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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | February 19, 2010 | Modified ‘Related Sections’ |
| 3 | March 21, 2011 | Minor edits |
| 4 | June 3, 2013 | Final Draft – Consolidated Comments Spec Update Project |
| 5 | June 18, 2013 | Incorporation of new Commissioning and Computerized Maintenance Management System Data Requirements Specification cross references. |
| 6 | July 29, 2014 | Changes to reflect renaming of commissioning specification and final review (AV) |
| **7** | **February 9, 2015** | **Updated, Finalized Specification – Reference eDOCS #5630522 v7 (AV)** |
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NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

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**The on-line copy is the current version of the document.**

# GEneral

## Related Sections

### Section 01810 – Equipment Testing and Facility Commissioning

### Section 02315 - Excavating, Trenching and Backfilling

### Section 16010 - Equipment General Requirements

### Section 16031 – Inspection and Testing

## Measurement and Payment

### All costs associated with the work of this Section shall be included in the price(s) for Item No(s). \_\_\_ in the Bid Form.

# PRODUCTS

## Cable Protection For 600 Volts

### Use 38 mm x 140 mm planks pressured treated where underground conduits are buried less than 760mm deep.

## Markers

### Concrete type cable markers: 600 mm x 600 mm x 100 mm with the words: cable, joint or conduit impressed in the top surface, with arrows to indicate change in direction of cable and duct runs.

# EXECUTION

## Direct Burial of Cables

### After the sand bed specified in Section 02315 - Excavating, Trenching and Backfilling, is in place, lay cables maintaining a clearance of 75 mm from each side of the trench to the nearest cable. Do not pull cable into the trench.

### Buried cable shall comply with RWU90 specifications with confirmation of voltage limitations.

### 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.

### Underground cable splices are not acceptable. Splices of any kind related to cables in trenches and/or ducts, in any location are not acceptable.

### The minimum permitted radius at cable bends for rubber or plastic covered cables is 8 times the diameter of the cable; and for metallic armoured cables is 12 times the diameter of the cable or in accordance with the manufacturer's instructions.

### Cable separation:

#### Maintain a minimum separation of 75 mm between cables of different circuits.

#### Maintain a horizontal separation of 300 mm between low and high voltage cables.

#### When low voltage cables cross high voltage cables, maintain vertical separation of 300 mm of with low voltage cables in the upper position.

#### At crossovers, maintain a minimum vertical separation of 75 mm between low voltage cables and 300 mm between high voltage cables.

#### Maintain a minimum lateral and vertical separation of 300 mm for fire alarm and control cables when crossing other cables, with fire alarm and control cables in the upper position.

#### Install treated planks on lower cables 0.6 m in each direction at crossings.

## Cable Installation In Ducts

### Install cables in ducts as indicated in the Contract Documents. No lead covered cables are permitted.

### Do not pull spliced cables inside ducts.

### Install multiple cables in duct simultaneously.

### Use CSA approved lubricants of a type compatible with the cable jacket to reduce pulling tension.

### To facilitate the matching of colour coded multi-conductor control cables reel off in the same direction during installation.

### Before pulling cable into ducts and until cables are properly terminated, seal ends of non-leaded cables with moisture seal tape. No lead covered cables shall be permitted.

### After the installation of cables, seal duct ends with a duct sealing compound.

## Markers

### Mark cables every 150 m along cable runs and at changes in direction.

### Where markers are removed to permit the installation of additional cables, reinstall existing markers.

### Use concrete type markers.

### Lay concrete markers flat and centered over cable with the top flush with the finish grade.

## Field Quality Control

### Perform tests in accordance with Section 16010 - Electrical General Requirements.

### Perform tests using qualified personnel. Provide necessary instruments and equipment. Refer to Section 16031 – Inspection and Testing.

### Check phase rotation and identify each phase conductor of each feeder.

### Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 mega-ohms.

### Pre-acceptance tests

#### After installing cable and terminating, perform the insulation resistance test with 1000 V megger on each phase conductor.

#### Check insulation resistance after each termination to ensure that the cable system is ready for acceptance testing.

### Acceptance Tests

#### Ensure that all terminations and accessory equipment are disconnected.

#### Ground all shields, wires, metallic armour and conductors which are not being tested.

#### Megger Testing:

##### Megger test all 600 V power cables in accordance with the manufacturer’s specifications.

### Provide the Consultant with a list of all test results showing the location at which each test was performed, the circuit tested and the result of each test. Refer to Section 16031 – Inspection and Testing.

### Remove and replace the entire length of cable if the cable fails to meet any of the test criteria at no additional cost to the Region.

### For system commissioning requiring the use of all cables in trenches and/or ducts, installation and testing of all cables must be completed prior to the commencement of commissioning. Refer to Section 01810 – Equipment Testing and Facility Commissioning.

**END OF SECTION**