

GROUNDING - SECONDARY

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 01 Common Work Results - Electrical.

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.

1.3 ACTION AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 26 05 01 Common Work Results - Electrical.
- .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 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and 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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer packaging materials in accordance with Section 01 74 21 – Construction Demolition Waste Management.

Part 2 Products

2.1 EQUIPMENT

- .1 Grounding equipment shall be to CSA C22.2 No. 41.

GROUNDING - SECONDARY

- .2 Clamps for grounding of conductors to be sized as required to make for an electrically conductive connection to water piping.
- .3 Insulated bonding conductors: green, copper conductors, size as indicated.
- .4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .5 Ground rods to be copper clad steel, not less than (10'-0") (3048 mm) long by (3/4") (19 mm) diameter.
- .6 All ground rod clamps and fittings to be bronze or brass.
- .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 Compression welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 All equipment and exposed non-current-carrying metal, conduits and parts shall be permanently and effectually grounded to meet minimum requirements of the Canadian Electrical Code, and as indicated on the drawings and further specified. Standards set either by drawings or specifications which are above those covered by the CEC shall not be reduced under any circumstances.
- .2 Install complete permanent, continuous grounding system including, conductors, connectors, accessories. Where EMT is used, run bond wire in conduit.
- .3 Install connectors in accordance with manufacturer's instructions.
- .4 Protect exposed grounding conductors from mechanical injury.
- .5 Make buried connections, and connections to conductive water main, electrodes, using permanent inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .6 Use mechanical connectors for bonding connections to equipment provided with lugs.
- .7 Soldered joints not permitted.

GROUNDING - SECONDARY

- .8 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.
- .9 Connect building structural steel and metal siding to ground.
- .10 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

3.2 ELECTODES

- .1 Ground rods shall be buried in the locations as indicated on the drawings. The maximum resistance to ground of the entire system shall not exceed 10 Ohms, and additional ground rods shall be buried, as required, to attain this value.
- .2 A number 6 AWG insulated copper cable shall be run from the main distribution ground bus to the main water pipe and connected to the upstream side of the water meter. Water pipes shall be scraped and sanded to remove all scale, rust or paint at the location where the ground is to be made, and ground connections shall be tightened securely. Where water mains are not available, provide grounding electrode.
- .3 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 secondary 347/600V system and 120/208V system.
- .2 The main incoming ground conductor shall run unbroken to the service entrance distribution panel ground bus and then to the wall mounted ground bus.

3.4 EQUIPMENT BONDING

- .1 Install bonding connections to typical equipment included in, but not necessarily limited to following list:
 - .1 All panel ground busses.
 - .2 Transformers.
 - .3 Frames of motors.
 - .4 Motor control centres.
 - .5 Starters.
 - .6 Control panels.
 - .7 Cable trays.
 - .8 Structural steel.
 - .9 Wall mounted ground busses in electrical rooms and communications rooms.
 - .10 The metallic piping in domestic water systems.

GROUNDING - SECONDARY

- .11 The metallic piping in storm and sanitary waste systems.
- .12 The metallic piping in sprinkler systems.
- .13 Telephone service, as per the utility's standards.
- .14 Cable television service, as per the utility's standards.
- .2 Generally, minimum bonding shall be provided by the metallic conduit/outlet box system and by the bond wires in cables. Additional insulated bond conductors, sized as per the drawings, shall be provided as follows:
 - .1 In all EMT feeders that supply panelboards, CDP panels, FDP panels, MCCs and transformers – all sized as per CEC Table 16A.
 - .2 A separate green bond conductor sized as per Table 16A of the CEC shall be installed in each EMT conduit run for branch circuit wiring.
 - .3 A separate green bond conductor sized as per Table 16A of the CEC shall be installed in non-metallic conduit systems (i.e. – rigid PVC).
- .3 Where bond conductors terminate at ground busses in switchboards or panelboards, the connection shall be made with a compression lug, which shall be secured to the bus with nut, bolt and two Belleville washers. Size of bolts shall be to suit lug and shall be properly torqued and marked. One-hole short barrel (single crimp) lugs shall be used for wire sizes up to and including number 6 AWG. Two-hole long barrel (dual crimp) lugs shall be used for wire sizes number 4 AWG and larger.

3.5 GROUNDING BUS

- .1 Install copper grounding bus mounted on insulated supports on wall of the electrical room. Connections to these busses shall be via two-hole compression lugs.

3.6 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - 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.

END OF SECTION