.52.6.1 GENERAL

6.52.6.1.1 Any work that is not performed as required by the drawings and specifications shall be corrected by the **Contractor** at its expense and to the satisfaction of the Engineer.

6.52.6.2 MEASUREMENT OF PULLING TENSION

6.52.6.2.1 Where a mechanical pulling device is needed to install electrical cables in conduit, the **Contractor** shall submit to the Engineer a copy of the tension measurements recorded using a dynamometer and tension recorder at the end of each work day during which cables were installed.

END OF SUBSECTION