SECTION 16452

GROUNDING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with grounding of the electrical system as required by and as is indicated herein and/or on the Drawings.

B. Main electric service equipment, raceways, motors, panelboards and other electrical equipment shall be effectively and permanently grounded to a grounding electrode. This electrode shall be the nearest available effectively grounded structural metal member of the structure or the nearest available effectively grounded metal water pipe and also a driven rod. Grounding connections and conductor sizes shall be in accordance with requirements of the National Electrical Code, Article 250, and local ordinances, and as described herein.

C. The building system shall be grounded through the piling rebar. An anchor bolt shall be electrically connected to the vertical rebar in the piling.

D. A separate grounding conductor, sized in accordance with NEC Table 250-95 shall be provided in the conduit with the circuit conductors for all feeder and receptacle circuits. Branch circuits supplying lighting loads may use the conduit system for ground conductor. The grounding conductor may be bare or insulated copper; however, if this conductor is insulated, the insulating covering shall be a green color. Conduit runs shall be increased in size where necessary to accommodate the grounding conductor in addition to circuit conductors. The electrical continuity of all conduit runs shall be verified and corrected where necessary.

E. Additional grounding conductors and conduit shall be provided as specified herein or shown on the drawings. All conduit for grounding system conductors, not run in conduit with circuit conductors, shall be rigid steel conduit.

F. All electrical equipment enclosures and conductor enclosures shall be grounded. This includes but is not limited to metal raceways, outlet boxes, cabinets, switch boxes, motor frames, transformer cases and metallic enclosure for all electrical equipment.

G. Under no circumstances shall neutral conductors again be grounded after they have been grounded once at the transformer secondary.

H. Panelboards shall be equipped with a neutral bar which is insulated from the enclosure, and a grounding bar which is bonded to the enclosure. The grounding bar shall provide for terminating the green equipment grounding conductors in the panelboard or motor control

center cabinets. The grounding bar shall be bonded to the cabinet. Neutral busses shall be isolated from ground except at the transformer ground connection.

I. Types of grounding in this section includes the following:

1. Underground metal piping.
2. Underground metal water piping.
3. Underground metal structure.
4. Metal building frames.
5. Grounding electrodes.
6. Separately derived systems.
7. Service equipment.
8. Enclosures.
9. Systems.
10. Equipment.

J. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

PART 2 - PRODUCTS

2.1 GROUNDING – GENERAL

A. Materials and Components:

1. General: Except as otherwise indicated, provide electrical grounding and bonding systems indicated, with assembly of materials including, but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, surge arrestors and other items and accessories needed for complete installation. Where more than one type meets indicated requirements, selection is Installer's option. Where materials or components are not otherwise indicated, comply with NEC, UL and IEEE requirements and with established industry standards for applications indicated.
2. Provide conduit, tube, duct and fittings complying with other Division 16 sections.
3. Bonding Jumper Braid: Copper braided tape, constructed of 30-gage bare copper wires and properly sized for indicated applications.
4. Flexible Jumper Strap: Flexible flat conductor, 480 strands of 30-gage bare copper wire, 3/4" wide, 9-1/2" long, 48, 250 CM. Protect braid with copper bolthole ends with holes sized for 3/8" dia. bolts.
5. Grounding Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.
6. Bonding Plates, Connectors, Terminals and Clamps: Provide electrical bonding plates, connectors terminals and clamps as recommended by bonding plate, connector, terminal and clamp manufacturers for indicated applications.
7. Ground Electrodes: Steel with copper welded exterior, 5/8" dia. X 10'.

8. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, solder, soldering flux, bonding straps, as recommended by accessories manufacturers for type services indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF GROUNDING SYSTEMS

A. Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding and ground-fault protection devices comply with requirements. Comply with requirements of NEC, and NECA's "standard of Installation".

B. Coordinate with other electrical work as necessary to interface installation of grounding system and ground fault protection devices with other work.

C. Weld grounding conductors to underground grounding electrodes. The building equipment grounding system shall consist of the ground wire, and electrically continuous metallic conduit system. Every item of equipment served by the electrical system shall be bonded to the building equipment ground. Portions of metallic piping and duct systems which are electrically isolated shall be bonded to the equipment grounding system with a flexible bonding jumper.

D. The neutral shall be grounded to the grounding electrode system at the service entrance only, and shall be kept isolated from the building grounding system throughout the building. The neutral of separately derived systems shall be grounded at one point as specified here-in-below.

E. Provide bonding and grounding wires run in conduit and sized per the NEC in accordance with the local electrical inspection department and the NEC. Metallic piping and duct systems which enter the building shall be grounded at the point of entry to the building, in accordance with the NEC.

F. Continuity of the building equipment grounding system shall be maintained throughout the project. Grounding jumpers shall be installed across conduit expansion fittings, all liquid-tight flexible metal and flexible metal conduits, light fixture pigtails in excess of 6', and all other non-electrically continuous raceway fittings.

G. All main grounding conductors shall be stranded copper conductors, sized as shown and/or required, and run in a suitable raceway. All main grounding conductors shall be continuous without joints or splices over their entire length.

H. Bond the case and neutral of each transformer directly to the nearest available effectively grounded structural metal member of the structure, the nearest available effectively grounded metal water pipe, or in accordance with the local electrical inspection department. Flexible conduit shall not be used as a ground path to a transformer.

I. Provide a ground conductor from the telephone service equipment to the building grounding system as required by the local Telephone Company.

J. Carefully and securely ground all fluorescent fixture bodies to the conduit grounding system. Flexible conduit longer than 6' shall not be considered a ground path.

K. Ground all grounding-type receptacles with a separate ground wire.

J. Grounding of all motors or equipment connected to terminal box with flexible conduit shall be made with separate grounding conductor between motor frame or equipment cabinet and rigid conduit system. Grounding conductor shall be sized in accordance with table 250-95 of the NEC.

K. All grounding conductors shall be amply protected from mechanical injury and shall be supported in an approved manner. Where conductors are located in concrete, they shall be installed in conduit. Where ground conductors enter or emerge from slabs bearing directly on fill or soil, the voids between the conductor and surrounding conduit shall be filled with compound to provide an effective water seal.

L. Grounding conductors shall be not smaller than #12 AWG. Conductors shall be high conductivity copper, and sizes larger than #10 shall be stranded.

M. A ground grid for Entergy’s pad mounted transformer shall be provided as work of this system. Coordinate exact requirements with Entergy.

N. Grounding type-insulated bushings shall be installed on all raceways at transformers, switchboards, dry-type transformers, as well as switches used as service equipment. Bonding jumpers shall be provided in accordance with Table 250-95 of the National Electrical Code (NEC).

O. Install braided type-bonding jumpers with clamps on water meter piping to electrically bypass water meter.

P. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

Q. Ground each steel structural column to a 2/0 ground loop. Connect the loop to the main service switchboard. "Cadweld" grounding conductor to steel column.

R. Interconnect ground system with Lightning Protection System.

3.2 FIELD QUALITY CONTROL: General: Upon completion of installation of electrical grounding system, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 3 ohms, take appropriate action to reduce resistance to 3 ohms or less by driving additional ground rods and/or by chemically treating soil encircling ground rods with

sodium chloride, calcium chloride, copper sulphate, or magnesium. Then retest to demonstrate compliance.

END OF SECTION