

SECTION 27 05 26 - GROUNDING AND BONDING FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 REFERENCES

- A. General provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections.
- B. Architectural, Electrical, and Technology Drawings. Other systems drawings may apply. Division 26 Basic Electrical Materials and Methods sections apply to work of this section.

1.2 SUMMARY

- A. System Performance Requirements.
 - 1. The Telecommunications Entrance Facility (TEF), Telecommunications Room (TR), and Equipment Rooms (ER) require grounding and bonding. The Office of Information Technology (OIT) does not require an isolated grounding system for its voice and data networks. Each building shall have one Telecommunications Main Grounding Busbar (TMGB), which is bonded to the building's electrical service entrance and is electrically contiguous to the Grounding Electrode Conductor (GEC). The TMGB is usually located in a TEF, ER, or in an OIT specified TR. Each TR shall have at least one Telecommunications Grounding Busbar (TGB), which is connected back to the TMGB via the Telecommunications Bonding Backbone (TBB).

1.3 SUBMITTALS

- A. General Description and Requirements.
 - 1. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.
- B. Product Data: (Need to create Appendix with part numbers for Grounding Spec.)
 - 1. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.
- C. Prefabrication Shop Drawings:
 - 1. One-Line Wiring Diagrams: Include one-line wiring diagrams for telecommunications grounding and bonding work which indicate layout of ground rods, location of system grounding electrode connections, routing of grounding electrode conductors, and circuits and equipment grounding connections. Additionally submit ground riser diagram for entire project. Show bus bars with transformer ground electrode conductors, etc.
 - 2. Details: Indicating grounding method for cable tray and cabinets and/or racks.
 - 3. Labeling: Provide documentation of all labeling schemes for grounding busbars and grounding conductors.
 - 4. Documentation: Provide a minimum of (1) hardcopy set of prints (in addition to electronic copies) for review or as indicated in Division-1 general conditions.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of grounding and bonding products, of types, and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, grounding electrodes and plate electrodes, and bonding jumpers whose products have been in satisfactory use in similar service for not less than 5 years.

- B. Installer's Qualifications: Firms with at least 5 years of successful installation experience on projects with telecommunications grounding work similar to that required for project.
- C. Codes and Standards:
 - 1. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and the current edition of the NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits, and equipment.
 - 2. UL Compliance: Comply with applicable requirements of UL Standards No.'s 467, "Electrical Grounding and Bonding Equipment", and 869 "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits and equipment. In addition, comply with UL Std 486A, "Wire Connectors and soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products which are UL-listed and labeled for their intended usage.
 - 3. IEEE Compliance: Comply with applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141 and 142 pertaining to grounding and bonding of systems, circuits and equipment.
 - 4. ANSI/EIA/TIA Compliance: Comply with applicable requirements and recommended installation practices of the current editions of ANSI/EIA/TIA Standards 568 and 569 and J-STD-607.
 - 5. BICSI Compliance: Comply with applicable requirements and recommended installation practices of the current editions of BICSI Standards TDM, CO-OSP, Data Network Design Reference Manual, and Wireless.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.6 SEQUENCING AND SCHEDULING

- A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.7 PROJECT SITE CONDITIONS

- A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.8 WARRANTY

- A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.9 SPECIFICATION RESPONSE

- A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.10 DEFINITIONS

- A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Telecommunications Main Grounding Bus (TMGB).
 - 1. Provide (1) 24-inch x 4-inch x 1/4-inch (600mm x 100mm x 6mm) tinned copper UL listed busbar with pre-drilled two-hole bonding lugs.
 - 2. Pre-drilled holes shall be primarily for 4 AWG two-hole bonding lugs. Holes shall be a nominal diameter of 5/16-inch (8mm) with 5/8-inch (16mm) between the holes centerline.

3. TMGB shall also have a minimum of (6) pre-drilled two-hole lug points for #3/0 AWG bonding lugs. Holes shall be a nominal diameter of 7/16-inch (11mm) with 1-inch (25mm) between the holes centerline.
 4. TMGB shall have isolated stand-offs to provide a minimum 1-inch clearance off of wall.
- B. Telecommunications Grounding Bus (TGB).
1. Provide (1) 24-inch x 4-inch x 1/4-inch (600mm x 100mm x 6mm) tinned copper UL listed busbar with pre-drilled two-hole bonding lugs.
 2. Pre-drilled holes shall be primarily for 4 AWG two-hole bonding lugs. Holes shall be a nominal diameter of 5/16-inch (8mm) with 5/8-inch (16mm) between the holes centerline.
 3. TGB shall also have a minimum of (6) pre-drilled two-hole lug points for #3/0 AWG bonding lugs. Holes shall be a nominal diameter of 7/16-inch (11mm) with 1-inch (25mm) between the holes centerline.
 4. TGB shall have isolated stand-offs to provide a minimum 1-inch clearance off of wall.
- C. Conductors.
1. The minimum TBB conductor size is 6 AWG, but consideration shall be given to using 3/0 AWG conductor, as per the J-STD-607-B TBB sizing table shown below.

Grounding Conductor Size (AWG)	dc Resistance Per 100 ft (Copper Conductor)	Short-Time Rating (A)
8	0.077800	391
6	0.049100	621
4	0.030800	988
3	0.024500	1245
2	0.019400	1571
1	0.015400	1981
1/0	0.012200	2499
2/0	0.009670	3150
3/0	0.007660	3972
4/0	0.006080	5008
kcmil		
250	0.005150	5917
300	0.004290	7101
350	0.003670	8284
400	0.003210	9467
500	0.002580	11834

AWG = American wire gauge

dc = Direct Current

kcmil = Thousand circular mils

- a. Determine the size of the building's AC grounding electrode conductor (GEC) for the electrical service. If the size is unknown or indeterminable, assume a 3/0 AWG GEC.

- b. Determine the length of the TBB.
- c. Divide 40V by the Short-Time Ampere Rating of the GEC. The result is the maximum resistance value for any TBB length.
- d. Normalize the results to 100' by dividing the maximum resistance value by 0.5 for 50', 1 for 100', 2 for 200' 3 for 300', etc. Use this calculated resistance value in the next step.
- e. Refer to the table above and compare the calculated resistance value with the DC resistance values per 100'. Select the DC resistance value that does not exceed the calculated resistance value created above. The associated conductor size is the calculated TBB size.
- f. The table below may be used as a planning guide for estimating the TBB size prior to using the calculated method above.

TBB Linear Length (Feet)	TBB Size (AWG)
Less than 13	6
14 to 20	4
21 to 26	3
27 to 33	2
34 to 41	1
42 to 52	1/0
53 to 66	2/0
Greater than 66	3/0

2. A TBB may be an insulated conductor. Each telecommunications bonding conductor (from equipment) shall be a 6 AWG insulated conductor, with distinctively green colored insulation. The TBB used to bond cable tray shall be uninsulated, 6 AWG minimum.

D. Connectors.

1. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
2. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
3. Welded Connectors: Exothermic-welding kits of types recommended by Cadweld (or approved equal manufacturer) for materials being joined and installation conditions.
4. Compression Fittings: All cable splices from bonding backbone to tie cables shall use irreversible compression fittings to join cable ends.

E. Grounding Electrodes.

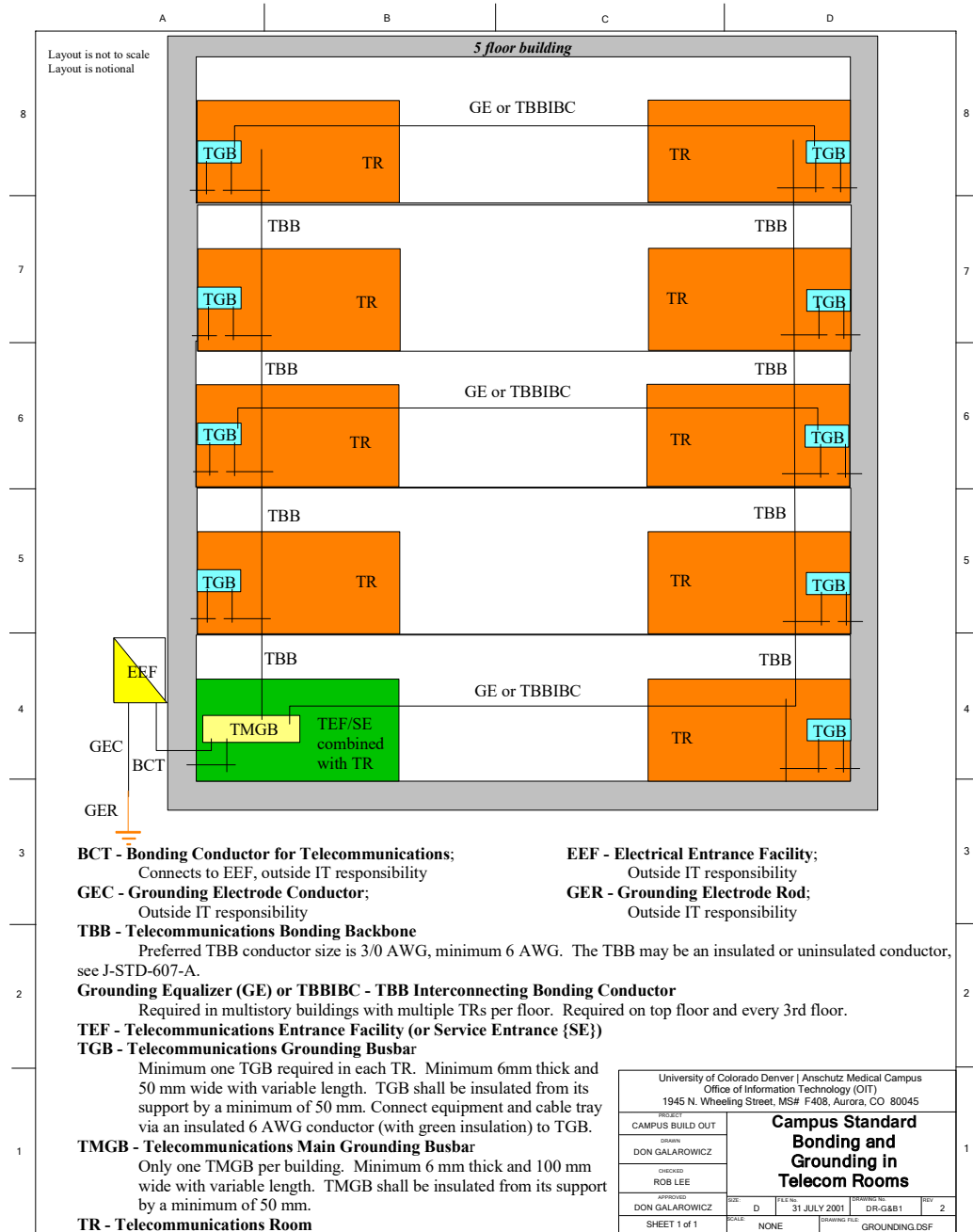
1. Ground Rods: Copper clad steel; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.
2. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Whenever two or more vertical TBBs are used in a multistory building, the TBBs shall be bonded together with a Grounding Equalizer (GE) at the building's top floor and at a minimum of every third floor in between.
- B. The TBB, GE, TMGB, and TGB shall be marked with nonmetallic labels, as specified by OIT.

- C. The TBB shall be installed in its own pathway, independent of the OIT pathways.
- D. Telecommunications connections shall be at 3 Ohms or less.
- E. The TBB shall be placed without splices. Joined segments of a TBB shall be connected using irreversible compression-type connectors, exothermic welding, or equivalent. All joints shall be adequately supported and protected from damage. TBBs shall be placed so they avoid bends, curves, and diverts. That is, straight and linear TBB runs are required.



END OF SECTION 27 05 26