SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Communications-circuit accessories.

B. Products Installed, but Not Furnished, under This Section:

1. Section 061000 "Rough Carpentry" furnishes equipment backing panels installed by this Section.
2. Section 260526 "Grounding and Bonding for Electrical Systems" furnishes the following installed by this Section:

    a. Grounding and bonding conductors.
    b. Grounding and bonding clamps.
    c. Grounding and bonding bushings.
    d. Grounding and bonding hubs.
    e. Grounding and bonding connectors.
    f. Intersystem bonding bridge grounding connector.
    g. Grounding and bonding busbars.
    h. Signal reference grids.

3. Section 260529 "Hangers and Supports for Electrical Systems" furnishes hangers, supports, and concrete bases for communications equipment installed by this Section.
4. Section 260533.16 "Boxes and Covers for Electrical Systems" furnishes the following installed by this Section:

    a. Metallic outlet boxes, device boxes, rings, and covers.
    b. Junction boxes and pull boxes.
    c. Cover plates for device boxes.

5. Section 260553 "Identification for Electrical Systems" furnishes labels and warning signs for communications pathways installed by this Section.
6. Section 262716 "Electrical Cabinets and Enclosures" furnishes the following installed by this Section:

    a. Cabinets and cutout boxes.
    b. Termination boxes.
    c. Miscellaneous enclosures.
    d. Rack or frame systems.
    e. Enclosure-mounted relocatable power taps.

7. Section 262719 "Multi-Outlet Assemblies" furnishes the following installed by this

Section:

a. Wall-mounted, surface metal raceway multi-outlet assemblies.
b. Indoor service poles.

8. Section 262726.33 "General-Grade Duplex Straight-Blade Receptacles" furnishes duplex receptacles installed by this Section.
9. Section 262726.39 "Locking Receptacles" furnishes locking receptacles installed by this Section.
10. Section 262726.51 "Connectors, Cords, and Plugs" furnishes pendant flexible cords and connectors installed by this Section.

C. Related Requirements:

1. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
2. Section 270010 "Supplemental Requirements for Communications" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
3. Section 270528 "Pathways for Communications Systems" for installation of cable pathways serving communications equipment room fittings installed under this Section.

1.2 DEFINITIONS

A. Abbreviations for Communications Spaces:

1. TDR: Telecommunications Distribution Room - aka IDF.
2. TE: Telecommunications enclosure; generally, serves a single tenant or floor.
3. TSER/TEC: Telecommunications Service Entry Room/Telecommunications Equipment Center - aka EF/MDF.

B. Abbreviations for Communications Facilities:

1. HC: Horizontal cross-connect; also called "floor distributor" (FD).
2. IC: Intermediate cross-connect; also called "building distributor" (BD).
3. MC: Main cross-connect; also called "campus distributor" (CD).

C. Abbreviations for Grounding and Bonding:

1. BBC: Backbone bonding conductor, for connecting multiple TBBs serving the same floor.
2. PBB: Primary bonding busbar; located in main distribution frame room, ideally near electrical service entrance.
3. RBB: Rack bonding busbar; located in equipment cabinets and racks.
4. SBB: Secondary bonding busbar; located in intermediate distribution frame rooms.
5. TBB: Telecommunications bonding backbone, for connecting SBBs to PBB.
6. TBC: Telecommunications bonding conductor, for connecting PBB to intersystem

bonding termination device or busbar at electrical service entrance.
7. TEBC: Telecommunications equipment bonding conductor, for connecting RBBs to SBBs or PBB.
8. UBC: Unit bonding conductor, for connecting individual communications equipment to RBBs or SBBs.

1.3 ACTION SUBMITTALS

A. Shop Drawings:

1. Communications equipment room drawings, diagrams, and supporting documents.

PART 2 - PRODUCTS

2.1 COMMUNICATIONS-CIRCUIT ACCESSORIES

A. Description: This category covers devices intended for connecting communications circuits in accordance with Article 800 of NFPA 70.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria:

    a. For Communications Circuits: UL CCN DUXR; including UL 1863 and UL 467.
    b. For Audio/Video, Data, and Signaling Circuits: UL CCN DUXR; including UL 1977 and UL 467.

3. Source Limitations: Obtain products from single manufacturer.
4. Description: This product type includes the frame only. Block inserts and related termination equipment are specified in communications cabling Sections.

C. UL DUXR - Patch Panel:

1. Manufacturers: Subject to compliance with requirements, **provide products by the following**:

    a. **Panduit Corp**

2. Source Limitations: Obtain products from single manufacturer.
3. Product Characteristics:

    a. Mounting: **Equipment rack**.
    b. Style: **Modular**

c. EMI Compatibility: **Unshielded**.
d. Configuration: **angled**.
e. Include provisions for labeling ports.

4. Required Product Options:

a. Distribution Port Quantity: **48**.
b. Cable Type: **Cat6A**

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Communications Equipment Room Drawings, Diagrams, and Supporting Documents:

a. Include plans, elevations, sections, details, and attachments to other work.
b. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
c. Equipment Racks and Cabinets: Indicate workspace requirements and access for cable connections.
d. Switchboards, Panelboards, and Safety Switches: Indicate workspace requirements and access for cable connections.
e. Grounding and Bonding: Indicate location of busbars and their mounting details showing standoff insulators and wall mounting brackets.
f. Cable Trays, Large Raceways, Ducts, and Piping: Indicate elevation and route of vertical and horizontal cable trays, raceways or ducts larger than **2 inches** wide, and fire-suppression piping located inside communications equipment room.
g. Luminaires: Indicate elevation, orientation, and size of luminaires inside the communications equipment room for coordination with cable trays, equipment racks, cabinets, and other equipment.
h. Access Panels: Indicate locations, dimensions, and clearances required to open access panels in ducts, walls, or ceilings inside communications equipment room.
i. Controls: Indicate locations of sensors, switches, and push-buttons for HVAC, fire suppression, fire alarm, and standby power.
j. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize configurations and space requirements of communications equipment.
k. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.
l. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

B. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR COMMUNICATIONS

A. Grounding and Bonding Conductors:

1. Communications Busbar Connections:

a. TBC: Not smaller than 3/0 AWG and no smaller than largest TBB.
b. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not larger than 750 kcmil, unless otherwise indicated on Drawings.
c. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated on Drawings.
d. TEBC: Not smaller than 2 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
e. UBC: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
f. Bonding Conductors to Structural Steel: Not smaller than **6 AWG** unless otherwise indicated on Drawings. Provide bolted clamp connectors.

2. Cable Tray Connections:

a. Cable Tray Equipment Grounding Conductor: 6 AWG.
b. Cable Tray Bonding Jumper: If not supplied by cable manufacturer, provide bonding jumper not smaller than 6 AWG and not longer than **12 inches**. If jumper is wire, it must be terminated with lug having one hole and standard barrel for one crimp. If jumper is flexible braid, it must be terminated with one- or two-hole ferrule. Attach with bonding screw or connector provided by cable tray manufacturer.

3. Underground Connections: Not smaller than 2 AWG. Provide welded connectors, except bolted connectors may be used in handholes or manholes and as otherwise indicated on Drawings.

B. Grounding and Bonding Busbars:

1. PBB:

a. Dimensions: 1/4 inch thick by 4 inches high.
b. Stand-Off Distance: 2 inches.

2. SBB:

a. Dimensions: 1/4 inch thick by 4 inches high.
b. Stand-Off Distance: 2 inches.

C. Access Floor Signal Reference Grid:

1. Provide low-impedance path between telecommunications cabinets, equipment racks, and reference grid, by installing 6 AWG bonding conductors in a grid pattern under the floor.

    a. Install grid bonding conductors on **4 ft** centers, so as to permit bonding of one structural pedestal for each access floor tile. Connect grid conductors together where they cross each other.
    b. Bond SBBs in room to two or more bonding conductors of reference grid with TEBCs.
    c. Bond equipment to nearest SBB and to reference grid with TEBCs.
    d. Bond conduits and piping entering equipment room with TEBCs to nearest SBB and to grid conductor nearest entry into room.

D. Signal Reference Grid Wire Mesh:

3.3 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

A. Pipe and Conduit Labeling: Comply with ASME A13.1 and IEEE C2.

B. Color Coding Scheme for Communications Cable and Terminations: Comply with BICSI N1 and TIA-598.

C. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:

1. "SIGNAL"

D. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

E. Locations of Underground Lines: Underground-line warning tape for communication, control wiring, and optical-fiber cable.

F. Communications Vaults, Manholes, Handholes, and Pull and Junction Boxes: For conductors in vaults, pull and junction boxes, manholes, and handholes, use snap-around labels to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at **50 ft** maximum intervals in straight runs, and at **25 ft** maximum intervals in congested areas.

G. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with conductor or cable designation, origin, and destination.

H. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with conductor designation.

I. Conductors to Be Extended in Future: Attach marker tape to conductors.

J. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

K. Equipment Identification Labels:

1. Black letters on white field.
2. Indoor Equipment: Self-adhesive label.
3. Outdoor Equipment: Laminated acrylic or melamine sign.
4. Equipment to Be Labeled:

    a. Racks, Frames, and Enclosures: Identify front and rear of each enclosure with self-adhesive labels containing equipment designation.
    b. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
    c. Communications cabinets.
    d. Access doors and panels for concealed communications items.
    e. Emergency system boxes and enclosures.
    f. Contactors.
    g. Remote-controlled switches, dimmer modules, and control devices.
    h. Monitoring and control equipment.
    i. Fire-alarm equipment.
    j. Security equipment.
    k. Life-safety communications equipment.

L. Backbone Cables: Label each cable with a snap-around label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

M. Horizontal Cables: Label each cable with a snap-around label.

N. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Identify cover plate in accordance with TIA-606.

O. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.4 SELECTION OF SIGNS AND HAZARD MARKINGS

A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.

B. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.
3. Safety Symbols: NEMA Z535.3.

4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

C. Label TBC, TBBs, and BBCs at attachment points with legend: "WARNING! COMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.5 FIELD-FABRICATION OF FITTINGS FOR ENTRANCE FACILITY

A. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Designated Critical Operations Areas: Comply with Article 708 of NFPA 70.
2. Communications Systems: Comply with Ch. 8 of NFPA 70 and with BICSI N1.
3. Grounding and Bonding: Comply with Article 250 of NFPA 70 and with BICSI N3.
4. Consult Architect for resolution of conflicting requirements.

B. Provide the following specified products in entrance facility room or space:

1. One equipment backing panel:

   a. Install from **6 inches** to **8 ft, 6 inches** above finished floor. If plywood is fire treated, ensure that fire-treatment stamp is visible after installation.

2. Quantity as indicated on Drawings of 19 inch open 19-inch enclosed equipment rack with RBB and enclosure-mounted relocatable power tap.

3.6 FIELD-FABRICATION OF FITTINGS FOR EQUIPMENT ROOM

A. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Designated Critical Operations Areas: Comply with Article 708 of NFPA 70.
2. Communications Systems: Comply with Ch. 8 of NFPA 70 and with BICSI N1.
3. Grounding and Bonding: Comply with Article 250 of NFPA 70 and with BICSI N3.
4. Consult Architect for resolution of conflicting requirements.

B. Provide the following specified products in entrance facility room or space:

1. Quantity as indicated on Drawings of equipment backing panel:

   a. Install from **6 inches** to **8 ft, 6 inches** above finished floor. If plywood is fire treated, ensure that fire-treatment stamp is visible after installation.

2. Quantity as indicated on Drawings of 19 inch open 19-inch enclosed equipment rack with RBB and enclosure-mounted relocatable power tap:

3.7 FIELD-FABRICATION OF FITTINGS FOR TELECOMMUNICATIONS ROOMS

A. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Designated Critical Operations Areas: Comply with Article 708 of NFPA 70.
2. Communications Systems: Comply with Ch. 8 of NFPA 70 and with BICSI N1.
3. Grounding and Bonding: Comply with Article 250 of NFPA 70 and with BICSI N3.
4. Consult Architect for resolution of conflicting requirements.

B. Provide the following specified products in intermediate distribution frame room or space:

1. **Quantity as indicated on Drawings of** equipment backing panel.

    a. Install from **6 inches** to **8 ft, 6 inches** above finished floor. If plywood is fire treated, ensure that fire-treatment stamp is visible after installation.

2. **Quantity as indicated on Drawings of** SBB.
3. **Quantity as indicated on Drawings of 19-inch open and/or 19-inch enclosed** equipment rack with RBB and enclosure-mounted relocatable power tap.
4. **Quantity as indicated on Drawings of** patch panel.

3.8 INSTALLATION OF BONDING FOR COMMUNICATIONS

A. Grounding of Communications: Bond PBB and SBBs to grounding electrode conductors at electrical power service entrance, and at electrical power derived systems serving communications equipment, using intersystem bonding termination device.

1. Structural Steel: Where structural steel of steel frame building is readily accessible within room or space, bond each SBB and PBB to vertical steel of building frame.

B. Comply with manufacturer's published instructions.

C. 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.

D. Special Techniques:

1. Bonding of Busbars:

    a. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers **12 inches** above finished floor unless

otherwise indicated.

b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.

2. Bonding 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 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. Busbar Interconnections: Bond SBBs to PBB with TBBs. If more than one TBB is installed, bond TBBs together with BBCs where required by TIA-607.
5. Communications Enclosures: Bond metallic enclosures of telecommunications equipment with UBCs to nearest SBB or PBB.
6. Equipment Racks: Bond metallic components of enclosures to RBB using UBCs. Provide **vertically 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. Shielded Cable: Bond shield of shielded cable to SBB in communications rooms and spaces. Comply with TIA-568.1 and TIA-568.2 when grounding shielded balanced twisted-pair cables.
8. Primary Protector: Bond to PBB with insulated bonding conductor.
9. Electrical Power Panelboards: Where electrical panelboards for communications equipment are located in same room or space, bond each ground bar of

panelboard to SBB.

10. Cable Trays: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
11. Ladder Racks: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
12. Access Floors: Bond metal parts of access floors to SBB.

3.9 FIELD QUALITY CONTROL FOR BONDING OF COMMUNICATIONS

A. Field tests and inspections must be witnessed by authorities having jurisdiction.

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 5 Ω, 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 and to SBBs. 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.

3.10 PROTECTION

A. After installation, protect communications equipment room fittings 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 271100