

**SECTION 27 05 26****GROUNDING AND BONDING FOR COMMUNICATIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. This section governs the products and execution requirements relating to furnishing and installing grounding and bonding for the communication systems.
- B. Description of work:
  - 1. Furnish and install a complete and fully-functioning grounding and bonding system. All cables, terminations, support hardware, and grounding and bonding hardware shall be furnished, installed, tested, labeled, and documented by the telecommunications subcontractor.
    - a) Coordinate with electrical contractor including pathways, termination points, busbar locations and connections to the main electrical service ground and electrical distribution panels.

**1.2 RELATED DOCUMENTS**

- A. The most recent versions of all related documents apply to this project.
- B. The following codes shall be followed as required by law:
  - 1. National Electric Code (NEC)
- C. The following standards shall be followed:
  - 1. IEEE Std 1100 - IEEE Recommended Practice for Powering and Grounding Electronic Equipment (Emerald Book)
  - 2. ANSI/NECA/BICSI--607 - Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
  - 3. ANSI/TIA--607-B - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
  - 4. ANSI/TIA/EIA-606-A - Administration Standard for Commercial Telecommunications Infrastructure
- D. The following guidelines shall be followed:
  - 1. BICSI, Telecommunications Distribution Methods Manual (TDMM)
  - 2. BICSI, Information Transport Systems Installation Methods Manual (ITSIMM)
- E. The following related project specifications shall be followed:
  - 1. 27 00 00 Communications
  - 2. 27 05 53 Identification for Communications Systems

**1.3 DEFINITIONS AND ACRONYMS**

- A. BCT – Bonding Conductor for Telecommunications -- A conductor that interconnects the telecommunications bonding infrastructure to the building's service equipment (power) ground.
- B. Bonding – The joining of metallic parts to form an electrically conductive path.

- C. GE – Grounding Equilizer -- The conductor that interconnects elements of the telecommunications grounding infrastructure.
- D. Ground – A conducting connection, whether intentional or accidental, between an electrical circuit (e.g., telecommunications) or equipment and the earth, or to some conducting body that serves in place of earth.
- E. NRTL – Nationally Recognized Testing Laboratory
- F. RBC – Rack Bonding Conductor -- A bonding conductor used to connect an equipment rack directly to the TMGB, or TGB.
- G. RGB – Rack Grounding Busbar -- A busbar that is vertically mounted on an equipment rack.
- H. TBB – Telecommunications Bonding Backbone -- A conductor that interconnects the telecommunications main grounding busbar (TMGB) to the telecommunications grounding busbar
- I. TGB – Telecommunications Grounding Busbar -- A common point of connection for telecommunications system and equipment bonding to ground, and located in the telecommunications room or equipment room.
- J. TMGB – Telecommunications Main Grounding Busbar -- A busbar placed in a convenient and accessible location and bonded by means of the bonding conductor for telecommunications, to the building service equipment (power) ground.
- K. UBC – Unit Bonding Conductor -- A conductor that interconnects the Rack Bonding Busbar to the telecommunications equipment.

#### 1.4 SUBMITTALS

- A. The following submittals are due at the Pre-Construction Phase, in accordance with submittal requirements in Section 27 00 00 Communications:
  - 1. Product Information
    - a) Provide manufacturer's product information cutsheet or specifications sheet with the specific product number identified.
  - 2. Shop Drawings
    - a) Provide scaled drawings (floor plans not less than 1/16" = 1'-0") indicating the location and size, dimensions, type of connection (e.g., mechanical, exothermic weld of each bonding busbar (e.g., TMGB, TGB), conductor (e.g., BCT, GE, TBB), connections (e.g., lugs), and splice points.
    - b) Provide scaled plan and elevation drawings of telecommunications rooms (not less than 1/4" = 1'-0") indicating locations of busbars (e.g., TMGB, TGB, UBC, RGB).
    - c) Bonding and Grounding shall have its own separate drawing(s).
- B. The following submittals are due Post-Construction, in accordance with the submittal requirements in Section 27 00 00 Communications:
  - 1. Record Drawings

- a) Provide scaled drawings (floor plans not less than 1/16" = 1'-0") indicating actual location and size/length of TMGB, TGBs, BCT, GE and TBB conductors and all splice points.
  - b) Provide scaled plan and elevation drawings of telecommunications rooms (not less than 1/4" = 1'-0") indicating actual locations of TMGB and TGBs.
  - c) Bonding and Grounding shall have its own separate drawing(s).
2. Manufacturer and Maintenance Manuals for all installed equipment. This is to include:
    - a) Manufacturer specification sheets (cutsheets) and installation instructions/manuals for all installed products.
  3. A letter from the contractor Project RCDD stating that the grounding system has been installed in accordance with the project documents and the referenced codes, standards, and guidelines. This letter is to also specifically acknowledge that the telecommunications grounding system has been fully tested according to these specifications. The required contents of this letter may be incorporated into the letter required from the Project RCDD in section 27 00 00.

## PART 2 – PRODUCTS

### 2.1 GENERAL

- A. All components shall be Listed by a NRTL.

### 2.2 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

- A. A telecommunications main grounding busbar (TMGB) shall be provided and installed at the telecommunications service entrance (or as indicated on the drawings).
- B. The TMGB shall:
  1. Be a predrilled copper busbar with holes for use with correctly matched Listed lugs and hardware.
  2. Have minimum dimensions of 0.25" thick by 4" wide by 16" long. Increase length as necessary to provide all connections plus 25% spare capacity.
  3. Be Listed by a NRTL.
  4. Be manufactured by:
    - a) Chatsworth
    - b) Erico
    - c) Harger
    - d) Hoffman
    - e) Panduit
    - f) Or approved equivalent

### 2.3 TELECOMMUNICATIONS GROUNDING BUSBAR (TGB)

- A. A telecommunications grounding busbar (TGB) shall be provided and installed in each telecommunications room.

- B. The TGB shall:
  - 1. Be a predrilled copper busbar with holes for use with correctly matched Listed lugs and hardware.
  - 2. Have minimum dimensions of 0.25" thick by 2" wide by 12" long. Increase length as necessary to provide all connections plus 25% spare capacity.
  - 3. Be listed by a NRTL.
  - 4. Be manufactured by:
    - a) Chatsworth
    - b) Erico
    - c) Harger
    - d) Hoffman
    - e) Panduit
    - f) Or approved equivalent

2.4 BONDING CONDUCTOR FOR TELECOMMUNICATIONS (BCT)

- A. A BCT shall:
  - 1. be copper and may be insulated.
  - 2. be Listed for the application when insulated.
  - 3. As a minimum, the same size as the largest TBB.
- B. The manufacturer shall be:
  - 1. Harger
  - 2. Or approved equivalent

2.5 TELECOMMUNICATIONS BONDING BUSBAR (TBB)

- A. The TBB shall:
  - 1. be copper and may be insulated.
  - 2. be Listed for the application when insulated.
  - 3. Be sized at 2 kcmil per linear foot of conductor length up to a maximum size of No. 3/0 AWG.

2.6 GROUNDING EQUILIZER (GE)

- A. A GE shall:
  - 1. be copper and may be insulated.
  - 2. be Listed for the application when insulated.
  - 3. As a minimum, the same size as the largest TBB.
- B. The manufacturer shall be:
  - 1. Harger
  - 2. Or approved equivalent

2.7 RACK BONDING CONDUCTOR (RBC)

- A. An RBC shall:
  - 1. be copper and may be insulated.
  - 2. be Listed for the application when insulated.
  - 3. Be sized as a No. 6 AWG.
- B. The manufacturer shall be:
  - 1. Harger
  - 2. Or approved equivalent

2.8 RACK GROUNDING BUSBAR (RGB)

- A. Description: grounding Strip for 2-post and 4-post Communications Racks.
- B. A RGB shall:
  - 1. be wrought copper and tin plated.
  - 2. be capable of supporting multiple unit bonding conductors.
  - 3. be Listed.
- C. The manufacturer shall be:
  - 1. Harger
  - 2. Panduit, Grounding Strip Kit, RGS134-1Y
  - 3. Or approved equivalent

2.9 GENERAL BONDING CONDUCTORS OR JUMPERS

- A. Provide and install general bonding conductors and jumpers per construction documents. Refer to drawings and execution section for required locations.
- B. For all conductors and jumpers connecting equipment located in the same room as the TMGB/TGB, conductors/jumpers shall be in a green insulated jacket. This jacket shall include markings that indicate conductor size (minimum of #6 AWG), manufacturer, and UL listing.
- C. Manufacturer shall be:
  - 1. Harger
  - 2. Panduit
  - 3. Or approved equivalent

2.10 BONDING ACCESSORIES

- A. Grounding Lugs
  - 1. Shall be Listed for the application.
  - 2. Shall be two holes compression crimp with inspection window, unless otherwise noted.
  - 2. Copper or tin plated copper.
  - 3. Manufacturers shall be:
    - a) Erico, Cadweld Telecom Lugs
    - b) Harger

- c) Panduit
  - d) Or approved equivalent
- B. Unit Bonding Conductor (UBC)
- 1. Shall be Listed for the application.
  - 2. Shall be a minimum No. 12 AWG
  - 2. Copper with 90-degree bent lugs installed.
  - 3. Manufacturers shall be:
    - a) Erico, Cadweld Telecom Lugs
    - b) Harger
    - c) Panduit
    - d) Or approved equivalent

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Locate TMGB and TGBs so that they are accessible to telecommunications personnel.
- B. At a minimum, follow all manufacturer instructions. In case of discrepancy between manufacturer and contractor requirements, the more stringent shall apply. In the case of conflicting instructions, report any discrepancy to the Design Engineer in a timely fashion so as not to impact the construction timeline.
- C. At a minimum, provide exothermic welds as identified on the drawings or required in the specifications. For all other connections, irreversible compression connections are sufficient.
- D. Identification
  - 1. All telecommunications grounding and bonding conductors shall be labeled within 6" of each end. Labels shall be nonmetallic and read as follows:

IF THIS CONNECTOR OR CABLE IS  
LOOSE OR MUST BE REMOVED,  
PLEASE CALL THE BUILDING  
TELECOMMUNICATIONS  
MANAGER

- E. Testing
  - 1. All grounding connections shall be tested for continuity and resistance after installation but prior to substantial completion. ***The telecommunications contractor is to invite the Design Engineer and ITS representative to witness a portion of this testing while it is being performed.***
  - 2. The test performed shall use an earth ground resistance tester that is configured for a continuity test otherwise known as a two-point test or a "dead earth" test. Tests shall be conducted between the electrical entrance ground and the TMGB as well as at each TGB. This resistance shall be less than 0.05 Ohms.

3.2 TMGB

- A. All metallic raceways for telecommunications cabling located within the same room or space as the TMGB shall be bonded to the TMGB.
- B. Insulate the TMGB 2" from the wall.
- C. For outside plant cables entering a building with a cable shield isolation gap, bond the cable shield (on the building side of the gap) to the TMGB. Outside plant protectors shall be bonded to the TMGB with a No. 6 AWG conductor.
- D. Connections to the busbar shall be made with 2-hole lugs.
- E. Connections shall be made by cleaning the area of connection on the busbar and on the two-hole lug and then applying a thin coating of anti-oxidant compound.

3.3 TGB

- A. All metallic raceways for telecommunications cabling located within the same room or space as the TGB shall be bonded to the TGB.
- B. Insulate the TGB 2" from the wall.
- C. Connections to the busbar shall be made with 2-hole lugs.
- D. Connections shall be made by cleaning the area of connection on the busbar and on the two-hole lug and then applying a thin coating of anti-oxidant compound.

3.4 BCT

- A. Route BCT in conduit from telecommunications service entrance room to the main electrical service ground connection.
  - 1. Label conduit at telecommunications service entrance with tag or adhesive label that states "Building Conductor for Telecommunications (BCT) to Main Electrical Service Ground Connection".
  - 2. Label conduit at main electrical service ground connection with tag or adhesive label that states "Building Conductor for Telecommunications (BCT) to Telecommunications Main Grounding Busbar (TMGB)".
  - 3. BCT shall not be run in a metallic conduit and shall not be completely encircled by metallic clamps.

3.5 TBB

- A. Where following the same routing as cable tray, attach TBB on the outer side of the cable tray to minimize contact with communications cabling.
- B. Size the TBB according to the following table:

Sizing of the TBB	
TBB Length in Linear meters (feet)	TBB Size AWG
Less than 4 (13)	6 (16mm <sup>2</sup> )
4-6 (14-20)	4 (25mm <sup>2</sup> )
6-8 (21-26)	3 (25mm <sup>2</sup> )
8-10 (27-33)	2 (35mm <sup>2</sup> )
10-13 (34-41)	1 (35mm <sup>2</sup> )
13-16 (42-52)	1/0 (50mm <sup>2</sup> )
16-20 (53-66)	2/0 (70mm <sup>2</sup> )
Greater than 20 (66)	3/0 (95mm <sup>2</sup> )

### 3.6 GENERAL BONDING CONDUCTORS OR JUMPERS

- A. General bonding conductors or jumpers are to be utilized in each telecommunications room between the TMGB/TGB and the following components:
1. The communications building entrance protectors.
  2. Electrical panel board (if in same room as TMGB/TGB).
  3. Building steel (if available in same room as TMGB/TGB).
  4. Telecommunications ladder rack and cable tray.
    - a) Bonding jumpers may be utilized to ground adjacent pieces of ladder rack and cable tray together, reducing the need to a single conductor back to the TMGB/TGB.
    - b) In cases where ladder rack or cable tray is painted, it is assumed that the paint will need to be removed at the connection point to ensure a completely bonded connection. If this is not the case, submit documentation from manufacturer indicating NRTL testing was done in regards to grounding without removal of the paint.
  5. Telecommunications equipment racks and cabinets.
    - a) Each cabinet and rack shall be bonded to the TMGB/TGB directly with a #6 AWG RBC from the Rack Grounding Busbar (RGB).
    - b) In cases where equipment racks or cabinets are painted, it is assumed that the paint will need to be removed at the connection point of the RGB to ensure a completely bonded connection. If this is not the case, submit documentation from manufacturer indicating NRTL testing was done in regards to grounding without removal of the paint.

### 3.7 GROUNDING LUGS

- A. Wires shall be inserted to the full depth of the lug.
- B. Space between wire insulation and the body of the compression lug shall be kept to a maximum of 1/4 inch.
- C. Lug must agree with wire size.
- D. To assure proper die is used with the specified connector, manufacturer's embossed coding systems shall be adhered to.
- E. Connectors shall not be modified in any way.
- F. Daisy chaining and stacking (piggy backing) of ground lugs is prohibited.
- G. Bolts, nuts, washers used to secure ground connections shall match the diameter of the hole.

**END OF SECTION**