**DIVISION 27 COMMUNICATIONS**

**SECTION 27 15 00 COMMUNICATIONS HORIZONTAL CABLING**

**PART 1 – GENERAL**

**1.1** USF General Requirements (reserved for future use)

**1.2 SUMMARY**

A. Section Includes:

1. UTP cabling.

2. 50/125 62.5/125-micrometer, optical fiber cabling.

3. Multiuser telecommunications outlet assemblies.

4. Cable connecting hardware, patch panels, and cross-connects.

5. Telecommunications outlet/connectors.

6. Cabling system identification products.

7. Cable management system.

**1.3 DEFINITIONS**

A. BICSI: Building Industry Consulting Service International.

B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. IDC: Insulation displacement connector.

F. LAN: Local area network.

G. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

H. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

I. RCDD: Registered Communications Distribution Designer.

J. UTP: Unshielded twisted pair.

**1.4** **ADMINISTRATIVE REQUIREMENTS**

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

**1.5** **ACTION SUBMITTALS**

A. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.

2. Cabling administration drawings and printouts.

3. Wiring diagrams to show typical wiring schematics, including the following:

a. Cross-connects.

**1.6** **CLOSEOUT SUBMITTALS**

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.

2. Program Software Backup: On magnetic media or compact disk, complete with data files.

3. Device address list.

4. Printout of software application and graphic screens.

**1.7** **MAINTENANCE MATERIAL SUBMITTALS**

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

**1.8** **QUALITY ASSURANCE**

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff. Owner may qualify installer under separate contract.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.

2.Installation Supervision: Installation shall be under the direct supervision of a dedicated project manager who shall be present at all times when Work of this Section is performed at Project site.

**1.9 DELIVERY, STORAGE, AND HANDLING**

A. Advise USF IT/Owner, minimum five working days’ notice, when cables are on project site. Test cables, in the presence of USF IT/Owner, upon receipt at Project site per BICSI ITSIM Standards.

**PART 2 – PRODUCTS**

**2.1 HORIZONTAL CABLING DESCRIPTION**

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.

2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.

3. Bridged taps and splices shall not be installed in the horizontal cabling.

4. Splitters shall not be installed as part of the optical fiber cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

**2.2 PERFORMANCE REQUIREMENTS**

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 450 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Grounding: Comply with J-STD-607-A.

**2.3** **BACKBOARDS**

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches.

**2.4** **UTP CABLE**

A. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

1. Hitachi

2. General

3. OCC

B. Description: 100-ohm, four-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.

2. Comply with TIA/EIA-568-B.1 for performance specifications.

3. Comply with TIA/EIA-568-B.2, Category 6.

4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

**2.5 UTP CABLE HARDWARE**

A. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

1. Hitachi

2. General

3. OCC

**2.6** **OPTICAL FIBER CABLE**

A. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

1. Corning Cable Systems.

2. General Cable Technologies Corporation.

3. Hitachi

4. Optical Cable Corporation (OCC)

B. Description: Multimode, 50/125 62.5/125-micrometer, 24 -fiber, nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.

2. Comply with TIA/EIA-568-B.3 for performance specifications.

3. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. General Purpose, Nonconductive: Type OFN or OFNG, or OFNR, OFNP.

b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.

c. Riser Rated, Nonconductive: Type OFNR or OFNP, complying with UL 1666.

d. General Purpose, Conductive: Type OFC or OFCG; or OFNG, OFN, OFCR, OFNR, OFCP, or OFNP.

e. Plenum Rated, Conductive: Type OFCP or OFNP, complying with NFPA 2Riser Rated, Conductive: Type OFCR; or OFNR, OFCP, or OFNP, complying with UL 1666.

4. Conductive cable shall be steel armored type.

5. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.

6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable Orange for 62.5/125-micrometer cable.

2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.

3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

**2.7** **OPTICAL FIBER CABLE HARDWARE**

A. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

1. Corning Cable Systems.

2. General Cable Technologies Corporation.

3. Hitachi

4. Optical Cable Corporation (OCC)

B. Cable Connecting Hardware:

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.

2. Quick-connect, simplex and duplex, Type SC for single mode Type ST for 62.5 multi-mode Type LC for 50 multi-mode connectors. Insertion loss not more than 0.75 dB.

3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

**2.8** **COAXIAL CABLE** (See Section 27 41 00, Common work results for Audio-Visual Systems)

**2.9** **COAXIAL CABLE HARDWARE** (See Section 27 41 00, Common work results for Audio-Visual Systems)

**2.10** **CONSOLIDATION POINTS**

A. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

1. Chatsworth Products, Inc.

2. Panduit Corp.

3. OCC

B. Description: Consolidation points shall comply with requirements for cable connecting hardware.

1. Mounting: Coordinate with USF IT.

2. NRTL listed as complying with UL 50 and UL 1863.

3. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

**2.11** **MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY** (MUTOA)

A. Manufacturers: Subject to compliance with requirements, product by one of the following:

1. Chatsworth Products, Inc.

2. Hubbell Premise Wiring.

3. Panduit Corp.

4. OCC

B. Description: MUTOAs shall meet the requirements for cable connecting hardware.

1. Mounting: Coordinate with USF IT.

2. NRTL listed as complying with UL 50 and UL 1863.

3. Label shall include maximum length of work area cords, based on TIA/EIA-568-B.1.

4. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

**2.12** **TELECOMMUNICATIONS OUTLET/CONNECTORS** **JACKS:** 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

A. Workstation Outlets: 3-port-connector assemblies mounted in single or multigang faceplate.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 26 27 26, Wiring Devices.

2. Metal Faceplate: Stainless steel, complying with requirements in Section 26 27 26, Wiring Devices.

3. For use with snap-in jacks accommodating, any combination of UTP, optical fiber, and coaxial work area cords.

a. Flush mounting jacks, positioning the cord at a 45-degree angle.

4. Legend: Machine printed, in the field, using adhesive-tape label.

**2.13** **GROUNDING**

A. Comply with requirements in Section 26 05 26 Grounding and Bonding for Electrical Systems for grounding conductors and connectors.

B. Comply with J-STD-607-A.

**2.14** **IDENTIFICATION PRODUCTS**

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

**2.15** **CABLE MANAGEMENT SYSTEM**

A. Manufacturers: Subject to compliance with requirements, product by one of the following:

1. Panduit

2. OCC

3. Chatworth

B. Description: Computer-based cable management system, with integrated database and graphic capabilities.

C. Document physical characteristics by recording the network, TIA/EIA details, and connections between equipment and cable.

D. System shall interface with the following testing and recording devices:

1. Direct upload tests from circuit testing instrument into the personal computer.

2.Direct download circuit labeling into labeling printer.

**PART 3 – EXECUTION**

**3.1** **ENTRANCE FACILITIES**

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

**3.2** **WIRING METHODS**

A. Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal pathways and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.

2. Comply with requirements in Section 27 05 36, Cable Trays for Communications Systems.

B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

2. Install lacing bars and distribution spools.

3. Install conductors parallel with or at right angles to sides and back of enclosure.

**3.3** **INSTALLATION OF CABLES**

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.

2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."

3. Install 110-style IDC termination hardware unless otherwise indicated.

4. MUTOA shall not be used as a cross-connect point.

5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:

a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.

b. Locate consolidation points for UTP at least 49 feet from communications equipment room.

6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.

7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.

10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

12. In the communications equipment room, install a 10-foot- long service loop on each end of cable.

13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, “Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.

2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.

2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.

2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches] apart.

3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.

2. Install cabling after the flooring system has been installed in raised floor areas.

3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

G. Outdoor Coaxial Cable Installation: (See Section 27 41 00, Common work results for Audio-Visual Systems)

H. Group connecting hardware for cables into separate logical fields.

I. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 12 inches.

**3.4 FIRESTOPPING**

A. Provide penetration Firestopping through all rated assemblies.

B. Comply with TIA-569-B, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

**3.5** **GROUNDING**

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

**3.6** **IDENTIFICATION**

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 26 05 53, Identification for Electrical Systems.

1. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint Fire-resistant plywood battle ship gray: For fire-resistant plywood, do not paint over manufacturer's label.

C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

2. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.

b. Label each unit and field within distribution racks and frames.

3. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

4. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

**3.7** **FIELD QUALITY CONTROL** (By Owner)

END OF SECTION 27 15 00