

## SECTION 16526

### GROUNDING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Provide a grounding system for the main building services and each separately derived system originating at the respective grounding electrode(s) and radiating to every electrical power controlling and consuming device in the system.
- B. The General and Supplementary Conditions, and General Requirements apply to the work specified in this Section.
- C. Related work specified elsewhere includes but is not limited to:
  - 1. Raceways
  - 2. Wire and Cables

#### PART 2 - PRODUCTS

##### 2.01 GROUND RODS

- A. Provide UL listed ¾" diameter by 10' long copperclad steel ground rods. Manufacturer: ERITECH.

##### 2.02 EXOTHERMIC WELDS

- A. Provide exothermic copper welds with materials and configuration to match application.
- B. Manufacturer: CADWELD

##### 2.03 CLAMPS

- A. Bronze, UL listed, with configuration to match application.
- B. Manufacturer: BURNDY; ILSCO; O.Z./GEDNEY.

##### 2.04 CONDUITS

- A. See Section 16110 - Raceways.

##### 2.05 CONDUCTORS

- A. Copper only, see Section 16120 - Wire and Cables

#### PART 3 - EXECUTION

##### 3.01 SERVICE ENTRANCE GROUNDING ELECTRODES

- A. The grounding electrode system shall be in strict accordance with NEC article 250. The following electrodes shall be bonded to each other and to the main service entrance ground bus. Grounding electrode conductors shall be sized according to NEC article 250 unless noted larger on the drawings.
  - 1. The reinforcing bars in the wall footing near the service entrance shall be bonded together with # 4/0 bare copper wire. Reinforcing bars utilized shall be at least 20 feet in length, located near the bottom of the concrete footing and encased by at least 2 inches of concrete. Connect #4/0 bare copper to reinforcing bars with exothermic weld and route to main service entrance ground bus.

## SECTION 16526

### GROUNDING

2. Driven grounding electrode consisting of a ground rod driven with top 24" below grade. Install rod a minimum of 36" clear of foundation walls. Connect #6 bare copper conductor to ground rod with exothermic weld and route to main service entrance ground bus.
3. Building Steel: Select a connection point on the building steel as close as possible to the domestic water service entrance that will also remain exposed.
4. Domestic Water Pipe: Select a connection point on the domestic water pipe as close as possible to the point it enters the building and that will also remain exposed.
5. Sprinkler Water Pipe: Select a connection point on the sprinkler water pipe as close as possible to the point it enters the building and that will also remain exposed.

#### 3.02 MAIN SERVICE GROUNDING ELECTRODES BONDING CONDUCTORS

- A. Install a 4/0 bare stranded copper conductor between each grounding electrode and its closest grounding electrode neighbor so that all electrodes are bonded together.
- B. Exothermic weld each bonding connection both cable to cable and cable to grounding electrode.

#### 3.03 MAIN SERVICE GROUNDING ELECTRODE CONDUCTOR

- A. Install a 4/0 bare stranded copper conductor from the service entrance grounding electrode to the service switchboard ground bus.
- B. Exothermic weld the connection to the ground rod pigtail and ground bus.

#### 3.04 SEPARATELY DERIVED SYSTEM GROUNDING ELECTRODE

- A. Select a local grounding electrode described by the National Electrical Code and make connection to a point permanently visible.

#### 3.05 SEPARATELY DERIVED SYSTEM GROUNDING ELECTRODE CONDUCTOR

- A. Install a stranded bare copper conductor sized according to NEC between the local grounding electrode and the separately derived system grounded conductor.
- B. Exothermic weld the grounding electrode conductor to the grounding electrode.

#### 3.06 ADDITIONAL BONDS

- A. Gas Service Pipe: Bond Gas Service Pipe at the first accessible point nearest its entry to the building to the nearest main service ground electrode with a No. 4/0 bare stranded conductor.
- B. Exothermic weld the connection at grounding and electrode and to a ground clamp at the gas pipe.
- C. Roof Structure: Bond roof structure steel at its nearest accessible point to the building steel connection point with a 4/0 bare stranded copper conductor. Exothermic weld both connections.
- D. Domestic Water Meter: Install bond across water meter with 4/0 stranded bare copper conductors of sufficient length to accommodate removal of meter. Exothermic weld both connections to water pipe.
- E. Non-Metallic Domestic Water Insulated Coupling: Install bond across insulated coupling with 4/0 stranded bare copper of sufficient length to accommodate removal of coupling. Exothermic weld both connections to water pipe.
- F. Telephone Services: Separately bond both the telephone service and building telephone system ground buses (one for ATT and one for local telephone company) in telephone room to the

## SECTION 16526

### GROUNDING

building service ground bus in the main switchboard with one No. 6 bare stranded copper conductor. Provide 6 ft. slack at each telephone equipment backboard.

- G. Satellite Dish: Bond satellite dish ground to the building service ground bus in the main switchboard with a No. 6 bare stranded copper conductor. Provide 15' slack at satellite dish.
- H. Gas Meter: Install bond across gas heater with a No. 410 stranded bar and copper conductor of sufficient length to accommodate removal of meter. Use ground clamps on pipes and exothermic weld cable to clamps (where gas meter is provided).

#### 3.07 EQUIPMENT GROUNDING CONDUCTOR

- A. General: In addition to utilizing the metallic conduit and equipment enclosures as a continuous equipment grounding path, install a separate insulated copper conductor, color coded green, from respective switchboard or panelboard ground bus to controller and/or device.
- B. All steel conduits entering the main switch shall have a threaded conduit insulated type "BLG" grounding bushing bonded together and to the ground bus with a No. 4 bare stranded copper conductor.

#### 3.08 ADDITIONAL EQUIPMENT GROUNDING CONDUCTOR

- A. Rooftop HVAC Units: Install an equipment grounding conductor from the respective switchboard or panelboard ground bus to the unit disconnect switch and from disconnect switch to equipment ground lug or to housing in absence of ground lug.
- B. Install a separate copper equipment grounding conductor between the respective ground buses of the following:
  - 1. Service Switch - distribution panelboard - panelboard
  - 2. Service Switch - transformer
  - 3. Transformer - panelboard
  - 4. Panelboard - sub-panelboard
- C. Isolated Ground Receptacles: Install a separate grounding conductor for each circuit or group of circuits as indicated on the plans from panelboard isolated ground bus to isolated ground receptacle screw. Install a separate equipment grounding conductor for each circuit or group of circuits as indicated on the plans from panelboard ground bus to device box ground screw.
- D. Typical Wiring Devices: At both switches and receptacles, provide a grounding jumper from the grounding screw on the device box, to the grounding screw on the device (excluding the conditioned power, isolated ground branch circuits).

#### 3.09 EQUIPMENT AND ISOLATED GROUNDING CONDUCTOR ROUTING

- A. Route equipment and isolated grounding conductor with respective feeder, power wiring and branch circuit conductors.

#### 3.10 CONDUITS

- A. All grounding electrode conductors, equipment grounding conductors and bonds where not internal to equipment enclosures shall be installed in conduit to within 6" of terminating clamp and exothermic weld.

#### 3.11 CODES AND RESTRICTIONS

## SECTION 16526

### GROUNDING

- A. Where expressly forbidden by local authorities, conduit shall not be used as an equipment grounding conductor. Electrical contractor shall provide a copper equipment grounding conductor sized in accordance with NEC 250-95.
- B. Aluminum conductors and termination clamps shall not be used in the grounding system.

#### 3.12 TESTING

##### A. Ground Resistance

- 1. Upon completion of the ground rod installation, the electrical contractor shall test the installation. Grounding resistance reading shall be taken before connection is made to the building cold water piping system. Ground resistance readings shall not be taken within forty-eight hours of rainfall.
- 2. If the resistance to ground exceeds 5 ohms, additional rods shall be driven and bonded together, until a reading of 5 ohms or less to ground is obtained. After completion of the grounding system, measure the system ground resistance with a "Megger Earth Tester". Submit directly to the Project Manager two (2) copies of each test report certified by the testing technician and the electrical contractor.

##### B. Neutral Current On Grounding Conductors

- 1. All grounding electrode conductors and ground bus shall be measured by the electrical contractor for objectionable levels of current and to detect any inadvertent connection of neutral to ground.
- 2. If the ground current exceeds 10% of the rating of the conductor ampacity, all devices on that feeder or circuit shall be rechecked for proper connection.

##### C. Connection

- 1. All grounding system connections shall be rechecked at final checkout for correct wiring termination methods and mechanical strength.

END OF SECTION