SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Methods and materials for grounding systems and equipment.
2. Interface with specialty grounding systems for telecommunications, lightning protection systems and signal reference grids.

1.3 DEFINITIONS

A. Definitions: Definitions of terms and other electrical considerations as set forth in the:

1. National Electrical Code.
2. Institute of Electrical and Electronic Engineers.
3. Instrument Society of America.
4. National Fire Protection Association.

1.4 SUBMITTALS

A. Furnish complete submittals for all components of the grounding system and testing in conformance with Division 1 requirements.

B. Contractor shall submit a written grounding test plan and resume for the individual who will perform the grounding tests detailing experience and qualifications. Contractor shall submit blank test result forms prior to testing.

1.5 QUALITY ASSURANCE

A. Electrical components, devices and accessories, listed and labeled as defined in NFPA 70, Article 100.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with NFPA 780 for installation of Lighting Protection Systems.

D. Comply with ANSI J-STD-607-A for Telecommunications System Grounding.

E. Comply with the requirements of IEEE 1100 for grounding of sensitive electronic equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Components as manufactured by:

1. Copperweld
2. Blackburn
3. Weaver

4. Burndy

5. Thomas and Betts

2.2 MATERIALS

A. Provide bonding jumpers and wire, grounding bushings, clamps and appurtenances required for complete grounding system to bond equipment and raceways to equipment grounding conductors.

B. Ground Rods

1. Unless shown otherwise on the Drawings, the ground rods shall be a minimum of 3/4 inch in diameter and 10 feet long and have a uniform covering of electrolytic copper metallically bonded to a rigid steel core. The copper to steel bond shall be corrosion resistant.

2. Shall conform to ANSI/UL 467.

3. Sectional type joined by threaded copper alloy couplings.

C. Ground Cable: All ground cable shall be annealed, concentrically stranded, bare copper. Grounding cable size shall be as shown on the Drawings or as required by the NEC.

D. Ground Bus: Each ground bar shall consist of 98% conductivity bare copper bus, dimensions as indicated on the drawings. Bus shall be pre-drilled for two hole lugs and be provided with insulated wall mounting stand-offs.

E. Provide complete grounding system including but not limited to:

1. Ground rods

2. Bonding conductors.

3. Compression ground grid connectors.

4. Connections to equipment.

5. Grounding system identification.

F. Bolted Connectors:

1. The bolted type grounding connector shall be made of high copper alloy and manufactured specifically for the particular grounding application. The connector shall be Burndy, O.Z. Gedney, or equal.

2. Mount bar on insulators so as to ensure that there is only one connection to building steel.

G. Equipment Grounding Circuit Conductor:

1. This conductor shall be the same type and insulation as the load circuit conductors. The minimum size shall be as outlined in Table 250-95 of the National Electrical Code, unless shown otherwise on the drawings.

2. Shall be present in all raceways. The conduit system is not an allowable equipment ground.

H. Use of salts, water or compounds to attain the specified ground resistance is not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Special Techniques:

1. Provide a separate grounding conductor, securely grounded in each raceway independent of raceway material.
2. Provide a separate grounding conductor for each motor and connect at motor box. Do not use bolts securing motor box to frame or cover for grounding connectors.
3. Size grounding and bonding systems in accordance with the NEC.
4. Route inside raceway.
5. Provide a grounding type bushing for secondary feeder conduits, which originate from the secondary section of each MCC section, switchboard or panel board.
6. Individually bond these raceways to the ground bus in the secondary section.
7. Provide a green insulated wire-grounding jumper from the device ground screw to a box grounding screw or for grounding type devices and to equipment grounding conductor.
8. Provide a separate grounding conductor in each individual raceway for parallel feeders.
9. Interconnect the secondary switchgear neutral bus to the ground bus in the secondary switchgear compartment, only at service entrance point or after a transformer.
10. Terminate grounding conductors inside transformers in mechanical lugs with two-hole tang. If attachment holes are not provided by the transformer manufacturer, drill appropriately sized holes in suitable location. Metal under the lug shall be buffed bright (no paint).
11. Bond cold water pipe system and building structure to grounding electrode system per NEC.
12. Completely install duct bank ground system.
    a. Furnish all trenching.
    b. Make all splices.
    c. Install all ground rods.
    d. Make connections to all equipment and structures.
13. Measure ground impedance in accordance with IEEE STD 81 after installation before connection to the remaining grounding system.
14. Low Voltage Grounded System (600V or Less).
    a. A low voltage grounded system shall be a system where the local power supply is a transformer with the transformer secondary grounded.
    b. The first disconnecting means on the load side of this transformer shall provide the point where the neutral conductor is grounded.
    c. The neutral shall be connected to the Equipment Grounding Circuit Conductor only at one point and shall be within the enclosure of the disconnecting means.

d. The Grounding Electrode Conductor or the Equipment Grounding Circuit Conductor shall not be used as the neutral.

15. Embedded Ground Connections:

    a. All underground and concrete embedded grounding connections shall be U.L. listed compression type ground grid connectors.

    b. The connections shall be made in accordance with the manufacturer's instructions.

    c. The Contractor shall not conceal or cover any ground connections until the Engineer or his authorized representative has established that every grounding connection conforms to the Drawings and Specifications and has given the Contractor written confirmation.

16. Lightning Protection System:

    a. Coordinate scope with lightning protection shop drawings.

    b. Provide any sleeves in building walls for downleads. Install sleeves during construction of walls to conceal sleeves.

    c. Provide connection between electrical system ground and lighting protection system per NEC and NFPA 780 requirements.

17. Ground Ring:

    a. Furnish all trenching and materials necessary to install the ground ring as shown on the plans.

    b. Bonding conductor shall be in direct contact with the earth, 98% conductivity soft-drawn bare copper, of the size shown on the plans.

    c. Minimum burial depth 36" or as indicated on the plans.

    d. Re-compact disturbed soils to original density in 6 inch layers

18. Duct Bank Ground:

    a. A grounding conductor shall be installed in each and every duct bank embedded in the concrete of the duct bank as detailed on the Drawings or specified herein.

    b. Conductor:

        1) Annealed copper.

        2) Bare.

        3) Concentric stranded.

    c. Installed in contact with the concrete in the duct bank as detailed in the drawings.

19. Ground Rods:

    a. Locations shall be as shown on the drawings or as close to the service entrance as possible.

    b. Length of rods forming an individual ground array shall be equal in length.

    c. Length shall be that required to obtain a minimum ground resistance of five (5) Ohms.

    d. Top of ground rod shall be fitted with a coupling and steel-driving stud.

20. Shield Grounding:

    a. Shielded instrumentation cable shall have its shield grounded at one end only unless shop drawings indicated the shield is to be grounded at both ends.

    b. The grounding point shall be at the control panel or otherwise at the receiving end of the signal carried by the cable.

    c. Termination of shield drain wire shall be on its own terminal screw.

    d. All of these terminal screws shall be jumpered together using manufactured terminal block jumpers.

    e. Connection to the ground bus shall be via a green No. 12 conductor to the main ground bus for the panel.

21. Signal Reference Grids and EMF Shielding: Provide connection to electrical system ground per manufacturer's requirements. Comply with the requirements of IEEE STD 1100.

22. Telecommunications.

    a. Coordinate with the requirements of Division 27 of the Specifications.

    b. Provide telecommunications grounding systems in accordance with ANSI J-STD-607-A.

3.2 FIELD QUALITY CONTROL

A. Test in accordance with applicable Division 26 sections of the Specifications.

3.3 ADJUSTING

A. Under the direction of the Engineer the Contractor shall add additional parallel connected ground rods and/or deeper driven rods until the ground resistance measurement meets the resistance requirements of the Engineer. Additional work performed by the Contractor shall be under a separate contract using documented per unit values for the additional Work.

END OF SECTION 260526

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