SECTION 271300 - COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.


1.2 SUMMARY

A. Section Includes:

1. Pathways.
2. UTP cable.
3. Cable connecting hardware, patch panels, and cross-connects.

B. Related Sections:

1. Section 280513 "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. BICSI: A professional association supporting the information technology systems (ITS) industry.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. LAN: Local area network.

F. RCDD: Registered Communications Distribution Designer.

G. UTP: Unshielded twisted pair.
1.4 BACKBONE CABBING DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-C, when tested according to test procedures of this standard.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. For coaxial cable, include the following installation data for each type used:
   a. Nominal OD.
   b. Minimum bending radius.
   c. Maximum pulling tension.

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:
   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.
6. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
   a. Vertical and horizontal offsets and transitions.
   b. Clearances for access above and to side of cable trays.
   c. Vertical elevation of cable trays above ceiling structure.
   d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.
1.7 INFORMATIONAL SUBMITTALS

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

B. Source quality-control reports.

C. Field quality-control reports.

D. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
   1. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
   2. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 50 or less.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.


1.9 PROJECT CONDITIONS

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

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

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   1. Support brackets with cable tie slots for fastening Hook and loop straps to brackets to secure cables. No cable ties will be used.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Use hook and loop straps only. NO cable ties are permitted.

C. Conduit and Boxes: Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
   1. Outlet boxes shall be a standard double gang deep (minimum 2.125" depth) electrical box with a single gang sheet rock collar.

2.2 TELEPHONE CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Superior Essex Inc.
   2. General Cable

B. Description: 100-ohm, quantity of pairs as indicated on drawings, formed into 25-pair binder groups covered with a 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 5e.
   4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
      a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
      b. Communications, Riser Rated: Type CMR, complying with UL 1666.
   5. Cable conductors for both the outside telephone feeder cable and the inside telephone feeder cable shall have the following characteristics:
      a. Average mutual capacitance @ 23 +/- 2°C = 83 +/- 7 nF per mile for 12 pair or less and 83 +/- 4 nF per mile for larger than 12 pair.
b. Mutual capacitance RMS dev = 3% maximum.
c. Capacitance unbalance, pair-to-pair, 6 pair or less = 100 pF per 1000 ft. (maximum individual), 12 pair or greater = 25 pF per 1000 ft. (maximum RMS).
d. Capacitance unbalance, pair-to-ground, maximum individual pair = 800 pF per 1000 ft., maximum cable average = 175 pF per 1000 ft.
e. Conductor DC resistance at 20°C shall be 27.5 ohms per 1000 ft. maximum.
f. Resistance unbalance shall be 1.5% max avg; 5.0% max individual.
g. Minimum dielectric strength for 3 seconds shall be 3.0 kV conductor-to-conductor and 10 kV core-to-sheath.
h. Minimum insulation resistance @ 100 - 500 VDC for one minute at 23°C +/- 1°C shall be 1000 Megohm-mile.
i. Nominal attenuation at 20°C shall be 13.4 dB per mile at 150 kHz and 29.8 dB per mile at 772 kHz.
j. Equal level far end cross talk (ELFEXT) for 1000 megohm-miles at 21°C +/- 1°C and 772 kHz shall be 49 dB per 1000 ft. minimum mean power sum and 43 dB per 1000 ft. minimum worst pair power sum.
k. Near end crosstalk (NEXT) mean power sum at 772 kHz = 47 dB per 1000 ft. minimum.

2.3 OUTSIDE TELEPHONE FEEDER CABLE

A. Outside telephone feeder cable shall be a multi-twisted pair copper cable, gel filled, with coated aluminum shield and outer plastic jacket suitable for underground service. The cable shall have the following characteristics:

2. Conductors shall be solid, 24 gauge, annealed copper. Strands shall be individually insulated, polyethylene insulated cable (PIC) and twisted into pairs.
3. Number of pairs in cable shall be noted for each job.
4. Individual conductors shall be color coded per telephone industry practice.
5. A petroleum gel shall be used to fill all voids and indices to prevent the intrusion of moisture.
6. A coated aluminum shield shall encase the cable and be flooded with petroleum jelly. The shield shall be continuous throughout the length of the cable.
7. The cable shall have an overall PVC jacket/sheath. The jacket/sheath shall be abrasion resistant, impervious to light or water.

B. Cable shall be as manufactured by:

1. General Cable
2. Superior Essex

2.4 INSIDE TELEPHONE FEEDER CABLE

A. Inside telephone feeder cable shall be multi-pair telephone copper cable designed for inside wiring. The cable shall have the following characteristics:
1. All feeder cables shall be 24 gauge, solid annealed copper, with a Category 5e (minimum) compliance/performance rating as defined by the ANSI/TIA/EIA-568-C standard.
2. Number of pairs in cable shall be noted for each job.
3. Individual conductors shall be color coded in accordance with the ANSI/ICEA S-80-576 Standard.
4. The cable shall have an overall jacket/sheath rated, per NEC, for the environment in which it will pass through, i.e., "CMP" if the cable passes through any plenum space.

B. Cable shall be as manufactured by:

1. General Cable 21xxxx (Plenum),

2.5 TELEPHONE CABLE HARDWARE

A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

1. Connecting Blocks: 66-style IDC for Category 5. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated. Layout per Appendix A figure 3 & 4.

B. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: Two for each conductor in assigned cables.
2. Layout per Appendix A figure 3 & 4.

C. Metal Backboards

1. All telephone wiring shall be terminated on wall mounted Category 5E compliant 66 type blocks mounted on metal wall mount brackets surrounded on all sides with 188B2, 188C3, and 188D3 type metal jumper-routing backboards as appropriate on the following standard color-coded metallic backboard assembler:

a. Field Color
   1) Brown – Entrance cables into the building (Intra Campus), use tie cable from building protector to terminate all pairs on this color field.
   2) White – Feeder cables between telecommunications rooms within a building (Telecommunications Room to Telecommunications Room).
   3) Blue – Cables from telecommunications room to telecommunications outlet.

2.6 TERMINATION HARDWARE
A. Building Entrance Protectors

1. All building protectors shall be AVAYA 489-Type or Circa 189 Type (or 4486 Type where specified) protection systems. Project will be responsible for matching protector types in existing buildings (P310-Type where specified). Pair count will be specified on a per job basis. Building protectors shall be STUB IN and STUB OUT type. Building protectors must conform to UL 497 Specifications.
   a. P310 is the type of protectors used in the FREY Building and in David Boyd Hall.
      1) Porta Systems Products by tii Network Technologies.
      2) Part number is P310-WW-24-XX (where XX is length of cable stub in feet)
      3) Or approved equal.

B. Building Protector Modules

1. Protector modules shall be Avaya Type 3B1EW or Circa C3B1E gas tube with sneak protection. They shall be interchangeable 5-pin plug-in modules.

2.7 SINGLEMODE OPTICAL FIBER CABLE

A. General Description: nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-C for performance specifications.
3. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying
   with UL 444, UL 1651, and NFPA 70 for the following type:
   a. Riser Rated: Type OFN, complying with UL 1666.
   b. Plenum Rated: Type OFNP, complying with UL 1666.

4. Maximum Attenuation: 0.5 dB/km at 1350 nm.
5. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
6. Fiber Type: Singlemode, glass core, glass cladding.
7. Core Diameter: 8.0 to 9.0 microns.
8. Core/Clad Concentricity Error: < or = 0.8 micron.
10. Cladding Noncircularity: < or = 1%.
11. Strand Color Code: Per industry practice.
12. Outdoor Cable:
   a. Cable shall have an overall PVC jacket/sheath. The jacket/sheath shall be abrasion resistant, impervious to light or water.
   b. Cable shall contain a petroleum gel or dry water blocking material that is used to fill all voids and indices to prevent the intrusion of moisture.

B. Manufacturers:

1. Corning
2. Avaya
3. CommScope

C. Jacket:
   1. Jacket shall be rated for the environment in which it is installed. (i.e. plenum, riser, etc.)
   2. Jacket Color: Yellow or black for Singlemode.
   3. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.

D. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.8 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Corning
   2. Leviton
   3. CommScope

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
   1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field.

C. Fiber Lightguide Interconnect Unit (LIU)
   1. Fiber LIUs shall be manufactured to fit in both a 19 inch relay rack and a 23 inch relay rack. The LIU shall be sized to accommodate the appropriate number of fiber connections and utilize the least amount of rack space. Even if the LIU is not fully populated with fiber connections, the LIU shall be completely populated with bulkhead panels to accommodate future use.

D. Cable Connecting Hardware:
   2. Quick-connect, simplex and duplex, Type SC connectors for singlemode. Attenuation loss not more than 0.5 dB per mated pair.”

E. Singlemode Fiber Connectors
   1. All singlemode fiber shall be terminated using factory manufactured pigtails with SC type connectors. Use one of the following manufacturers or an approved equivalent:
1. Corning
2. CommScope
3. Leviton

2. The pigtailed used shall be of the same manufacturer as the cable being terminated. The connectors shall be produced by the same manufacturer that supplied the couplers.

F. Singlemode Fiber Couplers

1. All singlemode fiber LIU panels shall be equipped with SC to SC couplers. Use one of the following products or an approved equivalent:
   a. Corning
   b. CommScope
   c. Leviton

2. The couplers for singlemode fiber shall be produced by the same manufacturer that supplied the connectors.

2.9 SPlicing HARDWARE

A. Splice Case

1. All splice cases shall be specified for the particular environment in which they will be placed and shall be sized to accommodate the cable count spliced. End plates shall be designed for the number and size of the cables served by the splice and shall be designed to seal around each cable individually. All splice cases shall be re-enterable and shall contain all necessary equipment to be installed properly, adhering to all appropriate electrical codes.

B. Manhole/Outside Splice Case

1. Manhole/outside splice cases shall be manufactured to provide protection against water, soil, temperature, oil, etc. The closure shall contain all the necessary equipment to be installed properly such as mounting brackets, grounding straps, etc. All splice cases shall be encapsulated.

C. Copper Splice Unit

1. Copper splice units shall be of the type to splice a 25 pair bundle with one unit. The size of the cable splice unit shall accommodate the appropriate amount of cable. Closures should be water and air tight. The closures should be easily re-enterable. Cable should be spliced in vault or manhole conditions only. No direct burial cable splices are allowed.

D. Fiber Splice Unit
1. All fiber splices shall be preformed using fusion splice technology. The size of the fiber splice unit shall accommodate the appropriate amount of cable. Closures should be water and air tight. The closures should be easily re-enterable. Cable should be spliced in vault or manhole conditions only. No direct burial cable splices allowed.

E. Outside Splice Cases

1. Outside splice cases shall be manufactured to provide protection against water, soil, temperature, oil, etc. All splice cases should be encapsulated. Splice cases should be easily re-enterable. The splice case should be sized to fit the cables that are being spliced.

2.10 GROUNDING

A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.11 IDENTIFICATION PRODUCTS

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

2.12 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

B. All telephone cabling will be installed on Building Entrance Protectors with the appropriate protector modules. All Protection units shall be grounded to the Telecommunications Main Grounding Busbar (TMGB):

C. The metal strength members of ALL entrance cables shall be grounded to the Telecommunications Main Grounding Busbar (TMGB):
D. For work to be done by the Owner, provide 72 hour notice when any tie in or manhole work is to be done. Note that some work as noted on the Drawings call for larger notification periods. Before the start of construction, meet with the telecommunications company to review the Contract Documents. Ninety days prior to tentative date of acceptance of project, notify LSU Office of Telecommunications and allow them access to perform their work.

3.2 WIRING METHODS

   1. Install plenum cable in environmental air spaces, including plenum ceilings.
   2. Comply with requirements for raceways and boxes specified in Section 260533 "Raceway and Boxes for Electrical Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF CABLES

A. All Telecommunication Rooms will have one (1) singlemode fiber cable and one (1) telephone cable home run back to the Main Telecommunications Room. The strand and pair counts are to be determined by project engineer in coordination with LSU’s Information Technology representative.

B. The Entrance Telecommunication Room will have one (1) singlemode fiber cable and one (1) telephone cable home run back to the University’s nearest appropriate service point. The strand and pair counts are to be determined by project engineer in coordination with LSU’s Information Technology representative.

C. All cables installed underground or under slab shall be NEC rated for wet locations. Use gel filled or water blocked type cable construction in conduit for the entire length of the run.

D. General Requirements for Cabling:
   2. Comply with BICSI TDMM, Ch. 5 "Backbone Distribution Systems."
   3. Install 66-style IDC termination hardware unless otherwise indicated.
   4. Terminate all conductors; no cable shall contain non-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
   5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
   6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI TDMM, Ch. 5 "Backbone Distribution Systems." Use lacing bars and distribution spools.

8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

9. Cold-Weather Installation: Bring cable to room temperature before unreeling. Heat lamps shall not be used for heating.

10. In the communications equipment room, install a 10-foot- long service loop on each end of cable.

11. Pulling Cable: Comply with BICSI TDMM, Ch. 5 "Backbone Distribution Systems." Monitor cable pull tensions.

E. Telephone Cable Installation:

1. Comply with TIA/EIA-568-C.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

F. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-C.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

G. 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 installed in a wire way 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.

H. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

I. Group connecting hardware for cables into separate logical fields. See Appendix A Figures 3 & 4.

J. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations 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:
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 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:
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 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.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, Ch. 7 "Firestopping."

3.5 IDENTIFICATION

A. LSU deploys its own labeling scheme. All cabling and terminations shall be labeled as follows:
   1. General infrastructure labeling:
      Permanently label all terminal strips, junction boxes, pull points and conduit runs as per telephone industry standards and these specifications.
      a. Room Numbers: Only room numbers specifically provided and/or approved by the LSU Office of Campus Planning shall be used for labeling; labels utilizing room numbers provided solely by the architect shall not be used.
      b. Equipment racks: Label equipment racks, naming the leftmost unit “Rack 1,” and incrementally increasing the number by 1 as you move to the right.
      c. Patch Panels: Label the patch panels - by row of 24 - in each rack, naming the uppermost unit “1,” and incrementally increasing the number by 1 as you move to the bottom. Note: Do not number the individual patch panels; Do number the individual rows.
d. **Faceplates:** 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.

Faceplate numbers shall be assigned sequentially in a room, starting at the first outlet to the left of the leftmost entrance with “1”, and increasing the count incrementally (by 1) in a clockwise direction around the room.

2. **Equipment room terminations:** All Cables and All termination fields shall be labeled.
   a. **Data outlets:** Each data jack shall be labeled. Labels shall be affixed to the patch panel at a point adjacent to the jack being labeled, and include the official far-end room number – no hyphens - followed by a colon, followed by the number of the faceplate which contains the far-end jack. Example: 1103B:2
   b. **Phone cable terminations:** Phone cable terminations shall be labeled. The 66-block shall be labeled with the official far-end room number – no hyphens – followed by a colon, followed by the number of the faceplate which contains the far-end jack, followed by the jack position on the faceplate. For example, a cable serving Room 1103-B, Faceplate 2, Voice Jack Position A, would be labeled “1103B:2A”.
   c. **Feeder cables:** All cables that feed other communications closets shall be labeled/tagged as to the location of other end of that particular cable. The patch panels or punch downs where that cable is terminated shall also be labeled in the same manner (label cable and termination field).
   d. **Horizontal Distribution Cables:** Each cable entering the equipment room shall be marked with the room number, outlet number and jack position number that represents the location of the other end of the cable.

3. **Documentation (Data Cable Labels Only):** The contractor shall provide the LSU Information Technology Services-networking and Infrastructure with both a printed and a software media copy of a Microsoft Excel, Corel, Quattro-Pro, or Lotus 1-2-3 spreadsheet which documents the installation of data cable labels. The spreadsheet shall contain, at a minimum, information on the labeling on each end of every data cable termination installed in every equipment closet. The format shall be such that each entry for a closet termination shall have in the adjacent column and on the same row, an entry for the work station end of the cable. Label documentation shall be formatted as follows:
   a. For the closet end, the column entries shall contain the Official 3 or 4 character LSU Building Abbreviation followed by a hyphen, followed by the Official closet room number - without any hyphens – followed by the Rack Number and a hyphen, the Patch Panel Row Number and a hyphen, and the Patch Panel Row Position Number. For example, for a jack located in CEBA equipment closet E-
3106-C-1, Rack 1, Patch Panel Row 2, Patch Panel Row Position Number 23, the column entry would read “CEBA-E3106C1-1-2-23”.

b. The documentation for the work station end of that cable would be placed on the same row in the next column, and would be an exact copy of the label installed in the equipment room rack for that cable. An example, from Section 3.5.B.1 (above) would be “1103B:2”.

B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer’s label.

C. Labels shall be preprinted or computer-printed type.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect copper telephone cable and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Telephone Copper Cable Tests:
   a. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
      1) Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
      2) A maximum of 1% defective pairs will be allowed in the Outside Plant Copper Cable. For any number higher than this, the cable shall be replaced or repaired at the splice point.

4. Optical Fiber Cable Tests:
   1. 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, Method A.1, One Reference Jumper. Fibers will be considered acceptable if the OTDR trace for that fiber shows an end to end loss of less than xdB + yy(0.2)dB +
zz(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: 
\[ xx = \text{distance} \times \text{fiber attenuation/unit distance} @ \lambda \] 
In addition, 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. Any additional tests required by the ANSI/TIA/EIA standard shall also be performed and also included in the written test report.

2. The vendor shall test each fiber strand utilizing an OTDR bi-directional 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, 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.

3. If the cable fails to meet the above requirements, it shall be replaced by the contractor at the contractor’s expense.

D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted for a ‘Class 3’ administration system as outlined in the BICSI TDMM, Ch. 10 “Telecommunication Administration”. Data may be transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. End-to-end cabling will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.