

**Part 1 General****1.1 RELATED SECTIONS**

- .1 Section 01 00 10 – General Instructions
- .2 Section 07 84 00 – Firestopping.
- .3 Section 26 05 00 – Common Work Results for Electricity.
- .4 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.
- .5 Section 26 05 29 - Hangers and Supports for Electrical Systems.
- .6 Section 26 05 31 - Splitters, Junctions, Pull Boxes and Cabinets.
- .7 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .8 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .9 Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM B33-04, Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes.
  - .2 ASTM B172-01a(2007)e1, Standard Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors.
  - .3 ASTM B174-02(2007)e1, Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
- .2 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-09, Canadian Electrical Code, Part 1 (21<sup>st</sup> Edition), Safety Standard for Electrical Installations
  - .2 CSA C22.2 No. 0.3-09, Test Methods for Electrical Wires and Cables.
  - .3 CAN/CSA-C22.2 No. 131-07, Type TECK 90 Cable.
- .3 Insulated Cable Engineers Association, Inc. (ICEA), National Electrical Manufacturer's Association (NEMA)
  - .1 ANSI/NEMA WC70-2009 / ICEA-S-95-658-2009, Para 4.1.11. Power Cables, 2000 Volts or Less for the Distribution of Electrical Energy.

**1.3 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 00 10 – General Instructions.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 00 10 – General Instructions.

- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal all packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

## **Part 2 Products**

### **2.1 BUILDING WIRES**

- .1 Conductor material (wire in conduit): Annealed commercial grade, 98% conductivity, copper. #14 to #10 AWG solid; #8 and larger - stranded.
- .2 Unless otherwise shown on the drawings or specified herein, provide conductors for circuits protected at 40 amperes and higher with insulation as follows:
  - .1 At 250 V and lower, RW90
  - .2 At greater than 250 V and less than 750 V in sizes up to #3 AWG = RW90
  - .3 For wiring systems at greater than 250 V and less than 750 V in sizes above #3 AWG, RWU 90 1000V.
  - .4 For circuits protected at less than 40 amperes Copper conductors: size as indicated, with thermoplastic insulation type TWU or TWH, as indicated, rated at 600 V.
  - .5 Colour Coding:
    - .1 Two (2) conductors, (1 phase): 1 black, 1 white
    - .2 Three (3) conductor, (1 phase): 1 black, 1 red, 1 white
    - .3 Three (3) conductor, 3 phase: 1 red (phase A), 1 black (phase B), 1 blue (phase C)
    - .4 Four (4) conductor, (3 phase): 1 red (phase A), 1 black (phase B), 1 blue (phase C), 1 white (neutral)
    - .5 Ground wire: green

### **2.2 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, 1000 V, as indicated.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking galvanized steel.
- .6 Overall covering: thermoplastic polyvinyl chloride material.

- .7 Fastenings:
  - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  - .2 Channel type supports for two or more cables at 900 mm centers or cable tray, as indicated.
  - .3 Threaded rods: 6 mm dia. to support suspended channels, or cable tray.
- .8 Connectors:
  - .1 Watertight approved for TECK cable

## **2.3 FLEXIBLE LOCOMOTIVE AND CAR EQUIPMENT CABLE (DLO)**

- .1 Single conductor cables for installation in conduit in accordance with the following:
  - .1 Conductor: tin coated annealed copper as per ASTM B33 and B-172 or B-174.
  - .2 Separator – opaque separator tape.
  - .3 Insulation- Ethylene Propylene rubber (EPR) rated to CSA Requirements for minimum 1000V for operation at 90°C in wet or dry locations.
  - .4 Jacket – chlorosulfonated polyethylene (CSPE) conforming to ICEA-S-95-658 Para 4.1.11. Non-Shielded Power Cable, 2000 Volts or Less.
  - .5 Print legend in white ink indicating: size, insulation type, temperature and voltage rating to CSA standard.
- .2 Current carrying capacity and size in accordance with CEC Table 2 Column 4 as indicated on the drawings.

## **2.4 ARMOURED CABLES**

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel strip.
- .4 Connectors: malleable steel

## **2.5 CONTROL CABLES**

- .1 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type TW with shielding of tape coated with paramagnetic material over all conductors and overall covering of PVC jackets or interlocked armour of flat galvanized steel and overall PVC jacket.
- .2 600 V stranded annealed copper conductors, sizes as indicated with PVC insulation type TW, where indicated, with shielding of magnetic tape over all conductors and overall covering of thermoplastic jacket with sheath of interlocked armour and jacket over sheath of PVC.

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**Part 3            Execution****3.1            INSTALLATION OF BUILDING WIRES**

- .1    Install wiring as follows:
  - .1       In conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

**3.2            INSTALLATION OF CONDUCTORS IN CONDUIT**

- .1    Conductors:
  - .1       Minimum wire size shall be #12 AWG unless otherwise specified.
  - .2       The current carrying capacity of the circuit conducts shall be equal to or better than shown on the drawings.
  - .3       Neutral Wire: full capacity continuous throughout its length.
  - .4       When load or breaker ratings are greater than 15A, the conditions shall be as indicated or of capacity equal to the load or breaker trip size as determined by the Canadian Electrical Code.
  - .5       Provide pigtails at all outlets for fixtures and wiring devices. All neutrals and branch circuits shall be connected in each outlet box to avoid a break in the neutral or the circuit wire when fixture or wiring device is disconnected.
  - .6       All branch circuit connections shall be made with an approved connector applied with a proper tool.
  - .7       Run a green insulated ground wire in all power and branch circuit EMT conduits. At each junction, pull and outlet box make a 360° loop of the stripped (insulation) uncut conductor under the ground screws.
- .2    Testing and Commissioning:
  - .1       Complete the following insulation resistance tests on the new feeders:
    - .1           Megger circuits, feeders and equipment up to 350 V with a 500-V instrument.
    - .2           Megger 350-600-V circuits, feeders and equipment with a 1000-V instrument.
    - .3           Check resistance to ground before energizing.
    - .4           Carry out the tests in the presence of the Departmental Representative.
    - .5           Provide the instruments, meters, equipment and personnel required to conduct the tests during and at the conclusion of the project.
    - .6           Submit the typewritten test results for the Departmental Representative's review.

**3.3            INSTALLATION OF TECK CABLE 0-1000V**

- .1    Install cables in cabletroughs.
- .2    Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - 0-1000V.

**3.4            INSTALLATION OF CONTROL CABLES**

- .1        Install control cables in conduit, underground ducts, as indicated.
- .2        Ground control cable shield.

**END OF SECTION**