

FOR REFERENCE ONLY – COMMUNICATIONS BACKBONE CABLING TO BE PROVIDED BY OTHERS.

SECTION 271300 - COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pathways.
 - 2. UTP cable. (Riser)
 - 3. Optical fiber cabling.
 - 4. Coaxial cable. (Riser)
 - 5. Cable connecting hardware, patch panels, and cross-connects.
 - 6. Cabling identification products.

1.2 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- C. EMI: Electromagnetic interference.
- D. IDC: Insulation displacement connector.
- E. LAN: Local area network.
- F. RCDD: Registered Communications Distribution Designer.
- G. UTP: Unshielded twisted pair.

1.3 BACKBONE CABLING DESCRIPTION

- A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
- B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.
- B. Communication contractor shall be an AMP authorized Netconnect Design and installation contractor (ND&I).

- C. The project must be registered with AMP/TE or equivalent single solution manufacturer in order to provide a complete 25 year system performance and component warranty. Warranty documentation must be provided to owner.

1.5 SUBMITTALS

- A. See Section 260510.

1.6 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. Patch-Panel Units: One of each type. (Commscope: 1499601-2 or approved equal).
 - 2. Connecting Blocks: One of each type. (Commscope: 569440-1 or approved equal).

1.7 QUALITY ASSURANCE.

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
 - 3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Testing Agency Qualifications: An NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 814 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: 50 or less.
- D. 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.
- E. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- F. Grounding: Comply with ANSI-J-STD-607-A.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
 - 2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.
 - 3. Test each pair of UTP cable for open and short circuits.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- 1.10 COORDINATION

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

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. General Requirements: Comply with TIA/EIA-569-A.
- B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-rings.
 - 3. Straps and other devices.
 - 4. Cable tray.

2.2 BACKBOARDS

- A. Backboards: Communication backboard (TBB) shall be 8'H x 4'L x 3/4"D plywood with the bottom at 6" AFF. Extend a No. 6 bare copper grounding conductor from the electrical service ground to the backboard and leave with sufficient slack to reach any place thereon. Coat backboard with a minimum of two coats fire retardant paint.

2.3 UTP CABLE

- A. Manufacturers: Basis of Design is Commscope.
- B. Description: 100-ohm, 50 -pair UTP, formed into 25-pair binder groups covered with a gray thermoplastic jacket and overall metallic shield.
 - 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:
 - a. Multipurpose, Riser Rated: Type MPR or MP, complying with UL 1666.

2.4 UTP CABLE HARDWARE

- A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- B. Connecting Blocks: 110-style (Commscope: 569440-1 or approved equal). Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- C. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: (Commscope:1375055-6 Cat jack or approved equal). One for each four-pair conductor group of indicated cables, plus 25% spares.
 2. Patch panel shall be Commscope part number 1499601-2 48 port angled patch panel or an approved equal.
- D. Patch Cords: Factory-made, four-pair cables in 5', 7', and 10' lengths; terminated with eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 2. Patch cords shall have color-coded boots for circuit identification.
 3. Provide one patch cord for each connection plus 10% spare. I.E. One patch cord for each connection in the data rack and one patch cord for each connection at the user end.
 4. Quantity of patch cords shall be divided between the multiple lengths as follows: 5' = 20 percent, 7' = 30 percent, and 10' = 50 percent.

2.5 OPTICAL FIBER CABLE

- A. Basis of design is Corning Cable and Commscope or approved equal.
- B. Description: Singlemode Armored Fiber Cable (8.3/125-micrometer), Multimode Armored Fiber Cable (62.5/125-micrometer and 50/125-micrometer). Install strand count as shown.
1. Comply with ICEA S-83-596 for mechanical properties.
 2. Comply with TIA/EIA-568-B.3 for performance specifications.
 3. Comply with TIA/EIA-492AAAA-B for detailed specifications.
 4. 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. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
 5. Maximum Attenuation: 3.5 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.
 7. Provide SC connectors on all fiber
 8. Provide the last two single mode strands of each fiber run between each I.T. room with a fusion splice into a SC/APC pigtail for CATV.
 9. Terminate all fiber onto rack mounted enclosures.
 10. Provide rack mounted enclosures for the fiber terminations in each data rack.

2.6 OPTICAL FIBER CABLE HARDWARE

- A. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
 2. All fiber terminals shall be rack mounted.
- B. Cable Connecting Hardware:
1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
 2. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss not more than 0.75 dB.

2.7 COAXIAL CABLE

- A. General Coaxial Cable Requirements: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz. CATV Plenum Rated: Type CATVP, complying with NFPA 262.

- B. RG-11/U: NFPA 70, Type CATV.
 - 1. No. 14AWG, solid, copper-covered steel conductor.
 - 2. Gas-injected, foam-PE insulation.
 - 3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
 - 4. Jacketed with sunlight-resistant, black PVC or PE.
 - 5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

2.8 COAXIAL CABLE HARDWARE

- A. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.9 GROUNDING

- A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

2.10 IDENTIFICATION PRODUCTS

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

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

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. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Section 260533 "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.
- B. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- C. Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- D. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- E. Pathway Installation in Communications Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard when entering room from overhead.
 - 4. Extend conduits 3 inches above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- F. Backboards: Install backboards with 96 inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 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. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 5. 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.
 - 6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 7. 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. Use lacing bars and distribution spools.
 - 8. 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.
 - 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 - 10. In the communications equipment room, install a 10-foot long service loop on each end of cable.
 - 11. 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.
 - 3. Provide Velcro ties. Ties shall be used for securing fiber cable.

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

- F. Group connecting hardware for cables into separate logical fields.

3.5 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-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 260553 "Identification for Electrical Systems."
 - 1. Administration Class: 4.
 - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 4 level of administration including optional identification requirements of this standard.
- C. Comply with requirements in Section 271500 "Communications Horizontal Cabling" for cable and asset management software.
- D. Cable Schedule: Install in a 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.
- E. 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, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- F. 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. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 4. 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 with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 5. 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.
- G. 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, for the following:
1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 4. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
 - 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

- D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 271300