PART 1 – GENERAL

1.1 HORIZONTAL CABLING DESCRIPTION

A. Horizontal Cabling is the 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

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 to connecting hardware on each end.
C. **EMI**: Electromagnetic interference.
D. **ETR**: Entrance Telecommunications Room
E. **IDC**: Insulation displacement connector.
F. **LAN**: Local area network.
G. **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.
H. **POTS**: Plain Old Telephone Service. Used to describe traditional analog voice service.
I. **TR**: Telecommunications Room
J. **Work Area Outlet**: A connecting device on which horizontal cable terminates opposite of the Telecommunications Room (TR or ETR).
K. **RCDD**: Registered Communications Distribution Designer.

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 department. Coordinate with LSU’s ITS representatives 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 Designed (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 of bid.

C. SUBMITTALS
1. All test results for installed cables shall be provided to LSU’s ITS 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:
   - Building Code
   - TR/ETR number
   - Rack #
   - Patch Panel Row # (first installed patch panel is “1”)
   - Patch Panel jack position # (1-24)
   - End room # of circuit
   - Box # in room (left to right, clockwise around room)
   - Test result (good/bad) of each circuit

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PART 2 – PRODUCTS

2.1 COMMUNICATION CABLES

A. ALL cables that are pulled in the horizontal space will be Plenum rated cable.

B. BALANCED TWISTED PAIR CABLES
   1. Description: 100-ohm, four-pair BALANCED TWISTED PAIR, covered with a thermoplastic jacket. Color as specified.
      a. Comply with ICEA S-90-661 for mechanical properties.
      b. Comply with TIA/EIA-568-C for performance specifications.
      c. Comply with TIA/EIA-568-C Category 5e for telephone station cables and Category 6 for data station cables.
      d. Jacket shall be plenum rated.

2. Cable Jacket Color:
   a. Telephone Station Cables:
      1) Cat 5e Blue
   b. Data Station Cables:
      1) Cat 6: White
      2) Cat 6a: Gray

3. BALANCED TWISTED PAIR Category 5e Cables. Use the following products or LSU ITS approved equivalent:
   a. For telephone station cable use:
      1) General Cable, Cat 5e, Blue, Plenum Genspeed 5000
         a) Part Number 5131278E

4. BALANCED TWISTED PAIR Category 6 Cables. Use the following products or LSU ITS approved equivalent:
   1) General Cable, Cat 6, White, GenSpeed 6500
      a) Part Number 7131931

5. BALANCED TWISTED PAIR Category 6a Cables. Use the following products or LSU ITS approved equivalent:
   1) General Cable, Cat 6a, Gray, GenSpeed 10 MTP
      a) Part Number 7132851

C. FIBER OPTIC CABLES
   1. SINGLEMODE FIBER
      a. FIBER CABLE STRAND SPECIFICATIONS
         1) Nonconductive, tight buffer.
         2) Maximum Attenuation: 0.5 dB/km at 1350 nm.
         3) Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
         4) Fiber Type: Singlemode, glass core, glass cladding.
         5) Core Diameter: 8.0 to 9.0 microns.
         6) Core/Clad Concentricity Error: < or = 0.8 micron.
         7) Cladding Diameter: 125 microns +/- 1 micron.
         8) Cladding Non-circularity: < or = 1%.
         9) Strand Color Code: Per industry practice.
10) Strand count 4

b. HORIZONTAL FIBER OPTIC CABLE CONSTRUCTION
   1) Nonconductive, tight buffer, optical fiber cable
   2) Comply with ICEA S-83-596 for mechanical properties.
   3) Comply with TIA/EIA-568-C for performance specifications.
   4) Jacket Color: Yellow
   5) Cable shall be imprinted with fiber count, fiber type, and aggregate length at regular intervals.
   7) Jacket shall be plenum rated.

c. Use the following products or approved equal:
   1) Corning Single Mode Fiber
      a) Part Number 004E88-31131-29

C. COAXIAL CABLE
   1. RG-6
   2. Characteristic Impedance: 75-ohm +/- 3 ohm
   3. Structural Return Loss: 15 dB @ 1000 – 3000 MHz; 20 dB @ 5 – 1000 MHz
   4. Center Conductor: No. 18 AWG, solid, copper-clad steel;
   6. 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.

2.2 CATV Plenum Rated: Type CMP
   1. Jacket color: white
   2. Use the following product or LSU ITS approved equal:
      a. Commscope:
         1) Part Number 2227V-BKRL-RG6-QD
      b. Approved equal.

2.2 CONNECTORS

A. BALANCED TWISTED PAIR CABLE CONNECTORS
   1. Assemblies there 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 5e/6/6a 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.
2. **Jack Color:**
   a. Telephone Jack Cat 5e (at the station outlet): Electrical Ivory / Beige  
   b. Data Jack Cat 6 (at the station outlet and in the TR): Gray  
   c. Data Jack Cat 6a (at the station outlet and in the TR): International White  
   d. Point of Sale (at the POS outlet and in the TR): Green  
   e. Energy Management Services (at the EMS outlet and in the TR): Blue

3. **Use the following products or LSU ITS approved equivalent:**
   a. RJ-45 Category 5e Jacks, Panduit:
      1) Mini-Com CAT5e RJ45 Voice Jacks – Electrical Ivory / Beige
         a) Part number CJ5E88TEI
   b. RJ-45 Category 6 Jacks, Panduit:
      1) Mini-Com CAT6 RJ45 Data Jacks - Grey
         a) Part number CJ688TPIG
      2) Mini-Com CAT6 RJ45 Data Jacks - Green
         a) Part number CJ688TPGR
      3) Mini-Com CAT6 RJ45 Data Jacks - Blue
         a) Part number CJ688TPBU
   c. RJ-45 Category 6a Jacks, Panduit:
      1) Mini-Com CAT6a RJ45 Data Jacks – International White
         a) Part number CJ6X88TGIW

4. **For Wireless access points, cameras and security at the outlet locations:**
   a. Panduit: CAT6 male RJ45 Jacks
      1) Part Number SP688-C

5. **TELEPHONE TERMINATIONS (IN THE TR)**
   a. All horizontal telephone wiring shall be terminated on wall-mounted Category 5e compliant 66-style IDC type M1-50 blocks mounted on BLUE metal wall mount backboards.
   b. Provide blocks for the number of cables terminated on the block, plus 25 percent spare.

B. **FIBER OPTIC CABLE CONNECTORS**
   1. All Fiber cable strands shall be terminated using LC type connectors. The connector shall match the rating of the fiber that it is terminating.
   2. **Work Area Outlet:**
      a. 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.
b. Fiber connector to terminate fiber strands.
   1) Use of a crimp type connector will be allowed at the work area outlet only. Use the following:
      a) Corning: Unicam. LC
      b) Singlemode, LC – part number: 95-200-99

c. Fiber Coupler insert for the work area outlet faceplate.
   1) Panduit: LC/LC coupler insert
      a) Singlemode, LC – part number: CMDSLZIW

3. Telecommunication Rooms:
   a. The fiber optic connectors are included in the purchase of a “Fiber Housing Cassette”. The Cassette will include the following.

b. FIBER HOUSING CASSETTES:
   1) Fiber cassettes for the Fiber Cross-Connect Housings serve as both the fiber splice housing and fiber Housing bulkhead panel.
   2) 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:
      3) Corning (for CCH Housing)
         a) CCH-CS24-AE-P09RE (Will accommodate 24 strands)
         b) CCH-CS12-A9-P00RE (Will accommodate 12 strands)

C. COAXIAL CABLE CONNECTORS

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 number CMFIW

2.3 PATCH PANELS / CONNECTOR HOUSINGS

A. DATA MODULAR PATCH PANEL

1. 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 and accommodate exactly 24 jacks per row, and be colored black. Use the following products or approved equivalent:

   2. Panduit: Mini-Com 24 Port 19” - Black
      a) Part Number CPP24WBLY
B. 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 or approved equivalent for the patch panel:
   a. Panduit: Mini-Com 24 Port wall mount – Black
      1) Part Number CWPP24WBL
4. Use the following products or approved equivalent for the wall bracket:
   a. Panduit wall mount bracket for 19” patch panel – Black
      1) Part Number WBHx (x=number of rack units 1,2,3, or 4)
      a) Part Number WBHx

C. FIBER OPTIC CONNECTOR HOUSINGS
1. FIBER CROSS-CONNECT HOUSING (FIBER PATCH PANEL)
   a. Fiber Cross-Connect Housings shall be manufactured to fit in a 19-inch relay rack.
   b. 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.
   c. Use the following products or approved equal:
      2. Corning
         1) CCH-0XU (Where X represents the number of rack units needed to accommodate the housing.)

2.4 WORK AREA OUTLET FACEPLATES
A. WORK AREA OUTLET:
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 thermo-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
      a) Part Number CFP4xx
b. Panduit (4 PORT), Residential Housing outlet
   1) Mini-Com Faceplate, 4 port angled modules
      a) Part Number CFPS4xx

c. Panduit (6 PORT), Standard outlet
   1) Mini-Com Faceplate, 6 module
      a) Part Number CBxx
      2) Mini-Com insert for 6 module faceplate
         a) Part Number CHF2Mxx-X
         b) Each 6 port faceplate requires 3

d. Reserve space / blank for Faceplate
   1) Mini-Com blank module
      a) Part number CMBxx-X

      2) 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 Faceplate

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 Number S1PTBRS
      2) With sub plate part number S1SP

2.5 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 loop straps such that wiring is neatly arranged and can be easily modified.
D. Horizontal cabling shall contain no consolidation points, splice points, or transition points between the Telecommunications Room and the Work Area Outlet.
E. The maximum allowable horizontal cable length is 295 feet. Any exceptions shall be approved thru the LSU Information Technology Services department.
F. All horizontal cable shall be plenum rated cable
G. 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.
H. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items
I. Inside routing shall be installed parallel and perpendicular to existing structural lines and members
J. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
K. Telecommunications horizontal cable shall be installed in conduit where routed in walls, floors, and inaccessible ceilings.
L. If cable has to cross fluorescent lighting and/or power cables, the cables must cross perpendicular to both.
M. For cable not installed horizontally in conduit, support exposed cable in accessible ceiling space at least 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.
N. 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
   1. Terminate all Balanced Twisted Pair cable using modular type RJ45 connectors at both ends of the cable.
a. All Balanced Twisted Pair cables shall be terminated using female RJ45 with the exceptions of POTS voice in the TR and wireless access points and camera locations at the service location.
b. The POTS voice service will be terminated using Cat5e cable and it will be punched down on 66 blocks in all TRs.
c. The wireless access points and camera locations will be terminated using male RJ45 connectors.

2. Terminate all cable conductors; no cable shall contain non-terminated Pairs. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.

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
   a. Terminate all coaxial cable using F type connectors.
   b. The connector shall have a modular insert design to fit into the same faceplate as the balanced twisted pair cables.

C. FIBER OPTIC CABLE
   a. All fiber optic cables shall be terminated using type LC connector specified.
   b. Use LC UniCam connectors at the outlet and LC pigtailed in the TRs.

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. Voice and coax cabling will be terminated on wall backboards.

1. DATA CABLING
   a. Includes network connections, wireless access point connections, camera connections, Point-of-Sale (POS) connections, and Energy Management System (EMS) connections.
   b. Mount all horizontal data cabling in patch panels in relay racks.
      1) The location of the patch panels in the relay rack is described in Section 271100 – “Telecommunications Rooms.” And is also shown in Appendix A Figure 2B.
   c. Configuration of the data cabling in the patch panels will be determined by the use of the cable and the jacks will be color coded per their use.
      1) Network connections, wireless access point connections and camera connections will be either GREY or International WHITE / Off WHITE (depending of the rating of the cable) and will be arranged in the patch panel from left to right and top to bottom. There is NO requirement to separate these cables by color. They can be mixed together.
      2) Once the Grey and White jack fields are installed, plus 10% blank spaces in the patch panels for growth, the GREEN field (POS connections) will begin on a new patch panel started immediately below the last Network panel.
3) Any BLUE EMS connection will be installed on the very BOTTOM row of the patch panels and all the way to the RIGHT, regardless of the last field terminated.

d.

2. **VOICE CABLING**
a. Terminate all horizontal voice cables on 66 blocks located on BLUE metal backboard fields.
b. All pairs of the horizontal voice cable shall be terminated. No pairs are to be left un-terminated.
c. The location of the blue backboard field in the TR is described in Appendix A Figure 1, 2, and 3.

3. **COAX CABLING**
a. Mount all horizontal coax cabling in 19-inch patch panels that are located on the telecommunications room backboards.
b. The 19" patch panel will be the same patch panels used for the data network connections.
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 5.

4. **FIBER OPTIC CABLING**
a. Mount all horizontal fiber optic cabling in a fiber optic connector housing in a relay rack.
b. The location of the fiber optic connector housing in the relay rack is described in Section 271100 – “Telecommunications Rooms.” And is also shown in Appendix A Figure 2B.
c. All horizontal fiber optic cable connections will be terminated in a Fiber Optic Connector Housing that is separate from that of service / backbone fiber optic cables.
d. All fiber optic cables shall be terminated using the factory-manufactured pigtails that are included in the cassettes specified.
e. All pigtails shall be fusion spliced into fiber optic cable.

3.4 **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/connections 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 6 compliant data ports. See Appendix A Figure 6.
4. If there is a need for traditional voice (not VoIP) and/or Coax for CATV, then the outlet shall consist of the appropriate cabling to provide the service. ONE (1) additional Category 5e compliant port for voice and 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 assembly  
1. When fiber optics are required at a work area, it must be installed in a separate outlet box from any other horizontal cabling.  
2. A 4-strand singlemode 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 OUTLETS  
1. At the location indicated for this outlet the contractor shall leave a minimum of 10 feet of cable slack coiled up.  
2. If cable is installed in a hard ceiling space, then the cable slack should be at the “nearest accessible ceiling space,” not the “end point.”  
3. The cable shall be terminated using a male RJ45.

3.5 GROUNDING & BONDING  
A. Comply with requirements in Section 260526 “Grounding and Bonding for Electrical Systems” for grounding conductors and connectors.

3.6 LABELING  
A. No paper labels or tags will be acceptable.  
B. No hand written labels or tags will be acceptable.  
C. DATA CABLE LABELS:  
1) Faceplates  
   a.) Phone/data outlet faceplates shall be labeled. The faceplate labels 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: All data jacks 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 Pane Row Position Number 23, the work area outlet jack would be labeled 1-2-23.  
3) Wireless access points and camera locations. 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.

D. VOICE CABLE LABELS
   1. The contractor will not be required to do any labeling at the Work Area Outlet for the voice cable.
   2. The contractor will only be required to label the cable on the TR end of the cable.
   3. The contractor will be required to label / flag each voice cable with the location of the Work Area Outlet that cable is servicing.
   4. The location label will look like:
      a. “LOC: Rm XXXX:YYY”
      b. XXXX: The room # of the work area outlet.
      c. YYY: The work area outlet #.
      d. EXAMPLE: LOC: Rm 123:2

E. COAX CABLE LABELS
   1. The contractor will not be required to do any labeling at the Work Area Outlet for the Coax cable.
   2. The contractor will be required to label above each port on the coax cable patch panel in the TR.
   3. Coax shall be arranged in the patch panel in ascending sequential order by room number.
   4. The label is required to have the room number and outlet number for the location of the outlet side of the coax cable.
   5. 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

F. FIBER OPTIC CABLE LABELS:
   1. Each horizontal cable will be given a Unique Identifier and labeled per its Unique Identifier and its location.
   2. Work Area Outlet
      a. 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.
      b. Above the LC couple ports and centered on the faceplate the contractor shall adhere the “Unique Identifier” for that horizontal fiber cable.
3. Fiber Connector Housing in the TR
   a. At/on the outside of the door of the fiber connector housing the contractor shall place the label with the Unique Identifier of 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.
   b. 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

c. 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

3.7 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 the cables installed are PLENUM rated.
   c. Visually confirm that all the cables are of the proper type (Category 5e, Category 6, 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 that 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 6 Cable:
   
   a) All Category 6 distribution cables will be tested in accordance with procedures outlined in ANSI/EIA/TIA-568-C for the Permanent 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, re-terminated jack, etc.). Contractor tests shall utilize a Category 6 Level III compliant cable tester as described in ANSI/TIA/EIA-568-C. Electronic results for each BALANCED TWISTED PAIR Category 6, 4-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-568-C.
2) 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 5A 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. VOICE CABLE performance testing
   a. Horizontal voice cabling will be terminated via RJ45 modular Jacks at the Work Area Outlet and terminated / punched down on 66 blocks in the TR, therefore the test for voice only will be a simple continuity test.
   b. 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. 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.
   b. The horizontal coax cabling will be physically inspected 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.

4. FIBER OPTIC performance testing.
   a. All singlemode fiber cables shall be tested at both 1310 nm and 1550 nm after installation. Printed test results for each fiber strand are required. 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 \( xx \) dB + \( yy \times 0.2 \) dB + \( zz \times 0.5 \) dB (where \( yy \) is the number of splices, \( zz \) is the number of connector pairs and \( xx \) is calculated using the following formula: \( xx = \text{distance} \times \text{fiber attenuation/unit distance} @ \lambda \text{of the manufacturers specifications of fiber cable used} \)). 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.

END OF SECTION 271500