

**SECTION 16760
TELECOMMUNICATIONS - GROUNDING AND BONDING**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Related Sections
- B. Applicable Publications
- C. Work Sequencing and Coordination
- D. Telecommunications Submittals
- E. Quality Assurance
- F. Project Record Documents
- G. Qualifications
- H. Regulatory Requirements
- I. Performance Requirements
- J. Materials
- K. Execution

1.2 RELATED SECTIONS

- A. Division 16 Electrical Sections apply to this Section with the additions and modifications specified herein.
- B. Section 16710 – Telecommunications - General Requirements
- C. Section 16715 - Telecommunications - Acceptance Testing
- D. Section 16720 - Telecommunications - Basic Materials and Methods
- E. Section 16720 - Telecommunications – Air Blown Fiber Basic Materials and Methods
- E. Section 16725 - Telecommunications - Cable
- F. Section 16730 - Telecommunications - Underground Structures
- G. Section 16740 - Telecommunications - Building (RF) CATV / MATV System

1.3 APPLICABLE PUBLICATIONS

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- A. American National Standards Institute (ANSI) Publication: C2-93 National Electrical Safety Code
- B. Electronic Industries Alliance and Telecommunication Industries Association (EIA/TIA) Publications:
 - (1) EIA/TIA 568A - Commercial Building Telecommunications Wiring Standard
 - (2) EIA/TIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces
 - (3) EIA/TIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications
- C. Institute of Electrical and Electronic Engineers (IEEE) Publication: 142-1991 Recommended Practice for Grounding of Industrial and Commercial Power Systems
- D. National Fire Protection Association (NFPA) Publication: 70-93 National Electrical Code (NEC)
- E. California State University, Office of the Chancellor - Telecommunications Infrastructure Planning (TIP) Standards – Adopted July 2003 plus the most recently issued TIP updates.
- F. North Orange County Community College District TELECOMMUNICATION INFRASTRUCTURE STANDARDS dated January 2007.
- G. Underwriters Laboratories, Inc. (UL) Publication:
 - (1) 83-1983 Thermoplastic Insulated Wires
 - (2) 467-84 (R86) Grounding and Bonding

1.4 WORK SEQUENCING AND COORDINATION

- A. The Contractor shall coordinate interconnection to the District's existing grounding and bonding system with District's representative. The existing grounding and bonding system will not be taken out of service during the District's normal hours of operation. Any out of service activity shall be coordinated a minimum of two weeks in advance and shall occur after hours.

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1.5 SUBMITTALS

The University shall receive the following Contractor submittals:

- A. Product data for:
 - (1) Ground bus bars
 - (2) Conductors
 - (3) Connections (all types)
- B. Test Reports for:
 - (1) Overall resistance to ground and resistance of each busbar
 - (2) Ground resistance measurements made at each MDF, BDF, IDF, and designated telecommunications space
- C. Manufacturer's Instructions: include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.6 QUALITY ASSURANCE

- A. All grounding and bonding system work shall be tested and documented as defined in Section 16715 - Telecommunications Acceptance Testing.
- B. For products or workmanship specified by association, trade, Federal, or State Standards, the Contractor shall comply with the requirements of the standard, except when more rigid requirements required by applicable codes or District standards shall apply.
- C. The Contractor shall conform to reference standard by date of issue current on final design documents.

1.7 PROJECT RECORD DOCUMENTS

- A. The Contractor shall accurately record and submit to the District complete data regarding **communication** ground wire pathways, points of bonding, and point of connection to building grounds.
- B. Antenna protector grounding shall indicate ground source, distance, and size of ground wire.

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1.8 QUALIFICATIONS

- A. Products specified in this Section shall be manufactured by a company with a minimum of three years' documented experience specializing in manufacturing such products.

1.9 REGULATORY REQUIREMENTS

- A. Telecommunications grounding and bonding shall conform to requirements of NFPA 70 and ANSI C2.
- B. The Contractor shall furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to the campus as suitable for purpose specified and shown.

1.10 PERFORMANCE REQUIREMENTS

- A. Point to Point Resistance: 0.5 ohms or less.

PART 2 MATERIALS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall conform to the respective standards and to the Quality Standards stated herein. Electrical ratings shall be as indicated. Except where specifically indicated otherwise, the Contractor shall provide only new materials having all legally required approvals and/or labels. Materials shall conform to the requirements of UL 467 where applicable.

2.2 CONDUCTOR, UL 83

- A. Ground and bonding conductors shall be green-insulated, soft-drawn stranded copper conductors, unless otherwise indicated, installed with sufficient slack to avoid breaking due to settlement and movement of conductors or attached points.
- B. System grounding conductors shall be minimum of 3/0 AWG bare copper, unless otherwise indicated, and shall be continuous with no joints or splices.

2.3 CONNECTORS AND TERMINALS

- A. Wire Connectors and Terminals for use with Copper Conductors: UL 486A.

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2.4 GROUND BUS BARS

- A. Ground bar with tapped standard NEMA bolt holes for 2-hole compression connectors, mounting brackets and insulators, sizes as indicated:
- (1) 1/4" x 4" x 12", Lyncole XIT or approved equivalent in the BDF and the network room.
 - (2) 1/4" x 4" x 5.25", Lyncole XIT or approved equivalent in all other telecommunication spaces.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The Contractor shall provide grounding and bonding in accordance with the requirements of NFPA 70, IEEE 142, EIA/TIA 568, EIA/TIA 607, state and local codes, the campus standards and to requirements specified herein. Codes shall be complied with as a minimum requirement, with qualification standards prevailing when they are more stringent.

3.2 BONDING

- A. Metallic conduits, wireways, metal enclosures of bussways, cable boxes, equipment housings, cable racks and all non-current carrying metallic parts of the installed telecommunications services shall be grounded. The metallic conduit system shall be used for equipment and enclosure grounding but not as a system ground conductor. A code sized green insulated copper grounding conductor shall be included in nonmetallic conduits, and each end shall be terminated on suitable lug, bus, or bushing.
- B. All conduit stub-ups shall be grounded, and where multiple stub-ups are made within an equipment enclosure, they shall be equipped with grounding bushings and bonded together and to the enclosure and the enclosure ground bus.
- C. Each metallic raceway, pipe, duct and other metal object entering the buildings shall be bonded together. The Contractor shall use 6 AWG bare copper conductors.
- D. The Contractor shall bond telecommunications equipment and busbars separately.

3.3 SIGNAL REFERENCE GROUNDING AND BONDING

- A. Each identified telecommunications space within a building shall have a common signal reference ground. The signal reference ground shall conform to the following:
- (1) Within the building, all communication spaces shall be separately bonded to each other and connected to the primary building ground in accordance with the provisions of EIA/TIA 607. The communication ground shall not ground any other equipment or be connected to any potential high voltage source. All racks,

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frames, drain wires, and all installed communication equipment shall be grounded to this common reference ground only.

- (2) Unless otherwise noted, the Contractor shall provide, as a minimum, a continuous #0 AWG green electrical conductor connected to a 1/4" x 4" x 5.25" telecommunications grounding busbar (TGB) 15" AFF on the plywood backboard of each IDF (or telecommunication space) to terminate chassis and other equipment grounds.
- (3) The ground wires from each individual IDF shall be routed directly to the Building Distribution Frame (BDF), terminated and bonded together via a telecommunications main grounding busbar (TMGB) of minimum 1/4" x 4" x 12" dimensions. This point of single reference for all closets in a building shall in turn be grounded with a minimum #0 AWG ground conductor to an acceptable building ground of 5 ohms or less. An acceptable building ground for signal reference is the building service entrance ground.

3.4 RISER/TIE CABLE GROUNDING

- A. There shall be no bonding between the entry cable and the inside riser or distribution cable.
- B. All riser and tie cable shields shall be bonded into a single continuous path end-to-end and grounded on each floor in which pairs leave the sheath. Cable shields shall be grounded to the signal reference ground provided in each telecommunication space.

3.5 FIELD TESTS

- A. As an exception to requirements that may be stated elsewhere in the agreement with the District, the Inspector shall be given 5 working days notice prior to each test. The Contractor shall provide all test equipment and personnel and shall provide written copies of all test results.
- B. Grounding and bonding system conductors and connections shall be inspected for tightness and proper installation.
- C. The Contractor shall provide personnel and test equipment to perform a point to point resistance test before connecting equipment. Perform point to point tests in each building to determine the resistance between the main grounding system and all BDF/IDF ground busbars. Investigate and correct point to point resistance values that exceed 0.5 ohm. The Contractor shall record resistance measurements, test point locations, ambient temperature and weather conditions at time of test.

END OF SECTION

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