

SECTION 271300- COMMUNICATIONS BACKBONE CABLING

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PART 1 - GENERAL

1.1 BACKBONE CABLING DESCRIPTION

- A. The backbone cabling system shall provide IT services to the building and shall provide interconnections between telecommunications rooms, telecommunications terminal spaces, and any cross-connect facilities in the telecommunications cabling system infrastructure within the building. This system consists of servicing cables, main and intermediate cross-connects, and mechanical terminations.

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 Communication Systems."
- D. Section 270528: "Pathways for Communication Systems."
- E. Section 271100: "Communication Equipment Rooms."
- F. Section 271500: "Communications Horizontal Cabling."
- G. Appendix A

1.3 DEFINITIONS AND ACRONYMS

- A. BICSI: A professional association supporting the information technology systems (ITS) industry. www.BICSI.org
- B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- C. EMI: Electromagnetic interference.
- D. Entrance Telecommunications Room (ETR): A space in which the joining of inter and/or Intra building telecommunications backbone facilities takes place. It is the TR where exterior cabling enters the building.
- E. IDC: Insulation displacement connector.
- F. RCDD: Registered Communications Distribution Designer.
- G. Telecommunications Room (TR): A space for housing telecommunications equipment, cable terminations, and cross-connect cabling. A space that joins the backbone and horizontal cabling for a building.
- H. ITS: Information Technology Services
- I. UNI: University Network and Infrastructure

1.4 ADMINISTRATIVE REQUIREMENTS

- A. COORDINATION OF WORK

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1. Coordinate layout and installation of communications backbone cabling with LSU's Information Technology Service (ITS)/University Networking and Infrastructure (UNI) personnel prior to installation.
2. All splices into active service cables shall be coordinated with LSU's ITS/UNI personnel. The project is responsible for the cost of these splices, but it may be determined that LSU will have its own in-house contractor perform the 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 and available on site to discuss any issues as they arise. All qualifications shall be made available for verification by LSU and/or the Architect.

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.

PART 2 - PRODUCTS

2.1 CABLES

A. SINGLEMODE FIBER OPTICAL BACKBONE CABLE

1. 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: Single mode, glass core, glass cladding.
- 5) Core Diameter: 8.0 to 9.0 microns.
- 6) Core/Clad Concentricity Error: ≤ 0.8 micron.
- 7) Cladding Diameter: 125 microns ± 1 micron.
- 8) Cladding Non-circularity: $\leq 1\%$.
- 9) Strand Color Code: Per industry practice.

2. OUTSIDE SINGLEMODE FIBER OPTICAL BACKBONE CABLE

- 1) Cable shall have an overall PVC jacket/sheath. The jacket/sheath shall be abrasion resistant, impervious to light or water.
- 2) The cable may contain but it is not required to have a metal shield. If the cable has a metal shield, it shall encase the cable and the shield shall be continuous throughout the length of the cable.
- 3) The 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.
- 4) Jacket Color: Black
- 5) Cable shall be imprinted with fiber count, fiber type, and aggregate length at regular intervals.
- 6) Fiber count shall be determined by LSU's ITS/UNI personnel.

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- 7) Jacket shall be rated for the environment in which it is installed.
- 8) Use the following products or approved equal:
 - 1) Corning

3. INSIDE SINGLEMODE FIBER OPTICAL BACKBONE CABLE

- 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.
- 6) Jacket shall be rated for the environment in which it is installed. (I.e. plenum, riser, etc.)
- 7) Fiber count shall be determined by LSU's ITS/UNI personnel.
- 8) Use the following products or approved equal:
 - 1) Corning

B. CATV BACKBONE CABLE

1. All CATV backbone cabling will be the responsibility of Cox Communications for design and installation. The project shall provide Cox Communications with adequate pathway.

2.2 CONNECTING HARDWARE

A. OPTICAL FIBER CABLE HARDWARE

1. OPTICAL FIBER HOUSINGS

- 1) Fiber Cross-Connect Housings shall be manufactured to fit in both a 19 inch relay rack.
- 2) 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.
- 3) Choice of which housing will be determined by LSU's ITS/UNI personnel.
- 4) Use the following products or approved equal:
 - 1) Corning
 - 2) EDGE-0XU (Where X represents the number of rack units needed to accommodate the housing.) Note: This product is used for high density TRs.

OR

 - 3) CCH-0XU (Where X represents the number of rack units needed to accommodate the housing.)

2. FIBER HOUSING CASSETTES:

- 1) Fiber cassettes for the Fiber Cross-Connect Housings serve duty as both the fiber splice housing and fiber Housing bulkhead panel.
 - 1) Each cassette is preloaded with LC fiber pigtails and splice tubes required for the number of fiber ports available per the cassette purchased.

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- 2) Use the following products or approved equal:
 - a) Corning (for EDGE Housing)
 - b) EDGE-CS12-AE-P00RE (Will accommodate 12 strands.)
 - c) Corning (for CCH Housing)
 - d) CCH-CS24-AE-P00RE (Will accommodate 24 strands)
 - e) CCH-CS12-A9-P00RE (Will accommodate 12 strands)

B. SPLICING HARDWARE

1. Fiber Optic Cabling

1) Splice Cases

- 1) All splice cases shall be specified for the particular environment in which they will be placed and shall be sized to accommodate the entire strand count of the largest cable entering the splice. All splice cases shall be re-enterable and shall contain all necessary equipment to be installed properly and fully splice the largest cable entering the splice case.
- 2) If the entrance fiber cable (outside rated fiber cable) is the type that has a metal protective armor, that cable is required to be grounded per Section 260526 "Grounding and Bonding for Communication Systems"

2) Fiber Splice Unit

- 1) All fiber splices shall be preformed using fusion splice technology. Cable should be spliced in Fiber Splice Case or fiber housing cassette only.
- 2) Use the following products or approved equal:
 - a) Preform (Model will be determined by LSU ITS/UNI personnel based on strand count)

2.4 IDENTIFICATION PRODUCTS

- A. Shall 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.

NO hand written labels will be accepted.

PART 3 - EXECUTION

3.1 ENTRANCE BACKBONE CABLING

A. GENERAL:

1. All Entrance Telecommunication Rooms (ETRs) will have one (1) single mode fiber cable home run back to the University's nearest appropriate service point. A typical installation will call for a minimum of one (1) 12 strand single mode fiber cable. The project may need to have higher strand and pair counts, in these cases the count will be determined by the project engineer in coordination with LSU's Information Technology representative.
2. In the entrance telecommunications room, allow for a 10-foot- long service loop after the cable has been terminated.

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3. All cables installed underground or under slab shall be NEC rated for wet locations. Use water blocked type cable construction in conduit for the entire length of the run.
4. When installing entrance backbone cable (Outside Rated cable) into a building, NEC code 800.48 requires that no more than 50 feet of cable be installed in a building before it is terminated or transitioned into the appropriate interior rated cable.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
6. All cables shall be routed neatly in the room and follow the rules of routing cabling in the ETR and TRs set forth within the construction specs for setting up a TR(Section 271100: "Communication Equipment Rooms.").
7. When pulling cable always comply with the manufactures recommended methods of pulling and cable tension.

B. ENTRANCE FIBER BACKBONE CABLING

1. If the outside rated fiber cable is a gel type cable then the cable must be terminated with a gel block to prevent the gel from exiting the terminated end of the cable or the outside cable must be transitioned (spliced) into inside rated cable.
2. If the cable has a metal strength member then that metal strength member must be grounded to the Telecommunications Main Grounding Busbar (TMGB) per Section 260526 "Grounding and Bonding for Communications Systems."
3. The entrance fiber cable will be terminated/spliced in a rack mount fiber housing using the proper cassette with LC type connectors.

3.2 INTERIOR BACKBONE CABLING

A. GENERAL

1. All Telecommunication Rooms will have one (1) single mode fiber cable home run back to the Entrance Telecommunications Room. A typical installation will call for one (1) 12 strand single mode fiber cable.
2. All cables installed underground or under slab shall be NEC rated for wet locations. Use water blocked type cable construction in conduit for the entire length of the run.
3. Comply with TIA/EIA-568-B.1.
4. Comply with BICSI TDMM, Ch. 5 "Backbone Distribution Systems."
5. All cables shall be routed neatly in the room and follow the rules of routing cabling in the ETR and TRs set forth within the construction specs for setting up a TR(Section 271100: "Communication Equipment Rooms.").
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
7. In each of the telecommunications room, allow for a 10-foot- long service loop after the cable has been terminated.
8. When pulling cable always comply with the manufactures recommended methods of pulling and cable tension.

B. INTERIOR FIBER BACKBONE CABLING

1. All fiber optic cables shall be terminated in the approved rack mounted housings.
2. The fiber cables shall be terminated in cassette type hardware that utilizes LC type connectors.
3. It is a requirement that the project terminate all strands of the fiber cable, unless specifically called out for in the construction documents.

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3.3 TERMINATIONS

A. ENTRANCE TELECOMMUNICATIONS ROOM

1. The Fiber Termination Cassettes will be arranged in the Housing such that the service fiber cable to the building will be positioned to the far left in the fiber housing.
2. Immediately following the building service cable, the interior riser backbone cables will be arranged in sequential order based on the room number of the building TRs.
3. Immediately following the interior riser backbone cables, the Horizontal fiber cables will be arranged in sequential order based on the room number of where they serve.
4. With the exception of the horizontal fiber cables, there shall only be one cable terminated in a cassette. Note: one cable may require multiple cassettes.

B. TELECOMMUNICATIONS ROOM

1. The interior riser backbone cable that services this TR from the ETR will be arranged such that the service fiber cable will be positioned to the far left in the fiber housing.
2. Note: No "horizontal" fiber shall be terminated in this TR's fiber housing. All Horizontal fiber cabling shall be terminated in the ETR.

3.4 FIELD QUALITY CONTROL

1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
2. End-to-end cabling will be considered defective if it does not pass tests and inspections.
3. Where cabling is considered defective, that cabling is to be repaired or removed and replaced.

B. VISUAL INSPECTION:

1. Visually inspect the optical fiber jacket materials for NRTL certification markings to make sure that the cables are rated for the environment in which they are installed.
2. 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.
3. Visually inspect cable placement, cable termination, equipment and patch cords, and labeling of all components.

C. TESTING

1. Optical Fiber Cable Tests:

- 1) All single mode 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, Two Reference Jumpers required. Fibers will be considered acceptable if the OTDR trace for that fiber shows an end to end loss of less than the following equation:

$$xx\text{dB} + yy(0.2)\text{dB} + zz(0.5)\text{dB}$$

(Where xx is the maximum advertised attenuation by the manufacturer of the cable for the length of the fiber installed, yy is the number of splices, and zz is the number of connector pairs).

- 2) 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.
- 3) The contractor shall test each fiber strand utilizing an OTDR and perform a bi-directional test at the wavelengths specified above.

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- 4) 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. Electronic copies (.pdf) or hard-copy results for each fiber strand shall be submitted as part of "As-Built" documentation.

D. IDENTIFICATION STANDARDS

1. During construction all Backbone Cables (service and riser) shall be labeled/tagged as to the location of other end of that particular cable. The label shall be wrapped or flagged on the jacket of the cable at its first visible location as close to its termination as possible.
2. NO hand written labels will be acceptable. Labels shall be preprinted or computer-printed type.
3. FIBER OPTIC HOUSING LABELS:
 - 1) LSU deploys its own labeling scheme to track fiber optic cables and strands.
 - 2) These unique identifiers will be adhered to the front door of the Fiber Housing that the cable is terminated in.
 - 3) 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 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 other end of that cable.
 - 4) How to develop the Unique Identifier for the horizontal fiber cables:

□□□—□□□□—□□□: 1-12
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-3:1-12

- 5) The location label will look like this:

LOC: BLDG Room# xxx

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END OF SECTION 271300