

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 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .7 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .8 Section 28 31 00.02 - Multiplex Fire Alarm and Voice Communication Systems.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM B33-10 (2014), Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes.
 - .2 ASTM B172-10 (2015), Standard Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors.
 - .3 ASTM B174-10 (2015), Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
- .2 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations
 - .2 CSA C22.2 No. 0.3-09 (R2014), Test Methods for Electrical Wires and Cables.

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 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 MINERAL-INSULATED CABLES

- .1 Conductors: solid bare soft-annealed copper, size as indicated.
- .2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.
- .3 Outer covering: annealed seamless copper sheath, Type LWMI rated 300 V, 250°C.
- .4 Overall jacket: none.
- .5 Two hour fire rating.
- .6 Connectors: watertight, field installed and tested approved for MI cable.
- .7 Termination kits: field installed approved for MI cable.

2.3 FIRE ALARM SYSTEM WIRING

- .1 Conductors shall be solid copper.
- .2 Conductors shall conform to sizes indicated by manufacturer, but in any case, the minimum size of any conductor from transponder cabinet to devices shall be:
 - .1 For alarm receiving circuits and remote annunciator #16 gauge FAS. In no case shall the wire resistance in these circuits exceed 50 ohms.
 - .2 For addressable initiate circuits #18 gauge FAS twisted unshielded conductors run in separate conduit systems.

- .3 For signal/paging circuits min. #14 gauge FAS twisted unshielded 3 pair run in separate conduit system. Connect speakers in each area wired for A&B signal circuits and include spare conductors for future visual alarm strobes.
- .4 24 volt power wiring to addressable input and control modular shall be min. #14 gauge FAS. Verify with the equipment manufacturer.
- .3 Multiplex risers - #14 gauge FAS, twisted pair, shielded, mineral insulated (M.I.) copper jacketed cable. Cables ULC rated 2 hours.

2.4 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.

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 conductors 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 FIRE ALARM SYSTEM WIRING

- .1 All wiring shall be installed in E.M.T.
- .2 Install wiring in conformance with the requirements of the Canadian Electrical Code, Part 1, and applicable Provincial Codes.
- .3 All wiring shall be identified by coded markers at outlets and pull boxes. **There shall be no joints in the Fire alarm System wiring. All connections shall be made only at device terminals.**
- .4 The wiring of the life safety systems shall be terminated on coded terminal blocks at all control panels. Prepare composite record drawings, in riser form, showing every junction terminal block and identifying all colour and number codes. Submit these drawings with as built records.

3.4 MINERAL INSULATED CABLE

- .1 Install all surface mounted MIC cable parallel to building lines in a neat manner.
- .2 Follow manufacturer's recommendations. Pay all costs for manufacturer's onsite training of contractor's personnel. Provide two separate training sessions covering all aspects of cable handling, installation, termination, connections, shaping and testing.
- .3 Pay all costs for manufacturer's periodic site inspection and testing of cable and termination installation. Provide written reports. Correct all noted deficiencies.
- .4 Use specific approved tools for working with cables.
 - .1 Install cable neat, straight with smooth bends and offsets. Remove excess cable. Do not splice cable. Cables shall be continuous from source to load/equipment terminations.
 - .2 Provide approved metal clips and straps for 1 or 2 cables (600 mm on centre).
 - .3 Provide approval metal strapping band with bracket for 3 or more cables (1000 mm on centre).

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3.5 INSTALLATION OF MINERAL-INSULATED CABLES

- .1 Install cable concealed, securely supported by hangers.
- .2 Support 2 hour fire rated cables at 1 m intervals.
- .3 Make cable terminations by using factory-made kits.
- .4 Cable terminations: use thermoplastic sleeving over bare conductors.
- .5 Do not splice cables unless indicated.

3.6 INSTALLATION OF CONTROL CABLES

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

END OF SECTION