

## **PART 1        GENERAL**

### **1.1            REFERENCES**

- .1     American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
  - .1     ANSI/IEEE 837-1989 (R1996), Qualifying Permanent Connections Used in Substation Grounding.
- .2     Canadian Standards Association, (CSA International)
- .3     CAN/CSA Z32-1999, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

### **1.2            WASTE MANAGEMENT AND DISPOSAL**

- .1     Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2     Collect and separate for disposal material for recycling in accordance with Waste Management Plan.
- .3     Divert unused metal materials from landfill to metal recycling facility as approved by the Departmental Representative.
- .4     Fold up metal banding, flatten and place in designated area for recycling.

## **PART 2        PRODUCTS**

### **2.1            EQUIPMENT**

- .1     Clamps for grounding of conductor: size as per the Canadian Electrical Code as required to electrically conductive underground water pipe.
- .2     Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as indicated.
- .3     Rod electrodes: copperclad steel, 19 mm dia by 3 m long.
- .4     Grounding conductors: bare stranded copper soft annealed, size as indicated.
- .5     Insulated grounding conductors: green
- .6     Ground bus: 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.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process or permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 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.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Connect building structural steel and metal siding to ground by welding copper to steel.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

### **3.2 ELECTRODES**

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.
- .3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
- .4 Install rod, electrodes and make grounding connections.

- .5 Bond separate, multiple electrodes together.
- .6 Use size 4/0 AWG copper conductors for connections to electrodes.
- .7 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails.

### **3.3 SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections to neutral of primary 600V system, secondary 208 V system.

### **3.4 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, distribution panels, outdoor lighting.

### **3.5 GROUNDING BUS**

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

### **3.6 COMMUNICATION SYSTEMS**

- .1 Grounding connections for telephone, data communications and fire alarm systems as follows:
  - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
  - .2 Fire alarm as per manufacturers specifications,
  - .3 Data communications systems to be grounded back to the main system ground with a #6 AWG grounding conductor.

### **3.7 FIELD QUALITY CONTROL**

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

**END OF SECTION**