

SECTION 27 05 26
GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes specific requirements for the Telecommunications Grounding and Bonding System to provide a permanent bonding infrastructure for communications systems.
- B. The Telecommunications Grounding and Bonding System is bonded to the building grounding system and performance is dependent upon the building grounding system – the AC Electrode Grounding System and the Equipment Grounding System specified in Division 26 *Specification Electrical – Grounding and Bonding for Electrical Systems*.
- C. General requirements are covered in Division 27 Specification Section *Electrical Technology - General Requirements*.

1.02 RELATED SECTIONS

- A. The requirements of Division 27 Specification Section *Electrical Technology - General Requirements* shall serve as the basis for the requirements of this Section, and are incorporated by reference into this Section.
- B. The requirements of Division 26 Specification Section *Electrical - Grounding and Bonding for Electrical Systems* shall serve as the basis for the requirements of this Section, and are incorporated by reference into this Section.
- C. This Section may expand upon or supplement the requirements of Division 26 Specification Section *Electrical - Grounding and Bonding for Electrical Systems*. In the event of a conflict or discrepancy between this Section and the requirements of Division 26 Specification Section *Electrical - Grounding and Bonding for Electrical Systems*, the requirements of Division 26 Specification Section *Electrical - Grounding and Bonding for Electrical Systems* shall govern and notification of such discrepancy shall be submitted to the Engineer. However, if the requirement of this Section (or portion thereof) exceeds that of the requirements of Division 26 Specification Section *Electrical - Grounding and Bonding for Electrical Systems*, and is furthermore not contrary to the requirements of Division 26 Specification Section *Electrical - Grounding and Bonding for Electrical Systems*, then the requirement of this Section (or portion thereof) shall prevail.

1.03 SUBMITTALS

- A. Comply with the Submittal portion of Division 27 Specification Section *Basic Communications Requirements*. Provide submittal information for the following:
 - 1. Product Data

1.04 DEFINITIONS

- A. BCT: Bonding Conductor for Telecommunications: Conductor that bonds the TMGB to the AC Grounding Electrode System.
- B. EF: Entrance Facility: Entrance to a building for both public and private network service cables. May be located in an ER or TR.
- C. ER: Equipment Room: Environmentally controlled centralized space of telecommunications equipment. Sometimes referred to as Main Distribution Frame (MDF), Data Center (DC), or server room.
- D. GE: Grounding Equalizer: Bonding conductor that bonds TGBs on the same floor of a structure.
- E. TBB: Telecommunications Bonding Backbone: Bonding conductor that bonds the Telecommunications Main Grounding Busbar to one or more Telecommunications Grounding Busbars.
- F. TE: Telecommunication Enclosure: Floor or tenant serving space (enclosure or cabinet) that provides a connection point between backbone and horizontal infrastructures. Sometimes referred to as an Intermediate Distribution Frame (IDF) or Floor Distributer (FD).

- G. TEBC: Telecommunications Equipment Bonding Conductor: Bonding conductor that bonds all non-current carrying metal telecommunications equipment and materials to the nearest TGB or TMGB.
- H. TGB: Telecommunications Grounding Busbar: Busbar used to connect TEBCs and TBBs in a specific room. TGB is generally connected (bonded) to building structural steel, the nearest low-voltage electrical distribution panel and to the Telecommunications Main Grounding Busbar via the TBB. There is typically one (possibly more) Telecommunications Grounding Busbar per telecommunication room or equipment room.
- I. TMGB: Telecommunications Main Grounding Busbar: Busbar bonded to the electrical service ground (Intersystem Bonding Termination). Origination of the TBB. There is typically one Telecommunications Main Grounding Busbar per building, located in near the communications entrance facility (EF) or in the main telecommunications room (MDF) or Building Distributer (BD).
- J. TR: Telecommunication Room: Floor or tenant serving space that provides a connection point between backbone and horizontal infrastructures. Sometimes referred to as an Intermediate Distribution Frame (IDF) or Floor Distributer (FD).

PART 2 - MATERIALS

2.01 GENERAL

- A. Manufacturer: Communications grounding and bonding equipment and materials shall be manufactured by a single Manufacturer unless specifically stated otherwise. The manufacturer shall be:
 - 1. Panduit
- B. Part Numbers: Refer to the Equipment Schedule(s) at the end of this section for specific manufacturers and part numbers.
- C. Labels/Identification: Provide labels to identify of all components of the communications grounding and bonding system. Labels shall be permanent (i.e. not subject to fading or erasure) and permanently affixed. Handwritten labels are not acceptable.
- D. Equipment and materials in this Section shall be UL Listed and Labeled.

2.02 GROUNDING BUSBARS

- A. Grounding busbars shall meet the specifications of ANSI/NECA/BICSI 607 and ANSI J-STD-607 and conform to BICSI recommendations, with standard NEMA bolt hole sizing. Grounding busbars shall be predrilled copper busbars plated for reduced contact resistance and have minimum dimension of 1/4 inch thick by width and length listed below:
 - 1. Telecommunications Main Grounding Busbar (TMGB): TMGBs shall be a minimum of 4 inches wide and have a minimum length of 20 inches. Provide busbar with required quantity of two-hole lugs for application. Provide as shown on the Drawings. Where not shown, provide one TMGB per primary telecommunications room (e.g. MDF etc.).
 - 2. Telecommunications Grounding Busbar (TGB): TGBs shall be a minimum of 2 inches wide and have a minimum length of 10 inches. Provide busbar with required quantity of two-hole lugs for application. Provide as shown on the Drawings. Where not shown, provide a minimum of one TGB per secondary communications room (e.g. IDF, etc.).

2.03 BCT

- A. Provide insulated green, insulated green with yellow strip, or un-insulated - copper conductor properly sized according to length of conductor and size of AC Grounding Electrode Conductor for the electrical service per NEC, TDMM, and IAEI calculations.

2.04 GE

- A. Provide insulated green, insulated green with yellow strip, or un-insulated - copper conductor. Unless otherwise noted on the Drawings, conductors shall be sized according to conductor length as follows:
 - 1. Less than 13 feet: #6 AWG

2. 13 to 20 feet: #4 AWG
3. 20 to 26 feet: #3 AWG
4. 26 to 33 feet: #2 AWG
5. 33 to 44 feet: #1 AWG
6. 44 to 52 feet: #1/0 AWG
7. 52 to 66 feet: #2/0 AWG
8. Greater than 66 feet: #3/0 AWG

2.05 TBB

- A. Provide insulated green, insulated green with yellow strip, or un-insulated - copper conductor. Unless otherwise noted on the Drawings, conductors shall be sized according to conductor length as follows:
 1. Less than 13 feet: #6 AWG
 2. 13 to 20 feet: #4 AWG
 3. 20 to 26 feet: #3 AWG
 4. 26 to 33 feet: #2 AWG
 5. 33 to 44 feet: #1 AWG
 6. 44 to 52 feet: #1/0 AWG
 7. 52 to 66 feet: #2/0 AWG
 8. Greater than 66 feet: #3/0 AWG

2.06 TEBC

- A. Provide insulated green or insulated green with yellow strip - 6 AWG copper conductor not to exceed 100 feet in length.

PART 3 - EXECUTION

3.01 GENERAL

- A. Work shall comply with the Governing Requirements as defined in Division 27 Specification Section Basic Communications Requirements. Governing Requirements of particular relevance to this Section include, but are not limited to:
 1. ANSI/NECA/BICSI 607: Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
 2. ANSI J-STD-607: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 3. NEC: National Electric Code (NFPA Article 70)
 4. UL 467: Grounding and Bonding Equipment
- B. Contractor shall ensure that positive bonding connections are made to bare metallic surfaces, equipment, materials and hardware by removing surface corrosion, oxidation and paint prior to connection.
- C. Where possible, bonds to structural steel shall be exothermic.
- D. Where possible, exothermic or irreversible compression-type connections and two-hole lugs shall be used to terminate bonding conductors.
- E. Labels/Identification: Label and identify all components of the communications grounding and bonding system.

- F. All newly installed racks and cabinets shall have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.
- G. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.
- H. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built to that purpose.
- I. Contractor shall take care to clean (wire brush, scotch rite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.
- J. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Contractor's expense.
- K. Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy-chaining) of racks is expressly forbidden and will not be accepted.
- L. Rack Bonding Conductors (RBC) may tap into an overhead or under floor aisle ground, or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing five racks or less.

3.02 GROUNDING BUSBARS:

- A. Arrange telecommunication primary and secondary protector bonding, busbar bonding (e.g., BCT, GE, TBB, etc.) and approved building grounding conductors (e.g., toward the left, leaving space for equipment bonding conductors (e.g., TEBC, etc.) to the right.
 - 1. TMGB:
 - a. Directly bond TMGB to:
 - 1) Building structural steel (if building structural steel is approved building grounding system) via bonding conductor sized per BCT calculations – minimum size of 2/0 AWG copper conductor.
 - 2) Intersystem Bonding Termination via BCT if BCT is less than 30 feet in length or if BCT length is shorter than bonding conductor length to nearest low-voltage electrical distribution panel.
 - 3) Nearest low-voltage electrical distribution panel if Intersystem Bonding Termination is not available.
 - 4) TGBs via TBBs as shown on drawings.
 - b. Label with “TMGB”.
 - 2. TGB:
 - a. Directly bond TGB to:
 - 1) Building structural steel (if building structural steel is approved building grounding system) via bonding conductor sized per BCT calculations – minimum size of 2/0 AWG copper conductor.
 - 2) Nearest low-voltage electrical distribution panel
 - 3) TMGB via TBBs as shown on drawings.
 - 4) TGBs via TBBs as shown on drawings.
 - 5) TGBs via GEs as shown on drawings.
 - 6) Telecommunications equipment and materials via TEBCs.
 - b. Label with “TGB”.

3.03 GE

- A. GEs shall be used to connect TGBs to other TGBs on designated floors. Route along the shortest and straightest path possible with minimal bends. Bends shall be sweeping. GEs shall be continuous (without splices), and shall be insulated from their support.
- B. Label with “WARNING! TELECOMMUNICATIONS GROUNDING EQUALIZER (GE). DO NOT REMOVE OR DISCONNECT!” Labels shall be affixed at both ends and at accessible intermediate points.

3.04 TBB

- A. TBBs shall be used to connect the TMGB to each TGB and TGB to TGB. Route along the shortest and straightest path possible with minimal bends. Bends shall be sweeping. TBBs shall be continuous (without splices), and shall be insulated from their support.
- B. Label with “WARNING! TELECOMMUNICATIONS BONDING BACKBONE (TBB). DO NOT REMOVE OR DISCONNECT!” Labels shall be affixed at both ends and at accessible intermediate points.

3.05 TEBC

- A. TEBCs shall be used to bond all non-current carrying metal telecommunications equipment and materials to the nearest TGB. Route along the shortest and straightest path possible with minimal bends. Bends shall be sweeping. TEBCs shall be continuous (without splices), and shall be insulated from their support.
- B. Label with “WARNING! TELECOMMUNICATIONS EQUIPMENT BONDING CONDUCTOR (TEBC). DO NOT REMOVE OR DISCONNECT!” Labels shall be affixed at both ends and at accessible intermediate points.

3.06 QUALITY ASSURANCE AND TESTING

- A. Visual inspection and correction of:
 - 1. Loose connections
 - 2. Corrosion
 - 3. Physical damage
 - 4. System modifications
 - 5. Correct and visible labeling
- B. Test Integrity of Bonding Connections
 - 1. Perform two-point bonding measurements using an earth grounding resistance tester configured for continuity test per manufacturer’s recommendations setup and safety precautions.
 - a. Measure between TMGB or TGB and nearest available grounding electrode (e.g., structural steel). Maximum value between two points shall be 0.1 ohm.
 - b. Measure between equipment, equipment racks, ladder racks, rack grounding busbars and TMGB or TGB. Maximum value between two points shall be 0.1 ohm.
 - c. Bonding resistance between any two conductive points in the EF, ER, TE, or TR shall not exceed 0.1 ohms.
 - 2. Forward copy of test results to Engineer.

PART 4 - EQUIPMENT SCHEDULE

4.01 GROUNDING AND BOUNDING EQUIPMENT SCHEDULE

27 05 26 - GROUNDING AND BONDING (GB)		
DESCRIPTION	Manufacturer/Part Number	
	Panduit	Special Rqmt
TWO HOLE COMPRESSION LUG	LCC SERIES	
HTAPS	HTCT SERIES	
CLEAR COVERS FOR HTAP	CLRCVR SERIES	
JUMPER KIT	RGCBNJ660P22	
JUMPER KIT	RGCBNJ660PY	
RACK JUMPER AND CABINET KIT	GJ672UH	
TWO HOLE ESD PORT	RGESD2-1	
GREEN THREAD-FORMING BONDING SCREW	RGTBSG-C	
GREEN BONDING CAGE NUT	CNB4K	
GREEN BONDING CAGE NUT	CNBK	
PAINT PIERCING BONDING WAHERS	RGW-100-1Y	
24" PRE-TERMINATED EQUIP. GROUNDING JUMPER	RGEJ1024PHY	
36" PRE-TERMINATED EQUIP. GROUNDING JUMPER	RGEJ1036PFY	
WALL MOUNTED TELECOM BUS BAR	GB2B0514TPI-1	
WALL MOUNTED TELECOM BUS BAR	GB4B1028TPI-1	
WALL MOUNTED TELECOM BUS BAR LBL KIT	LTYK	

END OF SECTION 27 05 26