

SECTION 27 08 00

COMMISSIONING COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General Provisions and Specification Sections, apply to this and the other sections of Division 27.
- B. This section relates to the Structured Cabling Sections of this specification.

1.02 SUMMARY

- A. This Section includes general administrative and procedural requirements for the structured cabling system and campus inter-building distribution systems. It includes terminations and testing parameters. Reference individual sections for further expansion of these requirements.
- B. Codes: The cabling system installation shall comply fully with all local, county and state laws, ordinances and regulations applicable to electronic and electrical installations.
- C. The following industry standards are the basis for the structured cabling system described in this document.
 - 1. TIA-568-D Commercial Building Telecommunications Cabling Standard & Relevant addenda
 - 2. TIA-568-D.1 General Requirements
 - 3. TIA-568-D.2 Balanced Twisted Pair Cabling Components Standard
 - 4. TIA-568-D.3 Optical Fiber Cabling Components Standard
 - 5. TIA-569-D Commercial Building Standard for Telecom Pathways and Spaces
 - 6. TIA-606-B Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - 7. TIA-607-C Commercial Building Grounding/Bonding Requirements
 - 8. NEC National Electrical Code
 - 9. NFPA 70 National Fire Protection Association (NEC)
 - 10. ISO 11801 Generic Cabling for Customer Premises
 - 11. ISO/IEC International Organization for Standards / International Electrotechnical Commission
- D. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.
- E. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project.

PART 2 PRODUCTS

2.01 QUALITY ASSURANCE PARAMETERS

- A. All work shall be performed in accordance with these guidelines, current industry testing standards, and with the test equipment manufacturer recommendations. All work shall be in accordance with the general principles outlined in the BICSI TDMM manual, latest edition. The system shall be Panduit/Belden certified through the Panduit Warranty Authorization System.
- B. All equipment or apparatus of any one system must be the product of one manufacturer or approved equivalent products of a number of manufacturer's that are suitable for use in a unified system.
- C. All materials and equipment for which Underwriter's Laboratories have established standards shall bear a UL label of approval.
- D. Where proprietary names are used, whether or not followed by the words "or as approved", they shall be subject to substitution only as approved by the Owner and Technology Consultant.
- E. Where the Contractor proposes substitute equipment, contractor shall submit acceptable evidence to indicate compliance with all requirements of the documents, including performance rating, size and resistance to wear and deterioration equivalent to the specified item. In instances where substituted equipment requires additional material or work beyond that shown or required by the specified item, said additional material or work shall be the responsibility of this Contractor, regardless of the trade involved.
- F. Furnish (1) new Fluke DSX2-8000-NW Cable Analyzer, including Versiv Mainframe and Remote, LinkWare PC Software, CAT 6A/Class EA Permanent Link Adaptors (2), CAT 6A/Class EA Channel Adapters (2), Headset for Talk (2), Handstrap (2), Shoulder Strap (2), AC Chargers (2), carrying case, USB interface cable (Mini-B), Universal Couplers (2), Versiv Open Source Software CD, user manuals, and Statement of Calibration. This tester shall be used during testing of this project. Included features shall include the ability to integrate with labeling and cable management software, which yields downloadable 606-B cable IDs, ensuring data accuracy. This tester shall be turned over to Owner at project completion along with all tester product documentation and testing accessories. All modules are to be replaced after 5,000 insertions. Provide usage numbers for all modules being turned-over to the Owner. Items being turned-over to the Owner shall have utilization numbers of 3,500 or less; any items exceeding this amount must be replaced with new modules.

PART 3 EXECUTION

3.01 UTP CABLE TESTING

- A. Riser and campus distribution cable testing: Each cable pair within all UTP riser cables shall be tested for continuity to ensure conductors are terminated in proper sequence, with correct polarity (tip and ring), and without conductor-to-conductor shorts, conductor-to-ground shorts, or opens.
- B. Horizontal cable testing: All UTP station cables shall be tested to prove compliance with the current industry standard, TIA-568-D.2-1 Part 2: Balanced Twisted Pair Cabling

Components, Addendum – Transmission Performance Specifications for 4-pair 100 Ω Category 6A Cabling and any subsequent addenda. Permanent Link tests are the only acceptable test format for testing Category 6 cabling or Channel tests are the only acceptable test format for testing Category 6A cabling.

- C. Horizontal cable testing equipment: The testing of UTP station cables shall be performed using the recommended test equipment specifically designed to test cables for all parameters from 0 – 500 MHz. Testers shall be loaded with the most recent test values per the above referenced standard. The contractor will be required to provide current calibration and firmware release for the test equipment to be used.
- D. The field test equipment shall meet the requirements of ANSI/TIA-568-D including applicable Technical Service Bulletins and amendments. The appropriate level III tester shall be used to verify Category 6A cabling systems.

3.02 FIBER OPTIC CABLE TESTING

A. Inter-building cable testing requirements:

- 1. Bi-directional direction.
 - a. Test multi-mode strands at 850 nm and 1300 nm.
 - b. Test single-mode strands at 1310 nm and 1550 nm.
 - c. Use optical time domain reflectometer (OTDR) and power meter for tests.
 - d. Record the following at the above frequencies:
 - e. Signature trace
 - f. Length
 - g. Polarity
 - h. End to end attenuation
- 2. Fiber optic cables: Test results for fiber optic cables shall consist of the measured attenuation, the maximum attenuation allowed per these guidelines, and whether the test passed or failed for each fiber optic cable link.
- 3. Provide test report and include as a minimum the following information for all cables:
 - a. Fiber cable number
 - b. Fiber length.
 - c. Attenuation (loss in dB)
 - d. Test date
 - e. Tester make and model number
 - f. Tester calibration date
- 4. The maximum optical attenuation per connector pair for multimode fiber connectors shall be 0.3 dB or less when measured at 850/1300 nm in accordance with ANSI/EIA/TIA-526-14A, Method A-1. Maximum optical attenuation per connector pair for singlemode fiber connectors shall be .05 dB or less when measured at 1310/1550 nm in accordance with ANSI/EIA/TIA-526-7, Method B. Reflection shall be ≥ 45 dB.
- 5. Fluke Linkware format on CD or approved format.

3.03 TEST RESULTS

- A. Prior to acceptance, the contractor shall submit a copy of all applicable test results to the Owner/Technology Consultant in both electronic (file) and paper form.
- B. Category 6A UTP cables: The test results submitted for Category 6A UTP cables shall be recorded by Fluke Linkware or approved format on CD and include the following:

1. Graphical/numerical data. Both graphical data plots and numerical data are required for the following test parameters:
 - a. NEXT
 - b. PS NEXT
 - c. ELFEXT
 - d. PS ELFEXT
 - e. Attenuation
 - f. Return loss
 2. Numerical data. Numerical data only is required for the following test parameters:
 - a. Propagation delay
 - b. Delay skew
 - c. Resistance
 3. The Category 6A Horizontal Cable Certification reports shall have complete testing of Permanent Link at frequency increments up to 500 MHz as indicated in TIA-568-D and shall include the following:
 - a. Cable/Faceplate Number - matching faceplate numbers on patch panels
 - b. Test Date
 - c. Cable Length
 - d. Wire-Map
 - e. Network Tests for 100BASE-TX and 1000BASE-T
 - f. Attenuation
 - g. Near End Crosstalk (NEXT)
 - h. Power-sum NEXT (PS-NEXT)
 - i. Attenuation to Cross Talk Ratio (ACR)
 - j. Power-sum Attenuation to Crosstalk Ratio (PS-ACR)
 - k. Equal Level Far End Crosstalk (ELFEXT)
 - l. Power-sum Equal Level Far End Crosstalk (PS-ELFEXT)
 - m. Return Loss
 - n. Propagation Delay
 - o. Delay Skew
 - p. Signal to Noise Ratio
 4. Testing of horizontal cabling shall not be performed on test equipment with marginal pass/fail notification disabled. If the tester is capable of indicating tests that pass with a measured value closer to the limit than the guaranteed accuracy of the tester, the test result shall be marked (typically as Pass* or Fail*).
 5. Marginal pass results will not be accepted. Contractor shall correct issue and retest at no expense to the owner.
- C. UTP riser cables: Continuity and Wire Mapping tests shall be performed on each pair. The contractor shall submit a document detailing termination errors, open, short, split pairs, and confirming that these trouble cable pairs were corrected and tested satisfactorily per these guidelines.

3.04 SYSTEM DOCUMENTATION

- A. When all work has been completed and before final acceptance, the Contractor shall furnish to the Technology Consultant a complete set of documents that clearly represent all contract work “as-built”. This shall be inclusive of all test results and drawings. The Contractor is responsible for assuring the accuracy of the As-Built documentation.

- B. The contractor shall submit, within forty (40) working days of the completion of each phase, three (3) full sets of As-Built documentation to the Technology Consultant for approval. Prior to delivery, each document section and each drawing shall be signed and dated by the Contractor's project manager attesting to the accuracy of the as-built documents.
- C. Electronic drawing files must conform to project drawing standards and be nominally in the AutoCAD 2000 format with 2006 preferred. The As-Built drawings shall include at minimum, equipment locations, cable routes and outlet locations, and clearly show any deviations from the Contract Documents.
- D. The contractor shall provide, in the BDF, a full-size laminated or similarly framed copy of the drawing which clearly provides an "in-room" roadmap of the voice/data drops that are served from within that space respectively. The final product shall be coordinated with the IT department staff so as to follow Owner standards.
- E. Note -The Technology Consultant is under no obligation to provide the Contractor with digital drawing files. However, digital drawing files may be provided to the Contractor for use in the development of Shop Drawings or As-Built drawings under a separate agreement between the Contractor and the Architect.
- F. Test printouts and electronic documentation (CD's) generated for each cable by the wire (or fiber) shall be submitted as part of the documentation package. The CD's shall contain the electronic equivalent of the test results and be in and be of a format readable from Microsoft Word or Excel.
- G. The As-Built drawings shall include outlet locations. Their sequential number, as defined elsewhere in this document, shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. These documents shall be modified accordingly by the contractor to denote as-built information as defined above and returned to the Technology Consultant.
- H. The Technology Consultant may request that a 5% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Architect or Technology Consultant, including a 100% re-test. This re-test shall be at no additional cost to the Owner.
- I. Test Results documentation shall be clearly marked on the outside front cover with the words "Project Test Documentation", "LSU Medical SIM Building" and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, and reference setup. The test equipment name, manufacturer, model number, serial number, software version and calibration date shall also be provided at the end of the document. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
- J. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

END OF SECTION