SECTION 260526 – GROUNDING AND BONDING

1.0 All materials that are part of the grounding system shall be copper.

2.0 Underground grounding conductors shall be bare tinned-copper conductors, No. 4/0 AWG minimum.

3.0 Design professional shall document the work associated with the grounding system – reference to NEC only is unacceptable. The grounding system shall include the following grounding electrodes:

A. Building metal domestic water supply pipe (where applicable)

B. Building structural steel

C. Concrete Encased Electrode (see note below)

D. Perimeter ground loop around the entire building (#4/0 AWG minimum size).

Note: This is sometimes referred to as a "Ufer" ground. Normally, it consists of connections to encased reinforcing steel, minimum 20 foot length and not smaller than ½" diameter in the column footings, floor slabs and grade beams at approximately every 100 feet around building, and otherwise meeting the requirements stated in NEC article 250.

Ground rods tied to the perimeter ground loop shall be provided at the service entrance ground bus (triad), at each lightning protection system downcomer cable (when provided), at each perimeter building column and at each corner of the building. Known areas of high soil resistivity will be provided with additional ground rods or chemically enhanced ground rods, as required to achieve the specified grounding system performance.

4.0 Ground rods shall be copper-clad steel, 3/4 inch by 10 feet in diameter.

5.0 A separate equipment grounding conductor (EGC), sized in accordance with NEC requirements, shall be installed with all feeder and branch circuits. Reliance on the metallic conduit as the grounding means is unacceptable.

6.0 Isolated equipment ground conductors, if required, shall be connected to the building ground system at the separately derived supply transformer grounding location, or building service entrance, as applicable. The design shall be in accordance with NEC and IEEE Std.1100 (Emerald Book) guidelines.

7.0 All underground or concrete encased electrode grounding system connectors shall be of the exothermic welded type.

8.0 Grounding system connectors used in exposed work may be mechanical type, listed for use in grounding applications.

9.0 All manholes shall be equipped with ground rods and ground busbars. All medium voltage cable shields from spices and taps made in manholes shall be grounded in the manhole.

10.0 Design professional shall specify that the completed grounding systems meet the following ground resistance values.

A. Maximum ground resistance: 5 ohms.

Ground resistance testing shall be performed using the fall-of-potential method in accordance with IEEE Standard 81

11.0 Testing of the system shall be documented as part of the construction turnover materials, to verify conformance to design performance requirements. Include the following:

A. Perform “Fall-of-Potential Method” to determine that the proper ground resistance has been achieved, and submit a written report of ground resistance. Ensure that sufficient spacing between the test set current probe and the grounding electrode under test is achieved.

B. Test grounding resistance of all exterior steel building columns and above ground portion of underground metal water piping systems (within five feet of entrance into building) using “Fall-of-Potential” testing method according to IEEE Std. 81.

1. “Fall-of-Potential” testing shall be done not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage.

C. Perform point-to-point tests to determine resistance between the main grounding system and all major electrical frames, system neutral, and derived neutral points. Perform tests using clamp-on digital ground resistance tester with 2% accuracy or better.

D. Perform ground fault protection system functional testing for distribution equipment having ground fault protection and for any generator system.

E. Perform ground continuity and functional tests:

1. From main switchgear to grounding electrode and/or cold water main.
2. Between each main secondary feeder switchboard ground and its termination point (distribution panels, panelboards, motor control centers, UPS systems, electric heater disconnects, chiller starters, and other such equipment) and all feeders shown on single-line diagram.
3. Between each distribution panel to panelboards and between each panelboard to panelboard (excluding branch circuits).
4. Test each branch circuit receptacle for proper polarity and ground using a plug-in test device.

12.0 Site design shall include test wells for underground grounding loop in at least two (2) locations.