
SECTION 27 10 00
STRUCTURED CABLING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Communications system design requirements.
- B. Communications pathways.
- C. Copper cable and terminations.
- D. Fiber optic cable and interconnecting devices.
- E. Communications equipment room fittings.
- F. Communications outlets.
- G. Communications grounding and bonding.
- H. Communications identification.
- I. Section 26 05 33.13 - Conduit for Electrical Systems.
- J. Section 26 05 33.16 - Boxes for Electrical Systems.
- K. Section 26 27 26 - Wiring Devices.

1.2 REFERENCE STANDARDS

- A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment 2005e.
- C. ICEA S-83-596 - Indoor Optical Fiber Cable 2021.
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices 1988a (Reaffirmed 2012).
- F. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; Modification of IEC 61280-4-1 Edition 2, Fiber-Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant-Multimode Attenuation Measurement 2015c.
- G. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set 2020.
- H. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards 2009c, with Addendum (2016).
- I. TIA-568.3 - Optical Fiber Cabling and Components Standard 2016d.
- J. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- K. TIA-606 - Administration Standard for Telecommunications Infrastructure 2021d.
- L. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.
- M. UL 444 - Communications Cables Current Edition, Including All Revisions.
- N. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.
- O. UL 1651 - Fiber Optic Cable Current Edition, Including All Revisions.
- P. UL 1863 - Communications-Circuit Accessories Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

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- A. Coordination:
 - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
 - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Sustainable Design Documentation: Submit manufacturer's product data on cable and cable insulation showing compliance with specified lead content requirements.
- C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
- D. Evidence of qualifications for installer.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- F. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.
- G. Field Test Reports.
- H. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
 - 1. Record actual locations of outlet boxes and distribution frames.
 - 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
 - 3. Identify distribution frames and equipment rooms by room number on drawings.
- I. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.5 QUALITY ASSURANCE

- A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
 - B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
 - C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
 - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
 - 2. Supervisors and installers factory certified by manufacturers of products to be installed.
 - D. Products: Listed, classified, and labeled as suitable for the purpose intended.
 - E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

1.7 WARRANTY

- A. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Cabling and Equipment:
 - 1. Hubbell Premise Wiring: www.hubbell-premise.com.

2.2 SYSTEM DESIGN

- A. Provide a system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires and outlets to aid the Owner's IT Vendor with providing a complete data communication system.
 - 1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
 - 2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
 - 3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
 - 4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. System Description:
 - 1. Building Entrance Cable: By others.
 - 2. Provide data outlets where indicated on drawings.
- C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
 - 1. Locate main distribution frame as indicated on the drawings.
- D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.3 PATHWAYS

- A. Conduit: As specified in Section 26 05 33.13; provide pull cords in all conduit.
- B. Cable Trays: As specified in Section 26 05 36.

2.4 COPPER CABLE AND TERMINATIONS

- A. Manufacturers:
 - 1. CommScope: www.commscope.com.
 - 2. General Cable Technologies Corporation: www.generalcable.com.
 - 3. Siemon Company: www.siemon.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
 - B. Copper Horizontal Cable:
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1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type - Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
3. Cable Capacity: 4-pair.
4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
5. Cable Jacket Color -Data Cable: Blue.
- C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
 1. Performance: 500 mating cycles.
 2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

2.5 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

- A. Manufacturers:
 1. CommScope: www.commscope.com.
 2. General Cable Technologies Corporation: www.generalcable.com.
 3. Siemon Company: www.siemon.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fiber Optic Horizontal Cable:
 1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
 2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
 3. Cable Capacity: 12-fiber.
 4. Cable Applications:
 - a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
 - b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
 - c. General Applications: Use listed NFPA 70 Type OFN/OFNG general purpose cable, Type OFNR riser cable, or Type OFNP plenum cable.
 5. Cable Jacket Color:
 - a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
- C. Fiber Optic Interconnecting Devices:
 1. Connector Type: Type LC.
 2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
 3. Maximum Attenuation/Insertion Loss: 0.3 dB.
- D. Fiber Optic Patch Cords:
 1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.
 2. Patch Cords for Patch Panels:
 - a. Quantity: One for each pair of patch panel ports.
 - b. Length: 6 feet.
 3. Patch Cords for Work Areas:
 - a. Quantity: One for each work area outlet port.

- b. Length: 6 feet.

2.6 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:

1. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
2. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
 - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
 - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
 - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
 - d. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:

1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum.
 - a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
 - b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
 - c. Provide incoming cable strain relief and routing guides on back of panel.
 - d. Provide rear cable management tray at least 8 inches deep with removable cover.
 - e. Provide dust covers for unused adapters.

C. Equipment Frames, Racks and Cabinets:

1. Component Racks: EIA/ECA-310 standard 19 inch wide.
2. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.
3. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
4. Cabinets: Steel construction with corrosion resistant finish.
5. Locks: Keyed alike.

2.7 COMMUNICATIONS OUTLETS

A. Manufacturers:

1. CommScope: www.commscope.com/#sle.
2. Siemon Company: www.siemon.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Outlet Boxes: Comply with Section 26 05 33.16.

1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
 - a. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

C. Wall Plates:

1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:
 - a. Data or Combination Voice/Data Outlets: 2 ports.
4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 27 26.

2.8 GROUNDING AND BONDING COMPONENTS

- A. Comply with TIA-607.

2.9 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.

2.10 SOURCE QUALITY CONTROL

- A. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.2 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
 1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
 2. 12 inches from power conduits and cables and panelboards.
 3. 5 inches from fluorescent and high frequency lighting fixtures.
 4. 6 inches from flues, hot water pipes, and steam pipes.
- B. Conduit, in Addition to Requirements of Section 26 05 33.13:
 1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
 2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
 3. Arrange conduit to provide no more than 100 feet between pull points.
- C. Outlet Boxes:
 1. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of telecommunications outlets provided under this section.
 - a. Mounting Heights: Unless otherwise indicated, as follows:
 - 1) Telephone and Data Outlets: 18 inches above finished floor.
 - b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - c. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
 - d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.

- e. Locate outlet boxes so that wall plate does not span different building finishes.
- f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
 - 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 - 2. Do not over-cinch or crush cables.
 - 3. Do not exceed manufacturer's recommended cable pull tension.
 - 4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
 - 1. At Distribution Frames: 120 inches.
 - 2. At Outlets - Copper: 12 inches.
 - 3. At Outlets - Optical Fiber: 39 inches.
- C. Copper Cabling:
 - 1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
 - 2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
 - 3. Use T568B wiring configuration.
- D. Fiber Optic Cabling:
 - 1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
 - 2. Support vertical cable at intervals as recommended by manufacturer.
- E. Wall-Mounted Racks and Enclosures:
 - 1. Install to plywood backboards only, unless otherwise indicated.
 - 2. Mount so height of topmost panel does not exceed 78 inches above floor.
- F. Identification:
 - 1. Use wire and cable markers to identify cables at each end.
 - 2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
 - 3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.4 FIELD QUALITY CONTROL

- A. Comply with inspection and testing requirements of specified installation standards.
- B. Visual Inspection:
 - 1. Inspect cable jackets for certification markings.
 - 2. Inspect cable terminations for color coded labels of proper type.
 - 3. Inspect outlet plates and patch panels for complete labels.
- C. Testing - Copper Cabling and Associated Equipment:
 - 1. Test operation of shorting bars in connection blocks.
 - 2. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

- D. Testing - Fiber Optic Cabling:
 - 1. Backbone and horizontal cabling: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
 - 2. Multimode Backbone: Perform tests in accordance with TIA-526-14.
- E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION 27 10 00