

## SECTION 271020 - COMMUNICATIONS HORIZONTAL CABLING

## PART 1 - GENERAL

## 1.1 REFERENCES

- A. All references should be latest versions. If newer versions exist use current version.
1. ANSI/NFPA-70 National Electrical Code - 2014 Edition, including local and state amendments.
  2. IEEE 1100 (2006) Recommended Practice for Powering and Grounding Electronic Equipment
  3. TIA-568.0-D (2015) Generic Telecommunications Cabling for Customer Premises
  4. TIA-568.1-D (2015) Commercial Building Telecommunications Cabling Standard
  5. TIA-568-C.2 (2009) Balanced Twisted Pair Telecommunications Cabling and Components Standard
  6. TIA-568-C.3 (2008) Optical Fiber Cabling Components Standard
  7. TIA-569 (2015) Telecommunications Pathways and Spaces.
  8. GSCM (2015) Georgia State Construction Manual
  9. GTDM (2007) Georgia Telecommunications Design Manual
  10. FCC Part 68 Connection of Terminal Equipment to the Telephone Network (47 CFR 68)
  11. ADA Americans with Disabilities Act, Title III & IV
  12. CFR 29 (2009) Code of Federal Regulations

## 1.2 RELATED DOCUMENTS

- A. Division 27 Section "Communications Backbone Cabling".

## 1.3 SUMMARY

- A. Section Includes:
1. UTP cabling.
  2. Cable connecting hardware, patch panels, and cross-connects.
  3. Telecommunications outlet/connectors.
  4. Cabling identification products.
  5. Cabling administration system
- B. Related Sections:
1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.

## 1.4 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. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- H. RCDD: Registered Communications Distribution Designer.
- I. Basket Tray: A type of cable tray made of a rigid structure for housing and protecting cables and conductors with a welded steel wire mesh. Basket tray is not recommended for use inside telecommunications rooms.
- J. Ladder Tray: A type of cable tray made of a rigid structure for housing and protecting cables and conductors with two side rails connected by individual transverse members.

#### 1.5 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 "permanent link," a term that is used in the testing protocols.
  - 1. TIA-568.1-D requires that a minimum of two telecommunications outlet/connectors be installed for each work area unless noted otherwise on the drawings.
  - 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.

#### 1.6 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568.1-D, when tested according to test procedures of this standard.

#### 1.7 ACTION SUBMITTALS

- A. Product Data: Provide shop drawings for each type of product indicated.
- B. Shop Drawings:
  - 1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
  - 2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.

3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:
  - a. Cross-connects.
  - b. Patch panels.
  - c. Patch cords.
5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

#### 1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

#### 1.9 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 RCDD, who shall be present at all times when Work of this Section is performed at Project site.
- B. 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.
- C. Grounding: Comply with ANSI-J-STD-607-A.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

### PART 2 - PRODUCTS

#### 2.1 UTP CABLE

- A. Manufacturers:
  1. General Cable Technologies Corporation; - GenSPEED6.
  2. Berk-Tek; a Nexans company. - LANmark-6
  3. SYSTIMAX Solutions; a CommScope, Inc. brand. - 2071
- B. Description: 100-ohm, 4-pair UTP, covered with a thermoplastic jacket.
  1. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
    - a. Communications, Plenum Rated: Type CMP or MPP, complying with NFPA 262.

- b. Outdoor rated for cables that route below the slab. These conduits must home run back to the communications room.

## 2.2 UTP CABLE HARDWARE

- A. Manufacturers:
  1. Panduit Corp.
  2. SYSTIMAX
  3. Ortronics
- B. General Requirements for Cable Connecting Hardware: Cables shall be terminated with connecting hardware of same category or higher.
- C. Patch Panel: 48-port patch panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
- D. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units.
- E. Patch Cords: Factory-made, four-pair cables in 36-inch 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. Reference Savannah Chatham County School System Technology Design Guidelines for color coding and lengths.

## 2.3 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular.
- B. Workstation Outlets: Six-port-connector assemblies mounted in single faceplate.
  1. Coordinate faceplate type and color with architect's design
  2. For use with snap-in jacks accommodating any combination of UTP work area cords.
  3. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

## 2.4 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

## 2.5 IDENTIFICATION PRODUCTS

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

- B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

## 2.6 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
  1. Factory test UTP cables on reels according to TIA-568.1-D.
  2. Factory test UTP cables according to TIA-568.1-D.
  3. Cable will be considered defective if it does not pass tests and inspections.
  4. Prepare test and inspection reports.

- 2.7 Warranty: Contractor shall provide a 15 year manufacturer and performance warranty. The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

## PART 3 - EXECUTION

### 3.1 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 Division 26 Section "Raceway and Boxes for Electrical Systems."
  3. Install outdoor rated cable for cables that route below the slab.
- B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

### 3.2 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  1. Comply with TIA-568.1-D.
  2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
  3. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
  4. Cables may not be spliced. Secure and support cables at intervals not exceeding 60 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
  7. 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.
  8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  9. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
- C. Pulling Cable: Comply with BICSI ITSM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- D. UTP Cable Installation:
1. Comply with TIA-568.1-D.
  2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
- 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. Group connecting hardware for cables into separate logical fields.
- G. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569 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 5 inches.

### 3.3 FIRESTOPPING

- A. Contractor must fire stop the inside of the pipes that they use. The exterior of the pipes will be fire stopped by the electrical contractor.

### 3.4 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.
- E. The No.4 AWG to the communicator room will be provided by the electrical contractor
- F. The cabling contractor must provide a ground bar in each communication room.

### 3.5 IDENTIFICATION

- A. 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-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.
- B. 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. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
  4. 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.
  5. Label each unit and field within distribution racks and frames.
- C. 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-606-A.
1. Cables use flexible vinyl or polyester that flex as cables are bent.

### 3.6 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. Visually inspect UTP cable 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-568.1-D.
  2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
  3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  4. Test UTP backbone 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.
  5. UTP Performance Tests:
    - a. Test for each outlet with a level 3 cable analyzer.
      - 1). Wire map.
      - 2). Length (physical vs. electrical, and length requirements).
      - 3). Insertion loss.
      - 4). Near-end crosstalk (NEXT) loss.
      - 5). Power sum near-end crosstalk (PSNEXT) loss.
      - 6). Equal-level far-end crosstalk (ELFEXT).
      - 7). Power sum equal-level far-end crosstalk (PSELFEXT).
      - 8). Return loss.
      - 9). Propagation delay.
      - 10). Delay skew.
- B. Document data for each measurement. Data for submittals shall be printed in a summary report. An electronic copy shall be provided.
- C. Prepare test and inspection reports.



3.7 SCHEDULE

- A. Install cabling between all data, telephone, television and wireless access outlets and MDF and/or IDF's unless noted otherwise.

END OF SECTION 271020