

## **1 General**

### **1.1 RELATED SECTIONS**

- .1 Section 26 05 00 - Common Work Results - Electrical.

### **1.2 REFERENCES**

- .1 Canadian Standards Association, (CSA)
- .2 Insulated Cable Engineers Association, Inc. (ICEA)

## **2 Products**

### **2.1 CABLE PROTECTION**

- .1 38 x 140 mm planks pressure treated with copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

### **2.2 MARKERS**

- .1 Concrete type cable markers: 600 x 600 x 100 mm with the words: "cable", "joint" or "conduit" impressed in top surface, and with arrows to indicate change in direction of cable and duct runs.
- .2 Wooden post type markers: 89 x 89 mm, 1.5 m long, pressure treated with copper naphthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing cable or conduit to indicate depth and direction of duct and cable runs.
  - .1 Nameplate: aluminum anodized 89 x 125 mm, 1.5 mm thick mounted on cedar post with mylar label 0.125 mm thick with words Cable, Joint or Conduit with arrows to indicate change in direction.

### **2.3 MARKER TAPE**

- .1 Metal detectable polyethylene marker tape: 75 mm wide for direct burial.
- .2 Marker tape to be red in colour with the words "CAUTION ELECTRIC LINE BURIED BELOW" in large black letters.

### **2.4 SEALANT**

- .1 Low VOC mastic compound.

## **3 Execution**

### **3.1 DIRECT BURIAL OF CABLES**

- .1 After sand bed specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.
  - .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
  - .3 Make termination and splice only as indicated leaving 0.6 m of surplus cable in each direction.
    - .1 Make splices and terminations in accordance with manufacturer's instructions using approved splicing kits.
  - .4 Underground cable splices not acceptable.
  - .5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
  - .6 Cable separation:
    - .1 Maintain 75 mm minimum separation between cables of different circuits.
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- .2 Maintain 300 mm horizontal separation between low and high voltage cables.
- .3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.
- .4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.
- .5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.
- .6 Install treated planks on lower cables 0.6 m in each direction at crossings.
- .7 After sand protective cover specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run.

### **3.2 CABLE INSTALLATION IN DUCTS**

- .1 Install cables as indicated in ducts.
  - .1 Do not pull spliced cables inside ducts.
- .2 Install multiple cables in duct simultaneously.
- .3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .5 Pull mandrel through and clean each section of conduit prior to installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

### **3.3 MARKERS**

- .1 Mark cable every 150 m along cable runs and changes in direction.
- .2 Mark underground splices.
- .3 Where markers are removed to permit installation of additional cables, reinstall existing markers.
- .4 Install wooden post type markers.
- .5 Lay concrete markers flat and centered over cable with top flush with finish grade.

### **3.4 MARKER TAPE**

- .1 Install marker tape 300 mm below grade as indicated, continuous over full length of cables and ducts.

### **3.5 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and Section 01 91 13 - Commissioning (Cx) Requirements.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests for incoming service feeders and wiring to distribution panels.
  - .1 After installing cable but before splicing and terminating, perform insulation resistance test with megger on each phase conductor.
  - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests

- .1 Ensure that terminations and accessory equipment are disconnected.
- .2 Ground shields, ground wires, metallic armour and conductors not under test.
- .3 Leakage Current Testing.
  - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
  - .2 Hold maximum voltage for specified time period by manufacturer.
  - .3 Record leakage current at each step.
- .7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test. Include results in Commissioning Manual.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

**END OF SECTION**