

PART 1- GENERAL

1.1 Horizontal Cabling Description

- A. Physical cabling and terminating hardware that provides the means of transporting data and voice signal between the Work Area Outlets and its horizontal cross-connect location in the Telecommunications Room (TR). This section will cover all the types of cables used and the connectors associated with each type of cable. It will also cover the standard methods and configurations for the Horizontal Cabling.

1.2 Related Documents

- A. BICSI Telecommunications Distribution Methods Manual (TDMM), Thirteenth Edition.
- B. EIA/TIA-568-C: Communications Industry Testing Standards.
- C. Section 260526 - "Grounding and Bonding for Communications Systems."
- D. Section 270528 - "Pathways for Communications Systems."
- E. Section 271100 - "Telecommunications Rooms."
- F. Section 271300 - "Communications Backbone Cabling."
- G. Appendix A

1.3 Definitions and Acronyms

- A. BICSI: A professional association supporting the information technology systems (ITS) industry.
- B. Cross-Connect field: A connection scheme between cabling runs used to attach connecting hardware on each end.
- C. EMI: Electromagnetic Interference.
- D. ETR: Entrance Telecommunications Room.
- E. IDC: Insulation Displacement Connector.
- F. LAN: Local Area Network.
Permanent Link: Horizontal cabling that has been installed and terminated properly on both ends of the cable, one end terminated in the TR and the other end terminated in a work area outlet.
- G. POTS: Plain Old Telephone Service. Used to describe traditional analog voice service.
- H. RCDD: Registered Communications Distribution Designer.
- I. TR: Telecommunications Room

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- J. Work Area Outlet: A connecting device on which horizontal cable terminates opposite of the Telecommunications Room (TR or ETR).
- K. Wet Location: Slab-on-grade construction where pathways are installed underground or in concrete slabs in direct contact with soil is considered a wet location.
- L. ITS: Information Technology Services
- M. UNI: University Network and Infrastructure

1.4 Administrative Requirements

A. Coordination of Work

- 1. Coordinate all routing, installation practices and issues of horizontal cabling with LSU's Information Technology Services personnel prior to installation.
- 2. Certain final connections and tie connections will be made directly by LSU's ITS/UNI personnel. Coordinate with LSU's ITS/UNI in a timely manner prior to the necessary work.

B. Quality Assurance

- 1. All communications work shall be performed by qualified communications personnel regularly employed in this field. The communications subcontractor shall have a BICSI certified Registered Communications Distribution Designer (RCDD) on staff. All qualifications shall be available for verification by LSU and/or the Architect.
- 2. A registered Panduit Certified Installer (PCI) contractor shall perform all communications work. The contractor shall have completed standards based product and installation training. A copy of the PCI Contractor Agreement shall be submitted in the proposal. All qualifications shall be available for verification by LSU and/or the Architect at time bid.

C. Submittals

- 1. All test results for installed cables shall be provided to LSU's ITS/UNI department as proof that all cables pass test qualifications. These test results can be delivered as a hard copy or electronic copy before acceptance of the system can be given. If electronic copies of the results are given, the results shall be delivered as a PDF file.
- 2. At the completion of all horizontal cable testing, a spreadsheet shall be provided to the LSU ITS department. The document shall be in Microsoft Excel format. The following data populated:
 - a. Building code
 - b. TR/ ETR #
 - c. Rack #

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- d. Patch panel row # (first installed patch panel is "1")
- e. Patch panel jack position # (1-24)
- f. End room # of circuit
- g. Box # in room (left to right, clockwise around room)
- h. Test result (good/bad) of each circuit

Bldg.	Closet #	Rack	PP Row	PP Port	End Rm. #	Box #	Tested
CSC	201D	1	1	1	100	1	Y
CSC	201D	1	1	2	100	1	Y
CSC	201D	1	1	3	101	1	Y
CSC	201D	1	1	4	101	1	Y
CSC	201D	1	1	5	102A	1	Y
CSC	201D	1	1	6	102A	1	Y
CSC	201D	1	1	7	102B	1	Y
CSC	201D	1	1	8	102B	1	Y
CSC	201D	1	1	9	102C	1	Y
CSC	201D	1	1	10	102C	1	Y

PART 2- PRODUCT

I. Communications Cables

2.1 **Balanced Twisted Pair Cables**

- A. Description: 100-ohm, four-pair Balanced Twisted Pair, covered with a plenum rated thermoplastic jacket.
 - 1. Comply with ICEA S-90-661 for mechanical properties.
 - 2. Comply with TIA/ EIA-568-C for performance specifications.
 - 3. Comply with TIA/EIA-568-C Category 6a for data station cables.
 - 4. Jacket Color: **White**
- B. Use the following products or LSU ITS approved equivalent:
 - 1. Balanced Twisted Pair **Category 6a** Cables. For data station cable use:
 - a. Panduit

1) Part Number PUP6AS04WH-G

- b. General Cable
 - 2) Part Number 7141840

- 2. Balanced Twisted Pair Category 6a Cables. For **Wet Locations** use:
 - a. General Cable
 - 1) Part Number 7141007
 - b. Mohawk
 - 1) Part Number 59202

2.2 Fiber Optic Cables

- A. Single mode Fiber
 - 1. Horizontal Fiber Optic Cable Construction
 - a. Nonconductive, tight buffer, optical fiber cable
 - b. Comply with ICEA S-83-596 for mechanical properties.
 - c. Comply with TIA/ EIA-568-C for performance specifications.
 - d. Jacket Color: **Yellow**
 - e. Cable shall be imprinted with fiber count, fiber type, and aggregate length at regular intervals.
 - f. Strand color code: per industry practice.
 - g. Jacket shall be plenum rated.
 - h. Strand count 6.
 - 2. Use the following products or LSU ITS approved equal:
 - a. Corning single mode fiber
 - 1) Part number 006E88-31131-29

2.3 Coaxial Cable

- A. RG-6
 - 1. Characteristic Impedance: 75-ohm +/- 3 ohm.
 - 2. Structural Return Loss: 15 dB @ 1000-3000 MHz; 20 dB @ 5 – 1000 MHz.
 - 3. Center Conductor: No. 18 AWG, solid, copper-clad steel.
 - 4. Dielectric Material: foam- FEP insulation.
 - 5. Quad shielded
 - a. Inner shield with 100 percent aluminum/ poly-foil shield and 60 percent aluminum braid.

- b. Outer shield with 100 percent aluminum/ poly-foil shield and 40 percent aluminum braid.
- A. CATV Plenum Rated: Type CMP
 1. Jacket color: **White**
 2. Use the following product or LSU ITS approved equal:
 - a. General Cable
 - b. Part number C3525.41.86

II. Communication Hardware

2.4 **Balanced Twisted Pair Cable Connectors**

- A. Assemblies shall be RJ-45 modular jacks and color-coded for specific use. The same modular jack will be installed at the workstation and in the modular patch panel. Modular jacks shall be Category 6a compliant (as described in the ANSI/TIA/EIA-568-C) 8-conductor, 8-position, un-keyed, and utilize IDC termination contacts. The jack shall be terminated according to the T568B wiring standard. The jack shall be of the appropriate category compliance to match the cable to which it will be terminated.
- B. Jack Color:
 1. Data Jack Cat 6a (at the station outlet and in the TR): **White**.
 2. Building Automation Systems (BAS) (at the device outlet and in the TR): **Blue**.
- C. Use the following products or LSU ITS approved equivalent:
 1. RJ-45 Category 6a Jacks, Panduit:
 - a. Mini-com CAT6a RJ45 Data Jacks- White
 - 1) Part # CJ6X88TGWH
- D. The modular patch panels shall be manufactured to house the same category compliant RJ-45 modular jack that will be installed at the work area outlet. Modular patch panels shall be of the same manufacturer as the modular jack and shall be sized to accommodate the appropriate number of jacks provided plus an additional 10%. The panel shall fit in a 19-inch rack, accommodate exactly 24 jacks per row, and be colored black. Use the following products or approved equivalent:
 1. Panduit: Mini-Com 24 Port 19" – Black

- a. Part # CPP24WBLY

2.5 Fiber Optic Cable Connectors:

- A. All fiber cable strands shall be terminated using LC type connectors. The connector shall match the rating of the fiber that it is terminating.
- B. Work Area Outlet:
 1. A work area outlet fiber termination will consist of two parts: the connector for the termination of the fiber strand and the coupler insert for the work area outlet faceplate.
 2. Fiber connector to terminate fiber strands.
 - a. Use of a crimp type connector will be allowed at the work area outlet only. Use the following:
 - 1) Corning: UniCam LC
 - 2) Single Mode
 - 3) Part # 95-200-99
 3. Fiber coupler insert for the work area outlet faceplate.
 - a. Panduit: LC/ LC coupler insert
 - 1) Single Mode
 - 2) Part # CMDSLCZBU
- C. Fiber Optic Connector Housings:
 1. Fiber cross-connect housing (fiber patch panel)
 2. Fiber cross-connect housings shall be manufactured to fit a 19-inch relay rack.
 3. The housings shall be sized to accommodate the appropriate number of fiber connections and utilize the least amount of rack space. When possible it is advised that multiple cables be terminated in a single housing to save rack space.
 4. Use the following products or approved equal:
 - a. Corning
 - 1) CCH-0XU (where X represents the # of rack units needed to accommodate the housing).
- D. Telecommunication Rooms:
 1. The termination of the fiber will happen in a fiber "Housing" mounted in the relay rack.
 2. The horizontal fiber cable will be terminated in a Fiber Optic Housing Cassette.

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3. The fiber optic connectors are LC type connectors and are included in the purchase of a "Fiber Optic Housing Cassette".
4. Fiber housing cassettes:
 - a. Fiber cassettes for the fiber cross-connect housings serve as both the fiber splice housing and fiber housing bulkhead panel.
 - b. Each cassette is preloaded with LC fiber pigtails, LC/LC couplers and splice tubes required for the number of fiber ports available per the cassette purchased. Use the following products or approved equal:
 - 1) Corning (for CCH housing)
 - a. CCH-CS12-A9-P00RE (will accommodate 12 strands)
 - b. Up to 3 horizontal fiber cables can be accommodated in a single cassette.

2.6 Coaxial Cable Connectors:

5. For both Work Area Outlet and TR locations:
 1. F type connectors.
 2. Accepts RG-6 Coaxial cable.
 3. Use the following products or approved equivalent:
 - a. Panduit: mini-com jack insert- International White.
 - 1) Part # CMFIW
6. Coaxial Modular Patch Panel:
 1. The modular panel for the coax cable shall be the same patch panel as used for the data ports, but it will be mounted on the TR backboard using wall mount brackets.
 2. The modular patch panels shall be manufactured to house the same f- type modular jack that will be installed at the work area outlet. Modular patch panels shall be of the same manufacturer as the modular jack and shall be sized to accommodate the appropriate number of jacks provided plus an additional 10%.
 3. Use the following products of approved equivalent for the patch panel:
 - a. Panduit: Mini-Com 24 Port wall mount – Black
 - 1) Part # CPP24WBLY
 4. Use the following products or approved equivalent for the wall bracket:

- a. AllenTel wall mount bracket for 19" patch panel – Black
 - 1) Part #AT55HM-1

2.7 WAP and Camera Hardware

- A. Accessible Ceiling, use the following part or equal:
 - 1. Surface Mount outlet box
 - a. Part Number CBX1WH-A
- B. For inaccessible ceiling, coordinate installation with LSU ITS/ UNI personnel.

2.8 Work Area Outlet Faceplates:

- A. Work Area Outlets:
 - 1. Outlet faceplates shall be single gang and manufactured to accept the same modular jack that will be installed in the modular patch panel. Unless otherwise noted on drawings, all faceplates shall have 4-ports minimums. Plates shall be thermos-plastic or non-conductive flexible nylon or Lexan. Use Type 302 stainless steel on concrete, masonry construction, or any other location as mandated by code. Faceplates shall be equipped with blank inserts of same color in unused ports.
 - 2. The color of the faceplate shall be determined by the Architect or interior designer of the project.
 - 3. Both the faceplate and the blank inserts shall be the same color.
 - 4. Wall mounted work area outlet faceplate. Use the following products or approved equivalent:
 - a. Panduit (4 PORT), Standard outlet
 - 1) Mini-com faceplate, 4 module
 - 2) Part # CFP4xx
 - b. Panduit (4 PORT), Residential Housing outlet
 - 1) Mini-com faceplate, 4 port angled modules
 - 2) Part # CFPS4xx
 - c. Reserved space/ blank for faceplate
 - 1) Mini-com blank module
 - 2) Part # CMBxx-X

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- 3) xx = in the above part numbers represents the color of the faceplate and insert. The 2 shall match. IW (International White/ Off White), EI (Electric Ivory), WH (White), IG (International Grey), or BL (Black).
- B. Floor Mounted - Work Area Outlet
1. Provide a single gang, 4-port duplex frame. Frames shall be manufactured to accept the same modular jacks as the standard work area outlet faceplates. Provide blank inserts for all unused ports.
 - a. Manufacturer: Hubbell Inc.
 - b. E-series
 - 1) Part # S1PTBRS
 - 2) With sub plate part # S1SP (with 106 Frame)
 - 3) Or sub plate part # S1SP4X4PA

2.8 Labeling:

- A. Comply with TIA/ EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. NO hand written labels will be accepted.

PART 3: EXECUTION

3.1 General Cable Installation:

- A. Comply with TIA/ EIA-568-C.
- B. Comply with BICSI TDMM, Ch. 5 "Horizontal Distribution Systems."
- C. NO cable ties are allowed in LSU's cable plant. All cables shall be neatly arranged and tied with hook and loops straps. Wiring is neatly arranged and can be easily modified.
- D. Horizontal cabling shall contain no consolidation points, splice points, or transition points between the nearest Telecommunications Room and the Work Area Outlet. (Exception: Horizontal fiber optic cable shall be pulled thru the nearest TR to the building Entrance Telecommunications Room.)
- E. The proper cable for the environment is to be installed. (Wet locations shall have the appropriate cable.)
- F. The maximum allowable horizontal cable length is 295 feet.

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- G. All horizontal cable shall be plenum rated cable.
- H. Install lacing bars and distribution spools to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than the minimum recommended by the manufacturer.
- I. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- J. Inside routing shall be installed parallel and perpendicular to existing structural lines and members.
- K. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
- L. Telecommunications horizontal cable shall be installed in conduit where routed in walls, floors, and inaccessible ceilings.
- M. If cable has to cross fluorescent lighting and/or power cables, the cables must cross perpendicular to both.
- N. For cable not installed horizontally in conduit, support exposed cable in accessible ceiling space at most every five feet using industry standard J-hooks. Mount as high as possible next to floor/ roof deck. Do not support cabling from conduit, joists, or ductwork directly. Use only the J-hooks.
- O. 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.
 - a. Separation between conduit and cables used for electrical power: a minimum of 12 inches.
 - b. Separation between light fixtures: a minimum of 18 inches.
 - c. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and larger: a minimum of 48 inches.
 - d. Separation between Communications Cables and Fluorescent Fixtures: a minimum of 5 inches.

3.2 Terminations

- A. Balanced Twisted Pair Cable
 - 1. Terminate all Balanced Twisted Pair cable using modular type female RJ45 connectors at both ends of the cable.
 - 2. Terminate all cable conductors; no cable shall contain non- terminated pairs.

3. No cable shall have pairs that are split between 2 connectors.
 4. When terminating cable, comply with TIA/ EIA-568-C.
 5. The jack shall be terminated according to the T568B wiring standard.
- B. Coaxial Cable
1. Terminate all coaxial cable using F type connectors.
 2. The connector shall have a modular insert design to fit into the same faceplate as the balanced twisted pair cables.
- C. Fiber Optic Cable
1. All fiber optic cables shall be terminated using type LC connector specified.
 2. Use LC UniCam connectors at the outlet and LC pigtails in the TRs (pigtails are part of the Cassettes).

3.3. Telecommunications Work Area Outlet Configuration

- A. Work Area Outlet (Typical for an office space)
1. TIA/EIA-568-C.1 requires that a minimum of two work area outlet/connectors be installed for each work area
 2. All work area outlets must be accessible after final furniture is placed in space.
 3. Standard work area outlet for an office space shall consist of TWO (2) Category 6a compliant data ports. See Appendix A Figure 6.
 4. If there is a need for Coax for CATV, then the outlet shall consist of the appropriate cabling to provide this service. ONE (1) RG-6 Coax cable port for CATV.
 5. Ports will be positioned in the outlet per Appendix A Figure 6 for all cables.
- B. Fiber Optic Work Area Outlet
1. When fiber optics are required at a work area, it must be installed in a separate outlet box from other horizontal cabling.
 2. A 6-strand single mode fiber cable) will be pulled from the nearest TR to the servicing outlet location.
 3. All strands of the fiber cable shall be terminated. No strand shall be left un-terminated.
 4. The fiber optic connector shall be LC type connector.
 5. This outlet will be required to have a 4-port faceplate and be configured per Appendix A Figure 6.

C. WIRELESS ACCESS POINTS AND CAMERA

1. Above Accessible Ceiling
 - a. For WAP and Camera outlets above accessible ceilings, the outlet shall be attached / supported above the ceiling grid. The outlet shall be a surface mount type that can be either attached to the vertical ceiling hangers or attached to wall at the correct location.
 - b. Location of outlet box must be clearly marked with intended use type, jack id.
 - c. Location shall be marked on metal grid using ½ inch wide label. Printing must be black on white label.
2. On Inaccessible Ceiling
 - a. For WAP and Camera outlets on inaccessible ceilings the installation will require coordination with LSU ITS/UNI personnel.
3. Mounted on the exterior surface of the building.
 - a. For all penetrations and how the devices look on the exterior of the building, defer to the architect and LSU's Facility Development team.
 - b. If the penetration thru the exterior surface of the building enters the building above an accessible ceiling space, then install a surface mount outlet within 12 inches of the penetration. Once the cable is installed thru the penetration, then that penetration shall be fire stopped and sealed in compliance with the building Fire Stop system.
 - c. If the penetration thru the exterior surface of the building enters the building above an inaccessible ceiling space, coordinate the installation with LSU ITS/UNI personnel.

3.3 Telecommunications Room Configuration

- A. In the TR, group connecting hardware for cables into separate logical fields. Data and fiber cabling will be terminated on the relay rack. Coax cabling will be terminated on wall backboards.
 1. Data Cabling
 - a. Includes network connections, wireless access point connections, camera connections, and Building Automation System (BAS) connections.

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- b. Mount all horizontal data cabling in patch panels in relay racks.
 - c. Configuration of the data cabling in the patch panels will be determined by the use of the cable. Start patch panels on relay rack row 39 in Entrance Telecommunications Rooms and row 42 in Telecommunications Rooms. Install a maximum of 16 patch panel rows.
 - 1) The data connections will fill in the patch panels at the top of the field and will be arranged in the patch panels from left to right and top to bottom.
 - 2) Immediately after the complete population of the data network connections there shall be empty patch panel spaces available for a 10% growth.
 - 3) Immediately following the growth section of the patch panels and on a new row, the wireless access point connections will be arranged in the patch panels from left to right and top to bottom.
 - 4) Immediately following the wireless access point connections rows and on a new patch panel row, the camera connections will be arranged in the patch panel from left to right and top to bottom.
 - 5) Once ALL the data jack fields are installed, the BLUE BAS connections will be installed on the very BOTTOM row of the patch panels and all the way to the RIGHT.
2. Coax Cabling
- a. Mount all horizontal coax cabling in 19-inch patch panels on the telecommunications room backboards.
 - b. The 19" patch panel will be the same patch panels used for the data network connections in the relay racks.
 - c. Use brackets to attach the patch panels to the back board at location in the TR as described in Appendix A, Figure 1, 2, and
3. Fiber Optic Cabling
- a. Mount all horizontal fiber optic cabling in a fiber optic connector housing in the relay rack, starting on row 45.
 - b. All horizontal fiber optic cable connections will be terminated in a Fiber Optic Cassettes that are separate from that of service/ backbone fiber optic cables. Only 3 cables will be allowed to be terminated in a single cassette.

- c. The location of the Horizontal fiber cassette will be located as far to the right of the housing as possible. (More details on the set up of the Fiber Optic Housing will be covered in Section 271300 – “Communications Backbone Cabling”)
- d. All fiber optic cables shall be terminated using the factory-manufactured pigtailed that are included in the cassettes specified.
- e. All pigtailed shall be fusion spliced into fiber optic cable.

Identification

3.4 Labeling

- A. No paper labels or tags will be acceptable.
- B. No hand-written labels or tags will be acceptable.
- C. Work Area Outlets:
 - 1. Work Area Outlet:
 - a. Each Work Area Outlet shall have its own unique identifier. The outlet’s unique identifier shall be placed at the top of each faceplate, and shall consist of the official room number of the wiring closet serving the outlet, followed by a colon, followed by a space, then the faceplate number. For example, Faceplate 1 served from Closet 1023 would have the following label: 1023: 1.
 - b. Faceplate numbers shall be assigned sequentially in a room, starting at the first outlet to the left of the leftmost entrance with a “1,” and increasing the count incrementally by 1 in a clockwise direction around the room.
 - 2. Work Area Outlets ports:
 - a. All data jacks in an individual work area outlet shall be labeled. Each data jack on the faceplate shall be labeled with the rack number, patch panel row number, and the patch panel row position number from which it is served, separated by hyphens. For example, if the far-end of a jack in the faceplate is located in Rack 1, Patch Panel Row 2, Patch Panel Row Position Number 23, the work area outlet jack would be labeled 1-2-23.
 - 3. Wireless access points and camera locations:

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- a. Cables installed for wireless access points and cameras, shall be flagged with the room number of the TR as well as the Rack/ Patch Panel Row/ Panel Port location as described above.
4. Equipment Room Terminations:
 - a. Racks: rack shall be labeled. Each rack shall be labeled sequentially from left to right beginning with the number 1.
 - b. Data Outlets: each jack shall be labeled. Labels shall be affixed to the patch panel at a point adjacent to the jack being labeled. Labels shall include the official far end room number followed by a colon, followed by the number of the faceplate, which contends the far end jack. Example 1103B:2.
 5. Coax Cable Labels:
 - a. The contractor will not be required to do any labeling at the work area outlet for the Coax cable.
 - b. The contractor will be required to label above each port on the coax cable patch panel in the TR.
 - c. Coax shall be arranged in the patch panel in ascending sequential order by room number.
 - d. The label is required to have the room number and outlet number for the location of the outlet side of the coax cable.
 - e. The location label will look like:
 - a. "XXXX YYY"
 - b. XXXX: the room # of the work area outlet.
 - c. YYY: the work area outlet #.
 - d. Example: 123:2
 6. Fiber Optic Cable Labels:
 - a. Each horizontal cable will be given a unique identifier and labeled per its unique identifier and its location.
 - b. Work Area Outlet:
 - 1) At the work area outlet the outlet will be labeled with the room number of the servicing TR and the outlet box number in the room. Similar to that of the data cabling.
 - 2) Above the LC couple ports and centered on the faceplate the contractor shall adhere the "unique identifier" for that horizontal fiber cable.

c. Fiber Connector Housing in the TR:

1) On the outside of the door the fiber connector housing the contractor shall place the label with the unique identifier on the cable directly above/ in front of the location of where the cable is physically located in the housing. Directly below the label with the unique identifier of the cable will be a label that indicates the location of the work area outlet of that horizontal fiber cable.

2) How to develop the unique identifier for the horizontal fiber cables:

□ □ □ — □ □ □ □ — □ □ □ : 1- 4
 1 2 3 4 5 6 7 8 9 10

1-3 Cable Type: Select rating of cable

- SMF: Single Mode Fiber

4-7 Building Code: Official LSU building acronym 8-10 Unique Cable Identification Number

Each horizontal fiber cable is given a unique number that is used to track that cable. The number will start with the number 1 and increase by 1 for the next cable. The only requirement for the numbering scheme is that the number be in increasing sequential order in the TR fiber optic connector housing.

Example:

- 1, 2, 3...101, 102, ...

Example of unique identifier:

SMF-FSB-3:1-4

3) How to develop the Fiber Work Area Outlet location label: the location label will look like:

“LOC: XXXX YYY”

XXXX: Official LSU building acronym

YYY: The room # of the work area outlet

Example: **LOC: FSB 123**

3.5 Field Quality Control & Testing

- A. All questions and/ or disagreements with regards to the cabling practices for the project will be discussed and a resolution will be agreed upon by LSU's ITS department and the contractor's RCDD for the project. End-to-end horizontal cabling will be considered defective if it does not pass physical inspections and performance tests.
- B. If a cable fails to pass physical inspections and performance tests, the contractor will perform corrections to the cable. Corrections can be made to the existing cabling that are pre-approved by LSU ITS or the cabling must be replaced by the contractor at the contractor's expense.
- C. Physical inspection of cable assemblies.
 - 1. The contractor (or qualified independent testing agent) will perform the following physical tests and inspections prior to LSU's ITS.
 - a. Visually inspect all horizontal cables for compliance with installation requirements for the entire route of every cable installed.
 - b. Visually inspect all horizontal cable jacket materials to verify that all cables installed are PLENUM rated.
 - c. Visually confirm that all the cables are of the proper type (Category 6a, Singlemode, etc.) and that the jackets are the proper color.
 - d. Inspect cabling terminations in communications equipment rooms and at telecommunication outlets for compliance with termination requirements. Verify that the terminations are made properly, that the jacks are the correct color, and that the ports are labeled properly.
- D. Performance Testing
 - 1. Balanced twisted pair performance tests:
 - a. All horizontal distribution runs shall work together to create a permanent link solution for wire and jack combination. A

permanent link solution is a pairing of wire and jack tested together to produce optimum efficiency and throughput. The permanent link solution will be tested as a complete assembly from the work area outlet to the patch panel interface.

- b. Test for each outlet. Perform the following tests according to TIA/ EIA-568-C.
 - 1) Category 6A Cable:
 - a) All Category 6A distribution cables will be tested in accordance with procedures laid out in TIA/EIA-568-C for the basic link. Written test results for each cable shall include all four of the primary field test parameter results. Any cable that fails testing shall be reported along with the procedures used to rectify the failure (i.e., replaced cable, replaced jack, etc.). Contractor tests shall utilize a Category 6A Level II compliant cable tester. Electronic results for each balanced twisted pair Category 6A four-pair cable will be submitted as part of the contractor's "As-Built" project performance acceptance records. In addition to the above information, the documentation will also include a pass/ fail indication for the specified cable, the test date, the serial number and software version of the scanner, and a copy of the calibration certificate for the scanner. Necessary applications for reading the results will be provided by the requirements refer to ANSI/ TIA/ EIA-569-B.
 - c. Document data for each measurement. Data for submittals shall be printed in a summary report.
 - d. Prepare test and inspection reports.
 2. Coax Cable performance testing:
 - a. The horizontal coax cable assembly consists of the coupler modules at the work area outlet, the coax cable with the f-type connectors properly terminated on each end of the cable, and the coupler module in the TR.

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- b. The horizontal coax cabling will be physically inspected and a continuity test will be made to determine that the f-type connectors have been properly terminated.
 - c. If the cable fails to meet the above requirements, the contractor will perform corrections to the cable or it shall be replaced by the contractor at the contractor's expense.
3. Fiber Optic performance testing:
- a. All singlemode fiber cables shall be tested at both 1310 nm and 1550 nm after installation. All tests are to be performed in accordance with ANSI/ TIA/ EIA-526-7.
 - b. No splice may show a loss of greater than 0.2 dB and no connector pairs may show a loss of greater than 0.5 dB. Fibers will be considered acceptable if the OTDR trace for that fiber shows an end to end loss of less than $xx\text{dB} + yy(0.2)\text{ dB} + zz(0.5)\text{ dB}$ (where yy is the number of splices, zz is the number of connector pairs and xx is calculated using the following formula: $xx = \text{distance} \times \text{fiber attenuation}/ \text{unit distance} @ \text{lambda}$ of the manufacturers specifications of fiber cable used). The vendor shall test each fiber strand utilizing an OTDR tester at the wavelengths specified above. Overall, the OTDR test results shall be made up of the wavelength of the conducted test, the link length, the link attenuation, cable identification, and the locations of the near end, the far end and each splice point or points of discontinuity. Hard-copy results for each fiber strand shall be submitted as part of "As-Built" documentation.
 - c. If the cable fails to meet the above requirements, the contractor will perform corrections to the cable or it shall be replaced by the contractor at the contractor's expense.
 - d. Printed test results for each fiber strand are required.

END OF SECTION 271500