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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | February 19, 2010 | Modified ‘Related Sections’ and approved suppliers |
| 3 | March 23,2011 | Minor edits |
| 4 | June 4, 2013 | Final Draft – Consolidated Comments Spec Update Project |
| 5 | June 18, 2013 | Incorporation of new Commissioning Specification cross reference. Incorporated several aspects of the NL building specifications. |
| 6 | July 30, 2014 | Changes to reflect renaming of commissioning specification and final review (AV) |
| **7** | **November 17, 2014** | **Updated, Finalized Specification – Reference eDOCS #5630513 v5 (AV)** |
| 8 | February 2, 2015 | Updated standards (IEEE 837-2014) |
| 9 | February 10, 2017 | Removed named manufacturers and replaced them with performance based specifications. (CPD PMO, OMM) (AV) |

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

### 1. Grounding conductors for all distribution grounding to be insulated copper, un-insulated where in contact with earth. Copper conductors shall, at a minimum, be used in the following areas: grounding of transformer neutrals, service entrance switch ground of neutral, pad mount transformer grounding, ground rider conductors from main ground station to sub-closets, telephone and data system grounds and circuits rated less than 60 amps.

### [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 [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

### Section 01425 - Computerized Maintenance Management System Data Requirements

### Section 01810 - Equipment Testing and Facility Commissioning

### Section 16010 – Electrical General Requirements

### Section 16450 – Grounding- Secondary

### [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.*]

## References

### Comply with the latest edition of the following statutes, codes, standards, and all amendments thereto:

#### American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE)

##### ANSI/IEEE 837-2014, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

#### CSA [Consultant to add specific applicable standards from CSA to this subsection]

##### CSA C22.2 NO. 41-13, Grounding and Bonding Equipment (Tri-national standard, with NMX-J-590-ANCE and UL 467).

##### Ontario Electrical Code (OEC)

#### ESA [Consultant to add specific applicable standards from ESA to this subsection]

# PRODUCTS

## Ground Fault Indicator

### Adjustable ground-fault delays from 0.2 sec to 0.6 sec.

### Adjustable ground-fault pickup levels from 20A to 200A.

### UL/ULC and CSA approved.

### [Consultant to review and amend as required]

## Equipment

### Provide all equipment information in accordance with Section 01425 - Computerized Maintenance Management System Data Requirements.

### Clamps for grounding of conductor: size as required for connection to electrically conductive underground water pipe and meeting Canadian Electrical Code, Ontario Edition.

### Copper conductor: a minimum of [6] m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated in the Contract Documents.

### Rod electrodes: copper clad steel, 19 mm in diameter by 3 m long.

### Plate electrodes: copper surface area of 0.2 square metres, 1.6 mm thick.

### Grounding conductors: bare stranded copper, tinned, soft annealed, of size as indicated in the Contract Documents.

### Insulated grounding conductors: green, type [\_\_\_\_\_\_]

### Ground bus: copper, size [as indicated on the Contract Drawings], complete with insulated supports, fastenings, and connectors.

### Non-corroding accessories necessary for the grounding system, type, size, and material as indicated in the Contract Documents, including but not necessarily limited to:

#### Grounding and bonding bushings.

#### Protective type clamps.

#### Bolted type conductor connectors, as required by the ESA.

#### Thermit welded type conductor connectors.

#### Bonding jumpers, straps.

#### Pressure wire connectors

# EXECUTION

## Installation General

### Install a complete permanent, and continuous grounding system including, electrodes, conductors, connectors, and accessories. Where Electrical Metallic Tubing (EMT) is used, run ground wire in the conduit.

### Install connectors in accordance with the manufacturer's instructions.

### Protect all exposed grounding conductors from mechanical injury.

### Make buried connections and connections to the conductive water main and electrodes, using permanent mechanical connectors or inspect able wrought copper compression connectors in accordance with ANSI/IEEE 837-2014.

### Installation shall be in accordance with the requirements of CSA C22.2 NO. 41-13.

### Use mechanical connectors for grounding connections to the equipment provided with lugs.

### Soldered joints are not permitted.

### Install bonding wire for flexible conduit, connected at both ends to the grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to the exterior of the flexible conduit.

### Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with the equipment.

### Install separate ground conductor to outdoor lighting standards.

### Connect building structural steel and metal siding to the ground by welding copper to steel.

### Make grounding connections in radial configuration only, with connections terminating at a single grounding point. Avoid loop connections.

### Bond single conductor, metallic armoured cables to the cabinet at the supply end, and provide a non-metallic entry plate at the load end.

### Ground secondary service pedestals.

## Electrical Utility Chambers

### Install a conveniently located grounding stud, electrode, size [\_\_\_\_\_\_] stranded copper conductor in each manhole.

### Install a ground rod in each manhole so that the top projects through the bottom of the manhole. Provide with a lug to which the grounding connection can be made.

## Electrodes

### Make ground connections to a continuously conductive underground water pipe on the street side of the water meter.

### Install a water meter shunt.

### Install concrete encased electrodes in the building foundation footings, with a terminal connected to the grounding network.

### Install rod and/or plate electrodes and make grounding connections.

### Bond separate, multiple electrodes together.

### Use size [ ] AWG copper conductors for connections to electrodes as required by Ontario Electrical Code.

### Make special provision for installing electrodes that will give [acceptable] resistance to the ground value where rock or sand terrain prevails. Ground as indicated in the Contract Documents.

## System and Circuit Grounding

### Install system and circuit grounding connections to the neutral of the primary 600 V system and secondary 120/240 V system.

## Equipment Grounding

### Install grounding connections to equipment including, but not limited to, the following: service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, and outdoor lighting.

## Grounding Bus

### Install a copper grounding bus mounted on insulated supports on the wall of the electrical room.

### Ground items of electrical equipment in the electrical room to the ground bus with individual bare stranded copper connections, size 4/0 AWG as required by Ontario Electrical Code.

## Communication Systems

### Install grounding connections for the telephone, sound, fire alarm, and intercommunication systems as follows:

#### Telephones: prepare the telephone grounding system in accordance with the *[Consultant to identify applicable telephone company]* requirements.

#### Sound, fire alarm, intercommunication systems as indicated in the Contract Documents.

## Field Quality Control

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

### Perform ground continuity and resistance tests using a method which is appropriate to the Site conditions and which meets the approval of the Consultant and ESA.

### Perform all required tests before energizing the electrical system.

### Disconnect the ground fault indicator during testing.

## Commissioning

### For all commissioning activities on systems where components of this Section are integral to functionality, refer to Section 01810 – Equipment Testing and Facility Commissioning. All inspection and testing activities shall be completed in accordance with the commissioning plan that shall be provided to the Consultant prior to the commencement of commissioning activities.

**END OF SECTION**