

## **PART 1 - General**

### **1.1 RELATED SECTIONS**

- .1 Section 26 05 20 - Wire and Box Connectors (0 - 1000V).
- .2 Section 26 05 01 Common Work Results - For Electrical.

### **1.2 REFERENCES**

- .1 CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131-M89(R1994), Type TECK 90 Cable.

### **1.3 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

## **PART 2 - Products**

### **2.1 GENERAL**

- .1 Wire and cable shall conform fully to the latest specifications of the Canadian Standards Association (C.S.A.), Electrical and Electronic Manufacturers Association Of Canada (EEMAC), the Insulated Power Cable Engineers Association (IPCEA), and the American Society of Testing Materials (ASTM).

### **2.2 BUILDING WIRES**

- .1 Wiring on circuits exceeding 50 volts to ground shall be of soft drawn stranded copper of 98% conductivity and of full size and AWG gauge. Insulation shall be cross-linked polyethylene RW-90 rated 600 volts. Wiring shall be continuously colour coded as follows:
  - .1 Phase A Red
  - .2 Phase B Black
  - .3 Phase C Blue
  - .4 Neutral – White/Grey
  - .5 Ground Green
  - .6 Where extra colors are required for three way switches, etc., they shall be yellow.

- .2 Conductors pertaining to the wiring of thermostats, motorized valves, damper actuators, and electric pneumatic relays shall be stranded copper conductor of 95% conductivity and of full size and AWG gauge. Insulation shall be thermoplastic "TW" rated 600 volts. Colour code shall be orange and brown. Minimum size shall be No. 18 AWG.
- .3 Colour coding shall be by insulation colour as follows: Phase conductors on sizes up to and including No. 2 AWG. Neutral, ground and bond conductors on sizes up to and including No. 3/0 AWG. Approved coloured tape, in lieu of coloured insulation, may be used for phase conductors sized No. 1 AWG and larger, neutral, ground and bond conductors sized No. 4/0 AWG and larger.
- .4 ACM alloy conductors may be utilized for feeders 100A or above, size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.

### 2.3 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 Type: Chemically cross-linked thermosetting polyethylene rated type RW90, 600V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 FT6 rated.
- .6 Armour: interlocking aluminum.
- .7 Overall covering: thermoplastic polyvinyl chloride material.
- .8 Fastenings:
  - .1 One hole steel straps to secure surface cables 53 mm and smaller. Two hole steel straps for cables larger than 53 mm.
  - .2 Channel type supports for two or more cables at 1800 mm centers.
  - .3 Threaded rods: 12 mm diameter to support suspended channels.
- .9 Connectors:
  - .1 Watertight approved for TECK cable.

### 2.4 CONTROL CABLES

- .1 Type LVT: Soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket.

### **PART 3 - Execution**

#### **3.1 GENERAL**

- .1 The Contractor shall run all circuits so that the voltage drop, in no case exceeds 3% of the line volts. The neutral wire, wherever it is run shall be continuous with no fuses, switches, or breaks of any kind.
- .2 The installation of more than 3 conductors in a run of conduit is permissible provided C.E.C. Section 4-004(1) is adhered to with respect to the derating of the conductors.
- .3 The minimum conductor size for all 15-amp branch circuits is to be #12 AWG. For 15 amp 120 volt branch circuits, the following table shall be followed:

<b>Branch Circuit One-Way Length from Panel to Load (Including Vertical Drops)</b>	<b>Phase Wire Size</b>	<b>Dedicated Neutral Wire Size</b>	<b>Shared Neutral Wire Size</b>	<b>Bond Wire Size</b>
<b>Up to 24.38 m</b>	<b>#12 AWG</b>	<b>#12 AWG</b>	<b>#10 AWG</b>	<b>#12 AWG</b>
<b>24.68 m to 38.1 m</b>	<b>#10 AWG</b>	<b>#10 AWG</b>	<b>#8 AWG</b>	<b>#12 AWG</b>
<b>38.4 m to 56.38 m</b>	<b>#8 AWG</b>	<b>#8 AWG</b>	<b>#6 AWG</b>	<b>#10 AWG</b>

- .4 Oversized #10 AWG branch circuit wiring conductors to be extended to outlet box of device they feed. Oversized #8 or #6 AWG branch circuit wiring conductors to be extended from panelboard to junction box located on wall or in ceiling space directly above outlet or device they feed. A #8 or #6 AWG wire can be reduced to #10 AWG for vertical portion of drop only.
- .5 All "stranded" conductors are to be "twisted together" prior to any types of terminations taking place, but not necessarily limited to, some of the following areas:
  - .1 Receptacles.
  - .2 Light switches.
  - .3 Neutral terminal strips.
  - .4 Bonding terminal strips.
  - .5 Circuit breakers.
  - .6 Disconnect switches.
  - .7 Magnetic and manual starters.
  - .8 Magnetic contactors.
  - .9 Relays.
  - .10 Terminating lugs, etc.

#### **3.2 INSTALLATION OF BUILDING WIRES**

- .1 Where pulling wires and cables, the use of an approved lubricant only will be permitted. No wires or cables shall be pulled in conduits until such conduits are free from moisture and in no case shall wires be pulled until approval of the Departmental Representative is obtained.

- .2 All various types of cables are to be installed parallel or perpendicular to building lines and shall be adequately secured to the building structure at not more than 60" intervals or as otherwise indicated, in such a manner as to ensure they are protected from potential types of mechanical damage occurring. Install independent supports for cabling in ceiling spaces, and do not use those of other trades. Do not secure cables to mechanical systems piping or ducts, suspended ceiling support wires, etc.. The laying of "unsupported" cables of any types whatsoever directly atop ceiling grid system is strictly prohibited.
- .3 Install and secure surface cables directly to underside of metal decking and/or ceiling slab where installed in any concealed ceiling spaces.
- .4 Cables are "always" to be installed as high as possible to underside of structure.
  - .1 Where cables are installed in same direction as steel joists, they are also to be secured as high as possible to underside of metal decking and/or structure. Do not install cables in the upper portions of any Q-Decking.
- .5 The grouping together of cables to form a "bundle" for securing purposes is acceptable provided that the following procedures are adhered to.
  - .1 In addition to securing cables at 1500mm intervals to structure, multiple or bundled groups of cables (including low voltage types), shall be tyewrapped together at mid-point between each structure support, or every 760mm. Secure to structure at 1500mm intervals, and secure together (between structure supports) at 1500mm intervals.
- .6 After all wiring devices have been installed, the Contractor shall test all systems to make sure there are no grounds, leaks, or shorts. Such tests shall be performed to the satisfaction of both the inspection authority having jurisdiction and the Departmental Representative.

### **3.3 INSTALLATION OF TECK CABLES 0 -1000V**

- .1 Install cables.
  - .1 Group cables wherever possible on channels.
- .2 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - 0 - 1000 V.

### **3.4 INSTALLATION OF CONTROL CABLES**

- .1 The installation of "surface" wiring on walls or in open (non-enclosed) type ceilings, shall be Type EMT conduit complete with associated steel type connectors and couplings.
- .2 EMT conduit is to be extended to within 610 mm of "all" various control devices associated with the operation of any given piece of mechanical equipment.
- .3 Unless specifically indicated otherwise, liquid tight, flexible metal type conduit complete with steel type connector and steel locknut may be used for the "final" 610 mm connection between the end of the EMT conduit and the applicable control device.

- .4 EMT or PVC type conduit "wall stubs" complete with flush installed device box shall be installed in all masonry or concrete partitions where, and as may be required, where plenum rated cabling is used.
- .5 EMT connectors complete with nylon insulated throat or threaded type bushing shall be installed on end of EMT stub above "finish" type ceilings, etc., where plenum rated cabling is used.
- .6 All EMT conduit stubs are to be "bonded" to ground as per CEC.
- .7 Ground control cable shield.

### **3.5 STRANDED CONDUCTORS**

- .1 All stranded conductors prior to terminating under device bolts such as circuit breakers, switches, receptacles, etc., are to be twisted together so as to form a single conductor to ensure a reliable mechanical connection.

### **3.6 CAPACITIVE LEAKAGE WIRING METHODS**

- .1 The following wiring methods detailed below are designed to enhance the ability of the Owner to perform capacitive leakage tests in the future:
  - .1 All circuit conductors are to be individually ty-wrapped to their corresponding labelled neutral conductor in all panelboards, pull boxes and junction boxes. Enough slack conductor length should be left to enable the ability to clamp the ground detector around the individually ty-wrapped circuit conductor and its corresponding labelled neutral. This wiring method is to be neat and of good workmanship quality.
  - .2 The ty-wrapping of the neutral with its respective phase conductors is to be made at the closest point of entry into panelboards, pull boxes and junction boxes.
  - .3 The main switchboard, CDP's, panelboards, etc. are have their respective feeder phase and neutral conductors ty-wrapped together with enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality. This ty-wrapping is to be located such that ease of clamping the ground detector can be accomplished without excessive exposure to live bussing.
  - .4 After all electrical wiring has been completed by the Electrical Sub-Contractor, he is to test the grounded electrical distribution system to ensure there are no ground shorts or grounds.
  - .5 All feeders or branch circuits which do not have neutral conductors are to have their respective phase conductors ty-wrapped together in accordance to the methods described previously.

**END OF SECTION**