

SECTION 27 1005

STRUCTURED CABLING FOR VOICE AND DATA - INSIDE-PLANT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Communications system design requirements.
- B. Communications pathways.
- C. Communications identification.
- D. Cabling and pathways inside building(s).
- E. Distribution frames, cross-connection equipment, enclosures, and outlets.
- F. Administration and Labeling
- G. Testing

1.02 DESIGN INTENT

- A. The existing data room and rack system shall remain in place, and reused for new data outlets shown.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Storage and handling requirements and recommendations.
 - 2. Installation methods and instructions.
- B. 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).
- C. Shop Drawings shall also include outlet numbering and identifier assignments.
- D. Manufacturer Qualifications.
- E. 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.
- F. Field Test Reports.
- G. Test results verifying that all equipment has been tested for compatibility as part of a structured cabling system.
- H. Project Record Documents (shall be prepared and approved by a RCDD):
 - 1. Provide copy of all approved submittals.
 - 2. Provide full size as-built drawings (minimum "D" size).
 - 3. As-built drawings shall accurately record location of service entrance conduit, termination backboards, outlet boxes, cable raceways, cable trays, pull boxes, and equipment racks electronically and on full size prints.
 - 4. The LVLTC shall prepare 11"X17" as-built serving zone drawings for each Telecommunications Room (TR). The drawings shall be laminated, framed and secured to the wall in the Main Equipment Room (MER) and Telecommunications Room (TR).
 - 5. Provide copy of all test reports.
 - 6. Copper cable records shall include the status of each copper pair. Optical fiber cable records shall include strand allocation, test results, and identification of media and protocol used.
 - 7. Record actual locations of outlet boxes and distribution frames.
 - 8. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
 - 9. Identify distribution frames and equipment rooms by room number on contract drawings.
 - 10. Provide three copies, complete and bound.
 - 11. Provide copies of all manufacturer's warranties.

- 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.
- J. Other Required Project Information (To be provided prior to Pre-Final of the building, for each of the specified media):
 - 1. Cable identification numbers.
 - 2. Cable design makeup.
 - 3. Cable lengths between splice points and terminations.
 - 4. Exact routing of cable.
 - 5. Strand count, mode of installed fiber, loss per splice in dB, and total amount of optical fibers installed.
 - 6. Bonding and grounding.
 - 7. Location and description of all associated structures and obstructions.
 - 8. Cable entrance locations and penetration details.
 - 9. Terminal information, outlet numbering, and pair count information at each distribution frame.
 - 10. Schematic drawings of riser.
 - 11. Routing of cable and termination information.
 - 12. Cable pair counts per connector block.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: At least 3 years' experience manufacturing products of the type specified.
- B. Installer Qualifications:
 - 1. The telecommunications installation contractor shall be licensed in the State of Georgia as a Low Voltage Licensed Telecommunications Contractor (LVLTC).
 - 2. The Contractor shall provide an on-site, full-time Project Manager who will act as a single point of contact for all activities regarding this project.
 - 3. The LVLTC Project Manager shall make on-site decisions regarding the scope of the work and any changes required by the work.
 - 4. The Project Manager shall be on the job any time work is being performed or workers are present. The PM shall get written approval prior to committing.
 - 5. The Project Manager shall be totally responsible for all aspects of the work.
 - 6. The selected LVLTC shall be fully capable and experienced in the telecommunications distribution system to be installed.
 - 7. The LVLTC shall have a minimum of five (5) years of experience installing Structured Cabling Systems and be a certified installer of the approved cable/component system solution.
 - 8. The LVLTC shall have a Registered Communications Distribution Designer (RCDD) on staff that will be ultimately responsible for the project. The credentials (current BICSI certification stamp) of the responsible RCDD shall be attached to the LVLTC's response for evaluation by the State.
 - 9. A BICSI Certified installer shall be employed by the LVLTC and be on site as the installation manager.
 - 10. The LVLTC shall provide a minimum of three (3) projects where similar work, both in scope and design, have been completed by the LVLTC within the last two (2) years.

1.05 WARRANTY

- A. The LVLTC shall furnish a warranty of products, applications and workmanship for fifteen (15) years from the date of acceptance by the State. All other products and workmanship shall carry warranties equal to or greater than the warranty from the date of acceptance by the State.
- B. Materials and workmanship shall be fully guaranteed by the LVLTC for fifteen (15) years from the date of acceptance by the State. Defects which may occur, as the result of faulty materials or workmanship, within fifteen (15) years after installation and acceptance by Owner shall be corrected by the LVLTC at no additional cost to Owner.

- C. The period of the LVLTC's warranty (ies) for any items herein are not exclusive remedies, and Owner has recourse to any warranties of additional scope given by LVLTC to Owner and all other remedies available at law or in equity.
- D. The LVLTC shall pass along to Owner any additional warranties offered by the manufacturers, at no additional costs to Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS - Coordinate with UNG IT for Campus standard

2.02 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for telecommunications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
 - 1. Comply with TIA-568 (cabling) and TIA-569 (pathways), latest editions (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.
 - 5. Comply with the latest adopted version of the GTDM.
- B. Telecommunications cabling, jacks, patch panels, punch down blocks and other equipment shall be certified for CAT 6 operation.
- C. All UTP copper cables shall be terminated in rack mounted patch panels. There is no distinction between voice and data cables in a structured cabling system.
- D. Products including, but not limited to, cabling, jacks, patch panels, and cabinets shall be consistent throughout the project. All equipment shall have been tested for compatibility as part of a structured cabling system.
- E. Active equipment (handsets, hubs, switches, media converters, etc.) is not included in this contract unless otherwise noted.
- F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".
- G. Copper Horizontal Cable (defined as cable from the Work Area to the patch panel): TIA/EIA-568 Category 6 solid conductor unshielded twisted pair (UTP), 24 AWG, 100 ohm; 4 individually twisted pairs; covered with blue jacket and complying with all relevant parts of and addenda to latest edition of TIA/EIA-568 and UL 444. Cables routed in conduit that goes below the slab shall be listed for wet locations. These cables must terminate directly in the data room and shall not be routed exposed in the building.

2.03 PATHWAYS

- A. Conduit: Refer to Section 26 0534 for general conduit specifications regarding routing. This does not mean conduit shall be 1/2" in size; data conduits shall not be less than 1". provide pull cords in all conduit.
 - 1. Conduit for horizontal cable distribution shall be minimum 1" trade size. This is considered conduit from the work area outlet, up and out of the wall over to the J HOOK.
 - 2. Provide insulated bushings at each end of all conduits.

2.04 COPPER CABLE AND TERMINATIONS

- A. Copper Backbone Cable: TIA/EIA-568 CAT 6 solid conductor unshielded twisted pair (UTP), 24 AWG, 100 ohm; 100 pairs formed into 25-pair binder groups; covered with gray thermoplastic jacket and complying with all relevant parts of and addenda to latest editions of TIA/EIA-568 and ICEA S-90-661, and UL 444.
 - 1. In plenums, provide NFPA 70 type CMP plenum-rated cable.

2. All cable routed under slab on grade shall be wet location listed for that condition. Cable shall transition to the type described above as soon as practicable upon penetrating the slab. The transition shall NOT be in a plenum.
 3. Provide cable having conductors twisted at minimum rate of two per foot; actual length and frequency of twists at manufacturer's option.
 4. Color code conductors in accordance with ICEA S-90-661.
- B. Copper Horizontal Cable (defined as cable from the Work Area to the patch panel): TIA/EIA-568 Category 6 solid conductor unshielded twisted pair (UTP), 24 AWG, 100 ohm; 4 individually twisted pairs; covered with blue jacket and complying with all relevant parts of and addenda to latest edition of TIA/EIA-568 and UL 444. Cables routed in conduit that goes below the slab shall be listed for wet locations. These cables must terminate directly in the data room and shall not be routed exposed in the building.
1. All cable shall be NFPA 70 type CMP plenum-rated, except as described below.
 2. All cable routed under slab on grade shall be wet location listed for that condition. Cable shall transition to the type described above as soon as practicable upon penetrating the slab. The transition shall NOT be in a plenum.
 3. Testing: Furnish factory reel tests.
 4. Cables shall be marked with the manufacturer's name, cable type/catalog number and the latest adopted NEC code compliance.
- C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool.
- 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. Outlet Jacks: 4-pair, pre-wired to T568B configuration, with color-coded indications for T568B configuration.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS - Existing to Remain - provide only new patch panels to support new cable terminations, plus 25%.

2.06 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.

2.07 CROSS-CONNECTION EQUIPMENT

- A. Patch Panels for Copper Cabling: Sized to fit EIA standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
1. Jacks: Eight position non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel. No 24 port patch panels allowed.
 - a. Shall be modular type.
 - b. Shall be available in universal wiring schemes (Use T568B).
 - c. Housing shall be fire retardant UL 94VO rated thermoplastic and tin lead solder plated IDC.
 - d. Housing shall be fully encased to protect printed circuit board and IDC fields.
 - e. Modular jack contacts shall accept a minimum of 2500 plug insertions without degradation of electrical or mechanical performance.
 - f. Modular jack contacts shall be constructed of Beryllium copper.
 - g. Shall utilize a paired punch down sequence. Cable pairs and sheath shall be maintained up to the IDC.
 - h. Shall be compatible with single conductor, industry standard 110 type impact termination tools.
 - i. Shall include means to hold terminated wires in place.
 - j. Shall have an attached color-coded wiring label.

- k. Shall be UL Verified and listed for TIA/EIA Category 6 electrical performance.
2. Shall accommodate 48 ports for each rack mount space. No high density port configurations allowed.
3. Panel circuit boards shall be fully enclosed front and rear for physical protection.
4. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
5. Labels: Factory installed laminated plastic nameplates above each port (front and back), numbered consecutively; comply with TIA/EIA-606 using encoded identifiers.
6. Panels shall provide wiring identification and color code and maintain a paired punch down sequence that does not require the overlapping of cable pairs.
7. Panels shall be Category 6A compliant.
8. Provide incoming cable strain relief and routing guides on back of panel.

2.08 ENCLOSURES - Existing to be reused.

- A. Outlet Boxes: For flush mounting in walls; depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
 1. Size, Unless Otherwise Indicated: 4 inches square by 2-1/8 inches deep. Provide with single gang plaster ring.
 2. Note: Many of the new data drops are in surface mounted raceway.
 3. All jacks shall be installed in faceplates.
 4. Where different media is shown to terminate in the same location, provide in the same faceplate.

2.09 ADMINISTRATION AND LABELING

- A. Horizontal Cables: Self-adhesive, self-laminating, mechanically printed with a clear protective laminating over-wrap or mechanically printed heat shrink tubing.
- B. UTP Patch Panels: Nameplates shall be white with black core laminated phenolic nameplates with 3/8 inch lettering etched through the outer covering.
- C. Pull Boxes: Provide 3/4" black stenciled letters on a painted orange rectangular background.
- D. Work Area Outlets: White 3/8" self-adhesive Mylar tape with 1/4" black, mechanically produced lettering.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.
- C. The Licensed Low Voltage Telecommunications Contractor (LVLTC) shall install work in accordance with the BICSI Cabling Installation Manual and the latest GTDM.

3.02 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:
 1. Do not install more than 2 (two) 90 degree bends in a single horizontal cable run.
 2. Runs exceeding 100 feet or 180 degrees total bends shall be broken with suitable sized pull boxes. Pull boxes shall not be located at bends.
 3. Factory made large radius sweeps shall be used for 1" trade size and larger.
 4. Conduit runs to work areas shall serve no more than one Work Area Outlet (WAO).
 5. Leave pull cords in place where cables are not initially installed.

6. Conceal conduit under floor slabs and within finished walls, ceilings, and floors except where specifically indicated to be exposed.
 - a. Conduit may remain exposed to view in mechanical rooms, electrical rooms, and telecommunications rooms.
 - b. Treat conduit in crawl spaces and under floor slabs as if exposed to view.
 - c. Where exposed to view, install parallel with or at right angles to ceilings, walls, and structural members.
 - d. Under floor slabs, locate conduit at 12 inches, minimum, below vapor retarder; seal penetrations of vapor retarder around conduit.

C. Grounding and Bonding: Perform in accordance with ANSI/J-STD-607 and NFPA 70.

3.03 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 (horizontal) 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. Cables shall not be bound tightly by plastic straps in a manner that distorts cables or jackets. Use VELCRO ties only - no cable ties allowed.
5. Install in accordance with the BICSI Installation Manual.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Distribution Frames: 180 inches.
2. At Outlets - Copper: 12 inches.

C. Copper Horizontal Cabling:

1. Jacks shall be installed such that cables terminated to the jacks maintain a minimum bend radius of at least 4 times the cable diameter.
2. Cables shall be terminated on jacks such that there is no tension on the conductors in the termination contacts.
3. Provide one cable per jack. No sharing of pairs is allowed.
4. All horizontal UTP cables shall be terminated in patch panels.
5. All horizontal UTP cables concealed in walls or soffits shall be installed in metal conduits.
6. All horizontal UTP cables shall be installed in wire management systems consisting of conduit and/or cable tray continuous from the work area outlet to the TR or MER.
7. Maximum installed horizontal UTP cable length shall not exceed 250 feet.
8. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
9. Copper Cabling Not in Conduit: Use only type CMP plenum-rated cable as specified.
10. Maintain the following clearances from EMI sources:
 - a. Power - 12 inches
 - b. Transformers - 36 inches

D. Identification:

1. Use wire and cable markers to identify cables at each end.
2. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

E. Faceplates and Adapter Plates:

1. Sufficient cable slack shall be stored behind the faceplate in such a way that allows the manufacturer's specified minimum bend radius of the cables to be maintained.
2. Shall be securely mounted to the mounting bracket.
3. Patch Panels: Label each jack as to its type and function, with a unique numerical identifier.

3.04 ADMINISTRATION AND LABELING

- A. All labeling shall be per TIA/EIA-606A standards.

- B. Hand written labels are not acceptable.
- C. Horizontal Cables:
 - 1. Permanently secure the label within 6 inches from both ends of the cable and at all pull boxes.
 - 2. Label shall indicate TR (or MER), patch panel and port to which the horizontal cable is terminated.
- D. Pull Boxes: Permanently mark all pull boxes on the cover and on at least one side.
- E. Work Area Outlets (WAO):
 - 1. Copper UTP cables terminated in a WAO shall be labeled to indicate the following: TR or MER designation, patch panel, and port number to which that cable is terminated.
 - 2. Fiber optic cables terminated in a WAO shall be labeled to indicate the following: the origination and destination TRs or MER, and the individual strand ID.
 - 3. Permanently secure the label to the WAO.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. 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.
 - 4. Inspect patch cords for complete labels.
- D. Testing - Copper Cabling and Associated Equipment:
 - 1. Test backbone cables after termination but before cross-connection.
 - 2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
 - 3. Test operation of shorting bars in connection blocks.
 - 4. Category 6 Backbone: Perform near end cross talk (NEXT) and attenuation tests.
 - 5. Category 6 Links: Perform tests for wire map, length, DC continuity, attenuation, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, and propagation delay.
 - 6. Utilize a Level IIe tester for Category 6 link compliance. If any part of the installed system results in a "FAIL" indicator on the tester, the problem shall be analyzed and corrected.
 - 7. Testers shall be correctly set to test the type and manufacturer of the horizontal cable used in the link being tested, including the correct NVP.
- E. Complete testing at least two weeks before the scheduled final site observation. Provide test results prior to the final.
- F. The manufacturer providing the system warranty shall certify the test results.
- G. Replace work considered unacceptable to Architect as a prerequisite to system acceptance.
- H. As part of the submitted test report, provide a sheet stating the acceptable limits for each test, and the Standard Agency and reference where that limit is stated.
- I. Identify each test by the WAO identifier.
- J. All testing shall be done in accordance with TIA/EIA TSB67.

END OF SECTION