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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.

**Notice:** This Document hardcopy must be used for reference purpose only.

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

# GEneral

## Related Sections

### [Under "Related Sections", identify other Sections that are related to, and/or dependent on, the work results or information specified elsewhere. The list should be limited to Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. For example, if hardware for aluminum entrances is specified in the aluminum entrance Section, a cross-reference would be appropriate in the finish hardware Section. The purpose of this cross-referencing is for information only, to aid in finding those other requirements—not to define the scope of the Section.

### Cross-referencing here may also be used to coordinate assemblies or systems whose components may span multiple Sections and which must meet certain performance requirements as an assembly or system.

### Contractor is responsible for coordination of the Work. Contractor is responsible for being familiar with and incorporating all required elements of cross-referenced Specifications cited.

### This Section is to be completed/updated during the design development by the Consultant. If it is not applicable to the section for the specific project it may be deleted.]

### [List Sections specifying installation of products supplied but not installed under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Execution requirements for ...[item]... specified under this Section.

### [List Sections specifying products installed but not supplied under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Product requirements for ...[item]... for installation under this Section.

### [List Sections specifying related requirements.]

### Section 01810 – Equipment Testing and Facility Commissioning

### Section 02315 - Excavating, Trenching and Backfilling

### Section 16010 - Equipment General Requirements

### Section 16031 – Inspection and Testing

### [Division 13 – SCADA and Instrumentation - insert applicable specifications]

### Product requirements for [item]... for installation under this Section.

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

### The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

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

*If the work of this Section is to be measured and paid for by several different methods, please amend the standard wording given above to reflect the different methods of measurement and payment.*]

# PRODUCTS

## Cable Protection For 600 Volts

### Use 38 mm x 140 mm planks pressured treated.

## 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.

### Make termination and splice only as indicated [*Consultant to provide additional details regarding termination and splicing*] leaving [0.6] m of surplus cable in each direction.

### 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 [x] 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 [150] 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.

### After the sand protective cover specified in Section 02315 - Excavating, Trenching and Backfilling is in place, install a continuous row of overlapping 38 mm x 140 mm pressure treated planks and interlocking cable blocks as indicated in the Contract Documents to cover the length of the run.

## Cable Installation In Ducts

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

### Do not pull spliced (if applicable) cables inside ducts. Note [subsection 3.1.5] above.

### 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**