PART 1: GENERAL

1.01 SCOPE OF WORK

A. The grounding and bonding system refers to all electrodes required by NEC, as well as including made, supplementary, information technology and telecommunications system grounding electrodes

B. Provide all labor, materials, tools, installation equipment, and test equipment required for the complete installation of grounding and bonding for fore mentioned systems within the structure.

C. The Design Team and/or Contractor are held responsible to be familiar with the provisions contained herein and with other Sections of this Specification as applicable to the completion of the installation. The approved vendor, designated agent or employee is responsible to be familiar with the provisions contained herein and is assumed to posses the knowledge, manpower, and material applicable to completion of the installation.

D. Work covered by this Section shall consist of furnishing labor, equipment, supplies, materials, and testing otherwise specified, and in performing the following operations recognized as necessary for the installation, termination, and labeling of ground and bonding infrastructure as described on the Drawing and /or required by these specifications.

E. Listed manufacturers and products are required. UNM IT approved equivalent products and systems are also acceptable with prior written approval of submittals by UNM IT.

F. The telecommunications main grounding bar (TMGB) is a dedicated extension of the building grounding electrode system for the telecommunications system. The TMGB should be located near the telecommunications service entrance and the electric service entrance.

G. The TMGB shall be located to minimize the length of the bonding conductor for telecommunications from the TMGB to the electric service ground.

H. The TMGB shall serve telecommunications equipment that is located in the same room or space.

I. The TMGB shall be located in an area that is accessible to UNM IT personnel.

J. A telecommunications grounding busbar (TGB) shall be provided in each area where telecommunications equipment is located. The TGB is the grounding connection point for telecommunications systems and equipment in each separate area.
K. All metal conduits or raceways for telecommunications cabling located within the same room or space as the TMGB shall be bonded to the TMGB.

L. Where an electric power panel for telecommunications equipment is located in the same room or space as the TGB, the panel ground bus or panel enclosure shall be bonded to the TGB.

M. The telecommunications backbone (TBB) is a conductor that originates at the TMGB and extends throughout the building interconnecting all telecommunications grounding busbars (TGBs) with the TMGB.

N. Where there are multiple telecommunications rooms or spaces with multiple TBBs, the TBBs shall be interconnected with a Grounding Equalizer (GE) conductor at the TGBs.

O. In structural steel frame buildings, where the steel framework is accessible within the room; the TMGB and each TGB shall be bonded to the structural steel frame using a minimum No. 6 AWG conductor.

1.02 RELATED SECTIONS

A. Division 27, Section 27 00 00 Communications General.
B. Division 27, Section 27 05 28 Pathway for Communicants Systems.
C. Division 27, Section 27 05 43 Underground Ducts and Raceways for Communications.
D. Division 27, Section 27 05 53 Identification for Communications Systems.
E. Division 27, Section 27 11 13 Communications Entrance Protection.
F. Division 27, Section 27 11 16 Communications Cabinets, Racks, Frames, and Enclosures.
G. Division 27, Section 27 11 19 Communications Termination Block and Patch Panels.
H. Division 27, Section 27 11 23 Communications Cable Management and Ladder Rack.
I. Division 27, Section 27 13 13 Communications Copper Backbone Cabling.
J. Division 27, Section 27 13 23 Communications Optical Fiber Backbone Cabling.
K. Division 27, Section 27 13 33 Communications Coaxial Backbone Cabling.
L. Division 27, Section 27 15 13 Communications Copper Horizontal Cabling.
M. Division 27, Section 27 15 23 Communications Optical Fiber Horizontal Cabling.
N. Division 27, Section 27 15 33 Communications Coaxial Horizontal Cabling.
O. Division 27, Section 27 15 43 Communications Faceplates and Connections.
P. Division 27, Section 27 21 33 Data Communications Wireless Access Points.
Q. Division 26, Section 26 41 00 Facility Lightning Protection

1.03 REFERENCES

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. The bonding and grounding system shall be compliant with the following references.


3. Telecommunications Industry Association, (TIA) J-STO-607-A- Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

4. Underwriters Laboratories, Inc. (UL): 467 - Grounding and Bonding Equipment

5. ANSI T1.333-2001 – Grounding and Bonding of Telecommunications Equipment

6. UNM Physical Plant Department Electrical Standards

7. Manufacturer Installation Specifications

1.04 Quality Assurance


2. Use adequate numbers of skilled work-persons thoroughly trained and experienced on the necessary crafts and completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

3. UNM IT will inspect, test and or commission the system upon completion. The Contractor is required to make modifications to any work found to be in non compliance with this Standard.

PART 2: PRODUCTS

2.01 MATERIALS

A. All materials used in the installation shall be new and shall comply in weight, size and composition as required by manufacturer and shall be labeled or listed by Underwriters Laboratories Inc. for use in electrical grounding.

2.02 GROUNDING BUSBARS
A. Telecommunications Grounding Main Grounding Busbar (TMGB).

1. Predrilled, copper, non anodized BICSI/TIA/EIA/ANSI approved (4"W x 1/4"H x 12"L) ground bus bar with insulators and standoffs. (Chatsworth 40153-012 or UNM IT approved equivalent)

B. Telecommunications Grounding Busbar (TGB)

1. Predrilled, copper, non anodized BICSI/TIA/EIA/ANSI approved (2"W x 1/4"H x 12"L) ground bus bar with insulators and standoffs. (Chatsworth 13622-012 or UNM IT approved equivalent).

C. Equipment Rack Busbar

1. Panduit #TRGK672 Telecommunications Rack Grounding Kit or UNM IT approved equivalent.

2.03 GROUNDING JOINTS AND SPLICES

A. Grounding conductor splices shall be joined with mechanical crimped sleeve designed to have two crimps per side with proper indents markings. Crimp sleeves shall be copper alloy.

B. Grounding conductor shall be terminated with a mechanical crimped type lug designed to have two crimps, spade section of have two bolts and made of copper alloy.

2.04 BONDING CONDUCTORS

A. Cable Tray Bonding Conductor

1. Green # 6 AWG insulated bonding jumper with appropriate lugs or manufactured braided copper grounding jumper equal to a # 6 AWG cable.

B. Equipment Frame Bonding Conductor

1. Bonding Conductor shall be run neatly and uniformly to the equipment, racks and trays.

C. Bonding Conductor (BC)

1. Green insulated copper bonding conductor, size as requires by NEC.

2. The BC shall be, as a minimum the same as the TBB.

D. Telecommunications Bonding Backbone (TBB)
1. Green insulated copper conductor, minimum as specified in the table below, size 6 AWG. The TBB shall be sized at 2 kcmil per linear foot of conductor length up to a maximum size of 3/0 AWG. Insulation shall meet fire ratings of its pathway.

<table>
<thead>
<tr>
<th>TBB length FT</th>
<th>Grounding Conductor Size (AWG)</th>
<th>DC Resistance Per 100 Ft (Copper Conductor)</th>
<th>Short-Time Rating (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 13 Ft</td>
<td>8</td>
<td>0.0778</td>
<td>391</td>
</tr>
<tr>
<td>14 - 20 Ft</td>
<td>6</td>
<td>0.0491</td>
<td>621</td>
</tr>
<tr>
<td>21 - 26 Ft</td>
<td>4</td>
<td>0.0308</td>
<td>988</td>
</tr>
<tr>
<td>27 - 33 Ft</td>
<td>3</td>
<td>0.0245</td>
<td>1245</td>
</tr>
<tr>
<td>34 - 41 Ft</td>
<td>2</td>
<td>0.194</td>
<td>1571</td>
</tr>
<tr>
<td>42 - 52 Ft</td>
<td>1</td>
<td>0.0154</td>
<td>1981</td>
</tr>
<tr>
<td>53 - 66 Ft</td>
<td>1/O</td>
<td>0.0122</td>
<td>2499</td>
</tr>
<tr>
<td>&gt; 66 FT</td>
<td>2/O</td>
<td>0.00967</td>
<td>3150</td>
</tr>
<tr>
<td></td>
<td>3/O</td>
<td>0.00766</td>
<td>3972</td>
</tr>
<tr>
<td></td>
<td>4/O</td>
<td>0.00608</td>
<td>5008</td>
</tr>
<tr>
<td></td>
<td>Kcml</td>
<td>0.00515</td>
<td>5917</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>0.00515</td>
<td>5917</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>0.00429</td>
<td>7101</td>
</tr>
<tr>
<td></td>
<td>350</td>
<td>0.00367</td>
<td>8284</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>0.00321</td>
<td>9467</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>0.00258</td>
<td>11834</td>
</tr>
</tbody>
</table>

AWG = American Wire Gauge
DC = Direct Current
kcmil = Thousand circular mils

2.05 GROUND RODS

A. Copper clad steel, 19 mm (3/4-inch) diameter by 3000 mm (10 feet) long, conforming to UL 467.
B. Quantity of rods shall be as required to obtain the specified ground resistance.

2.06 SPLICES AND TERMINATION COMPONENTS

A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

2.07 GROUND CONNECTIONS

A. Below Grade:
   1. Exothermic-welded type connectors.

B. Above Grade:
   1. Bonding Jumpers: compression type connectors, using zinc-plated fasteners and external tooth lock washers.
   2. Ground Busbar: Two-hole compression type lugs using tin-plated copper or copper alloy bolts and nuts.
   3. Rack and Cabinet Ground Bars: one-hole compression-type lugs using zinc-plated or copper alloy fasteners.
   4. Cable Shields: Make ground connections to multi-pair communications cables with metallic shields using shield bonding connectors with screw stud connection.

PART 3: EXECUTION

3.01 GROUNDING AND BONDING INSTALLATION

A. Bond and ground all conduits, cable trays, enclosures, cables, protectors and other conductive infrastructure as per the NEC and TIA 607 and other references to the main building ground.
   1. Clean surfaces nonconductive coatings (such as paint, lacquer, and enamel) on equipment to be grounded shall be removed from threads and other contacts surfaces to ensure good electrical continuity or be connected by means of fittings designed so as to make such removal unnecessary. Install all parts as specified by the manufacturer. Do not daisy chain bonding conductors from device to devices.
   2. Install all cable tray to meet the grounding and bonding requirements of NEC Articles 110.3, 250.96, 250.102, 392.3, 392.7 and all applicable codes.
   3. Connections to the TMGB shall be made by exothermic welding or by listed two-hole compression lugs.
4. All metal conduits or raceways for telecommunications cabling located within the same room or space as the TMGB shall be bonded to the TMGB.

B. Installation of the TMGB in ER/TR.

1. Install the TMGB at the bottom of the plywood backboard near the outside plant entrance conduits within the UNM IT Telecommunications Space.

2. TMGB shall be installed so that the BC is as short and straight as possible, with the proper bend radius. All bend radiuses shall be 90 degrees.

3. The BC shall be Green insulated conductor installed exposed per Table 1 in PART 2.

4. Busbar shall be predrilled for future connections.

5. Provide label (Do Not Disconnect) on connection to main electrical service ground.

C. Installation of TGB in TR.

1. Install the TGB at the bottom of plywood backboard near the copper riser terminations within the UNM IT Telecommunications Space.

2. TGB shall be installed so that the TBB for telecommunications is as short and straight as possible, with the proper 90 degree bend radius.

3. The BC shall be a green insulated conductor sized from Table 1 in Part 2.

4. Busbar shall be predrilled for future connections.

D. Installation of the TBB.

1. Installation mechanical type, copper alloy, with minimum of two bolts and separate sections for each conductor or copper compression type with two (2) indents.

E. Installation of Grounding Conductor Joints/Splices.

1. Install manufactured insulating cover or heavy tape insulation over joints /splices.

F. Grounding of Cable Tray/Ladder Rack/Basket Tray

1. Install Green #6 AWG bonding jumper (12 inches max) with manufacturer approved devices at each cable tray joint or install manufacture braid copper grounding
SPECIFICATION STANDARD
GROUNDING AND BONDING 27 05 26

jumper. In lieu of bonding jumpers, use manufactures approved grounding type connectors to connect sections of cable tray will be permitted.

2. Install Green #6 AWG grounding conductor with manufacturer approved devices from side of cable tray down to TMGB or TGB. Drill the side of the cable tray and install a ¼ / 20 appropriate length bolt, making sure that the bolt does not extend into wire management part of the tray.

G. Ground of Equipment Frame

1. Install a ground busbar at the top of the equipment frame to ground cable tray, TMGB or TGB.

H. Grounding of Telecommunications Ductbanks.

1. Provide a continuous # 4/0 bare stranded copper conductor within the concrete at the bottom of all duct banks. Terminate to the bonding ribbon in telecommunications maintenance holes.

I. Grounding of Telecommunications Maintenance Holes and Handholes.

1. Provide bonding jumper to reinforcing steel in each section.

2. Install a bonding ribbon horizontally around the bottom of each maintenance hole and attached to all cable rack and metallic hardware within the maintenance hole. Continue installation vertically between bonding clamps so both top and bottom halves are bonded together on each side. (The bonding ribbon will be used to bond and ground all future splice cases and hardware placed within the maintenance hole).

3. Provide a ground rod near a corner within 6 inches of the corner in each maintenance hole and handhole. Bond to the ribbon in maintenance hole.

J. Grounding of Protectors

1. Install grounding as per manufacturer instructions.

3.02 Testing the Grounding and Bonding System

1. Visually inspect all grounds and bonds for loose connections.

2. Test the potential difference between the TMGB and the electrical ground and between the TMGB and each TGB.
3. Connection at TMGB from main electrical service ground shall be installed to meet NEC 250.94 and TIA/EIA requirements type. Ground resistance shall not exceed 2 ohms, unless approved by UNM IT.

4. Ohm resistance testing shall be done between the TGB and all racks, cable tray, and electronic equipment to identify any high resistance connections.

5. The difference in ground potential between the telecommunications and electrical system at the workstation should not exceed 1.0 volt.

End of Section