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**Part 1            General**

**1.1            RELATED SECTIONS**

- .1        Section 26 05 00 - Common Work Results for Electrical.
- .2        Section 27 05 26 - Grounding and Bonding for Communications Systems.

**1.2            REFERENCES**

- .1        American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE).
  - .1        ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.
- .2        CSA International.
- .3        American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE).
  - .1        ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Product Data:
  - .1        Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4            CLOSEOUT SUBMITTALS**

- .1        Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2        Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

**1.5            DELIVERY, STORAGE, AND HANDLING**

- .1        Deliver, store, and handle materials in accordance with manufacturer's written instructions.
- .2        Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3        Storage and Handling Requirements:
  - .1        Store materials off ground, indoors, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2        Store and protect grounding equipment from nicks, scratches, and blemishes.

- .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **1.6 ACCEPTABLE PRODUCTS AND MATERIALS**

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 Rod Electrodes: copper clad steel mm diameter by minimum 3 m long.
- .3 Grounding Conductors: bare stranded copper, tinned, soft annealed size as indicated.
- .4 Insulated Grounding Conductors: green, copper conductors, size as indicated.
- .5 Ground Bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .6 Ground bar for telecommunication systems: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .7 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

### **2.2 ACCEPTABLE PRODUCTS**

- .1 Thomas & Betts.
- .2 Burndy.
- .3 Erico.
- .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

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**Part 3            Execution**

**3.1                EXAMINATION**

- .1      Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
  - .1      Visually inspect substrate.
  - .2      Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3      Proceed with installation only after unacceptable conditions have been remedied.

**3.2                INSTALLATION GENERAL**

- .1      Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories.
- .2      Install connectors in accordance with manufacturer's instructions.
- .3      Protect exposed grounding conductors from mechanical damage.
- .4      Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5      Soldered joints not permitted.
- .6      Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .7      Install separate ground conductor to outdoor lighting poles.
- .8      Connect building structural steel and metal siding to ground by welding copper to steel.
- .9      Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .10     Ground secondary service pedestals.

**3.3                MAINTENANCE HOLES**

- .1      Install conveniently located grounding stud, electrode, size as indicated stranded copper conductor in each maintenance hole.
- .2      Install ground rod in each maintenance hole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements.

**3.4                ELECTRODES**

- .1      Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2      Install water meter shunt.

- .3 Install rod, electrodes and make grounding connections as indicated.
- .4 Bond separate, multiple electrodes together.
- .5 Use size 4/0 AWG copper conductors for connections to electrodes.
- .6 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

### **3.5 SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections.

### **3.6 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchboards, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, alternators, transfer switches, elevators and escalators, distribution panels, outdoor lighting, cable trays, variable frequency drives, lighting trusses, fuel reservoirs, and natural gas service entrance.

### **3.7 GROUNDING BUS**

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.
- .2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0AWG.

### **3.8 COMMUNICATION SYSTEMS**

- .1 Install grounding connections for sound, fire alarm, security systems, intercommunication systems as follows:
  - .1 Telephones: make telephone grounding system in accordance with Section 27 05 26 - Grounding and Bonding for Communications Systems and telephone company's requirements.
  - .2 Sound, fire alarm, security systems, intercommunication systems as indicated.

### **3.9 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

**3.10            CLEANING**

- .1        Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1            Leave Work area clean at end of each day.
- .2        Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**