

SECTION 27 05 26 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Selection and installation of communications busbars.
 - 2. Selection and installation of communications bonding conductors.
- B. Related Requirements:
 - 1. Section 27 00 10 "Supplemental Requirements for Communications" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.3 DEFINITIONS

- A. BBC: Backbone bonding conductor, for connecting multiple TBBs serving the same floor.
- B. PBB: Primary bonding busbar, located in main distribution frame room, ideally near electrical service entrance.
 - 1. PBB is also referenced as TMGB (Telecommunications main grounding busbar).
- C. RBB: Rack bonding busbar, located in equipment cabinets and racks.
- D. RBC: Rack bonding conductor, for connection RBBs to TEBCs in large multi-rack telecom rooms
- E. SBB: Secondary bonding busbar, located in intermediate distribution frame rooms.
 - 1. SBB is also referenced as TGB (Telecommunications grounding busbar).
- F. SBC: Secondary bonding conductor, for connecting SBBs to TBBs in multi-story large buildings.
- G. TBB: Telecommunications bonding backbone, for connecting SBBs to PBB.
- H. TBC: Telecommunications bonding conductor, for connecting PBB to intersystem bonding termination device or busbar at electrical service entrance.
- I. TEBC: Telecommunications equipment bonding conductor, for connecting RBBs to SBBs or PBB.

- J. UBC: Unit bonding conductor, for connecting individual communications equipment to RBBs or SBBs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. For communications equipment room signal reference grid.
 - 2. Include plans, elevations, sections, details, and attachments to other work.
- C. Field Quality-Control Submittals:
 - 1. Field quality-control reports.

1.5 INFORMATIONAL SUBMITTALS

- A. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:
 - 1. Installing wire connector on conductor.
 - 2. Recommended torque values.

1.6 CLOSEOUT SUBMITTALS

- A. Record Documentation: Project record documents in accordance with Section 01 78 39 "Project Record Documents" must include:
 - 1. Locations of PBB and SBBs
 - 2. Routing of TBC, TBBs, SBCs, and BBCs
 - 3. Locations of ground rods, test wells, ground rings, and roof rings
- B. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
- C. Test Results:
 - 1. Ground-resistance test, measured at the point of TBC connection.
 - 2. Bonding-resistance test at each PBB or SBB and its nearest grounding electrode.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Installation Supervision: Installation shall be under the direct supervision of ITS Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.

- B. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of TBC connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of TBC only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF COMMUNICATIONS BUSBARS

- A. Unless otherwise indicated in this Section or on Drawings, provide products by the same manufacturer specified in Section 26 05 26 "Grounding and Bonding for Electrical Systems" for the CGEB and GEB.
- B. Comply with TIA-607-D.

3.3 SELECTION OF COMMUNICATIONS BONDING CONDUCTORS

- A. Unless otherwise indicated in this Section or on Drawings, provide products specified in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Comply with TIA-607-D.
- C. Communications Busbar Connections:
 - 1. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not smaller than 6 AWG and not larger than 750 kcmil, unless otherwise indicated on Drawings.
 - 2. TBC: Not smaller than largest TBB unless otherwise indicated on Drawings.
 - 3. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated on Drawings.
 - 4. SBC: Not smaller than 6 AWG and not smaller than the largest conductor bonded to the associated SBB, unless otherwise indicated on Drawings.
 - 5. TEBC: Not smaller than 6 AWG and not smaller than the largest equipment grounding conductor serving the rack/cabinet, unless otherwise indicated on Drawings. Provide bolted connectors.
 - 6. UBC: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted connectors.

7. Bonding Conductors to Structural Steel: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted clamp connectors.

3.4 INSTALLATION OF BONDING FOR COMMUNICATIONS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
 1. Bonding of Communications: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with BICSI N3.
 2. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:
 1. Busbars:
 - a. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 12 inch above finished floor unless otherwise indicated.
 - b. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
 2. Conductors:
 - a. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
 - b. Assemble wire connector to conductor, complying with manufacturer's published instructions and as follows:
 - 1) Use crimping tool and die specific to connector.
 - 2) Pretwist conductor.
 - 3) Apply antioxidant compound to bolted and compression connections.
 - c. Install in straightest and shortest route between origination and termination point, and no longer than required. Bend radius must not be smaller than 10 times diameter of conductor. No single bend may exceed 90 degrees.
 - d. Install without splices.
 - e. Support conductors at not more than 36 inch intervals.
 - f. Outside telecommunications rooms, install conductors in metric designator 21 (trade size 3/4) PVC-80 conduit until conduit enters telecommunications room. Install bonding conductors in EMT-A or EMT-SS when routed through plenum. Do not install bonding conductors in EMT-S unless otherwise indicated on Drawings.
 - 1) If bonding conductor must be installed in EMT-S or other ferrous metallic raceway, bond conductor to raceway using grounding bushing that complies with Section 27 05 28 "Pathways for Communications Systems," and bond both ends of raceway to SBB.
 3. Provide TBC and terminate ends to PBB and intersystem bonding termination device at electrical service entrance in accordance with Section 250.94, "Bonding for Communication Systems," of NFPA 70.
 4. Structural Steel: Where structural steel of steel frame building is readily accessible within room or space, bond each PBB to vertical steel of building frame.

5. Communications Enclosures: Bond metallic enclosures of telecommunications equipment with UBCs to nearest PBB.
6. Equipment Racks: Bond metallic components of enclosures to RBB using UBCs. Provide top-mounted RBB if not provided by enclosure or rack manufacturer. Bond RBB to SBB with TEBC. Power connection must comply with NFPA 70; equipment grounding conductor in power cord of cord- and plug-connected equipment must be considered supplemental to bonding requirements in this Section.
7. Primary Protector: Bond to PBB with insulated bonding conductor.
8. Electrical Power Panelboards: Where electrical panelboards for communications equipment are located in same room or space, bond each ground bar of panelboard to SBB.
9. Insert connections for other equipment.

3.5 IDENTIFICATION

- A. Comply with Section 27 05 53 "Identification for Communications Systems."
- B. Labels must be preprinted or computer-printed type.
 1. Label PBBs with "ts-PBB," where "ts" is telecommunications space identifier for location of PBB.
 2. Label SBBs with "ts-SBB," where "ts" is telecommunications space identifier for location of SBB.
 3. Provide warning sign at each PBB or SBB with legend: "IF A CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL "
 4. Label TBC, TBBs, and BBCs at attachment points with legend: "WARNING! COMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.6 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by Architect.
- B. Tests and Inspections:
 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench according to manufacturer's published instructions.
 2. Test bonding connections of system using AC earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing PBB or SBB, using process recommended by BICSI N1. Conduct tests with facility in operation.
 - a. Measure resistance between PBB and electrical service intersystem termination point. Maximum acceptable value is 100 mΩ.
 - 1) If measured resistance from electrical service equipment to ground exceeds the value specified in Section 26 05 26, notify Architect and include recommendations to reduce resistance to ground.
 - b. Measure resistance between SBBs and PBB. Maximum acceptable value is 100 mΩ.

3. Test for ground loop currents using digital clamp-on ammeter, with full scale not more than 10 A, displaying current in increments of 0.01 A at accuracy of plus or minus 2.0 percent.
 - a. With grounding infrastructure completed and communications system electronics operating, measure current in bonding conductors connected to PBB. Maximum acceptable AC current level is 1 A.

C. Nonconforming Work:

1. Communications bonding will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Collect, assemble, and submit test and inspection reports.

3.7 PROTECTION

- A. After installation, protect busbars and conductors from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION