

~~~~~ **PROJECT NOTE** ~~~~~

ARCHITECT OF RECORD/ENGINEER OF RECORD IS RESPONSIBLE FOR REVIEWING THIS SPECIFICATION SECTION IN DETAIL FOR COORDINATION WITH THE PROJECT SCOPE OF WORK.

ALL "PROJECT NOTE" TEXT IS TO BE REMOVED FOLLOWING REVIEW OF THE CONTENT OF EACH NOTE BY THE ARCHITECT OF RECORD/ENGINEER OF RECORD.

EDIT THE DOCUMENT FOOTER TO INCLUDE THE PROJECT NAME AND NUMBER.

EDIT THE DOCUMENT HEADER TO INDICATE THE ARCHITECT OF RECORD PROJECT ISSUE" DATE. THE "CPS CONTROL" DATE SHOULD NOT BE EDITED.

ANY MODIFICATIONS TO THE TECHNICAL STANDARDS IN THIS SECTION - INCLUDING THE REMOVAL OR ADDITION OF MANUFACTURERS - MUST BE APPROVED BY CPS. REQUESTS FOR MODIFICATION ARE TO BE SUBMITTED TO THE DESIGN MANAGER DURING THE DESIGN PHASE FOR REVIEW AND APPROVAL.

~~~ **END OF PROJECT NOTE** ~~~

SECTION 27 08 00
COMMISSIONING OF COMMUNICATIONS

~~~~~ **PROJECT NOTE** ~~~~~

UTILIZE THE TERM "IDF" ONLY FOR PROJECTS FEATURING A SEPARATE IDF ROOM.

~~~ **END OF PROJECT NOTE** ~~~

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Section defines the tests and checks that shall be made on all communications hardware and wiring to ensure compliance with the requirements of the Contract Documents.
- B. Commissioning of communications.
 - 1. Performance tests for UTP and fiber optic structured cabling.
 - 2. Preparation of test and inspection reports.

1.02 DEFINITIONS

- A. Refer to Section 27 05 03 - Communications General Requirements for definitions.

1.03 REFERENCE STANDARDS

- A. City of Chicago Building Code - Chicago Construction Codes, Title 14B; Current Edition.
- B. Chicago Electrical Code - Municipal Code of the City of Chicago, Building/Electrical Code Requirements; 2018.
- C. NECA/BICSI 568 - Standard for Installing Commercial Building Telecommunications Cabling; 2006.
- D. TIA/EIA-568 - Commercial Building Telecommunications Cabling Standard. (consists of 3 Parts, listed below); Rev C, 2012, and latest addenda.
- E. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 Edition 2: Fibre-Optic Communications Subsystem Test Procedures

| | | |
|----------------------------------|--------------|------------------------------------|
| NAME OF SCHOOL
PROJECT NUMBER | 27 08 00 - 1 | COMMISSIONING OF
COMMUNICATIONS |
|----------------------------------|--------------|------------------------------------|

– Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement; 2015a (Reaffirmed 2022).

- F. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; IEC 61280-4.1 Edition 3.1, Fiber Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant- Multimode Attenuation Measurement; 2023d.
- G. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2024.
- H. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2009, with Addendum (2016).
- I. TIA-568-C.3 - Optical Fiber Cabling Components Standard; 2016.
- J. TIA-569-D - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).
- K. TIA-606-B - Administration Standard for Telecommunications Infrastructure; Rev B, 2012 (with Addenda; 2015).
- L. TIA-607-C - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015c, with Addendum (2017).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
 - 2. Coordinate activities and cooperate with others on the Project to ensure that communications systems are installed and fully tested in a timely basis to permit installation of Board Authorized Representation's installed communications equipment and connections.
 - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Notify Architect/Engineer of Record of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
 - 5. Conduct tests and present test results to the Architect/Engineer of Record, the Construction Manager, and the CPS Office of Information & Technology Services (ITS).
 - 6. Final payment will not be issued until complete testing and compliant test results of all equipment, cabling, and connectivity is determined and submitted.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each type of product.
- C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
 - 1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by the Board.
 - 2. Cabling administration drawings and printouts.
 - 3. Wiring diagrams to show typical wiring schematics, including the following:
 - a. Cross-connects.
 - b. Patch panels.
 - c. Patch cords.
 - 4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
- D. Evidence of qualifications for installer.
- E. Field Test Reports.

| | | |
|----------------------------------|--------------|------------------------------------|
| NAME OF SCHOOL
PROJECT NUMBER | 27 08 00 - 2 | COMMISSIONING OF
COMMUNICATIONS |
|----------------------------------|--------------|------------------------------------|

- F. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
 - 1. Record actual locations of outlet boxes and distribution frames.
 - 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
 - 3. Identify distribution frames and equipment rooms by room number on contract drawings.
- G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Comply with requirements of Section 27 05 03 - Communications General Requirements for installer qualifications as noted in "Quality Assurance" Article.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in ANSI/IEEE 802.7, by a qualified testing agency, and marked for intended location and application.
- C. Comply with City of Chicago Building Code.
- D. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- E. Grounding: Comply with TIA-607-C.

1.07 WARRANTY

- A. Comply with requirements of Section 27 05 03 - Communications General Requirements for system warranty and application assurance.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

~~~~~ **PROJECT NOTE** ~~~~~

EDIT PARAGRAPHS BELOW TO INCLUDE IDFS IF APPROPRIATE

~~~ **END OF PROJECT NOTE** ~~~~

3.01 PHOTOGRAPHS

- A. Provide photographs of the completed MDF, **[or IDF(s),]** and concentrator enclosures with all active and passive components installed, including the typewritten directories of the concentrator enclosures and the MDF **[or IDF(s)]**.
 - 1. Each photograph shall each be imprinted with a Date/Time stamp.
 - 2. Photographs shall be minimum 3.5" x 5" in size.
- B. Photographs shall be included with documents at the concentrator enclosure locations and also in a full three ring binder located in the MDF **[or IDF(s) respectively]** for future reference

3.02 FIELD QUALITY CONTROL

- A. Comply with inspection and testing requirements of specified installation standards.
- B. Visual Inspection:
 - 1. Visually inspect UTP and optical fiber cable 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.
 - 2. Visually confirm Category 6 marking of outlets, outlet/connectors, and patch panels for horizontal UTP cabling for Data/Wireless, Kronos and MMTV applications.
 - 3. Visually confirm Category 5e marking of outlets, outlet/connectors, termination blocks and patch panels for horizontal UTP cabling voice and 25-pair Category 5e backbone applications.
 - 4. Visually confirm Category 3 marking of copper backbone UTP cables for indoor voice backbone applications.

5. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
6. Inspect cable terminations for color coded labels of proper type.
- C. Copper UTP Cable Tests:
 1. Copper UTP Test Instruments:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568. 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 permanent link test configuration.
 - b. For horizontal UTP cable certification tests, use a Level III tester.
 2. Copper Backbone UTP Cable Tests:
 - a. Test copper backbone UTP cabling for DC loop resistance, shorts, opens, intermittent faults, polarity between conductors, and for insertion loss (attenuation). Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 3. UTP Performance Tests:
 - a. Test permanent link for each outlet. Perform the following tests according to TIA/EIA-568:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.
 - 9) Propagation delay.
 - 10) Delay skew.
 - b. Testing for Category 6 horizontal UTP must additionally report values for attenuation-to-crosstalk ratio (ACR), and power sum attenuation-to-crosstalk ratio (PSACR).
 - c. A star ("*") passing shall not be considered acceptable.
- D. Optical Fiber Cable Tests:
 1. Optical Fiber Test Instruments:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 2. Optical Time Domain Reflectometry Tests: After terminating optical fiber cables, one individual fiber from each backbone cable installed shall be tested using an optical time domain reflectometer (OTDR). Perform OTDR testing in accordance with manufacturer's recommended test procedures. Test to determine the installed length, continuity, and OTDR-based attenuation measurement. Provide test report identifying backbone cable identification and indicating corresponding values from tests.
 3. Link End-to-End Attenuation Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568.
 - a. Multimode backbone link measurements: Test at 850 or 1300 nm in both directions according to TIA-526-14-A, Method B, One Reference Jumper.

- b. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568.
 - c. These readings must not be higher than the "Optimal Attenuation Loss (OAL)". The OAL will be calculated using the manufacturer's factory certified test results, (db/km) adjusted for the actual installed lengths (dBs) plus the manufacturer's best published attenuation losses for the connector on this project and/or splice installed on this project (0.25dB for Connectors and 0.10dB for splices).
 - d. Link End-to-End Attenuation Test reports shall include:
 - 1) Cable identification and Strand numbers.
 - 2) The OAL value for each link.
 - 3) The theoretical maximum attenuation value, per TIA/EIA-568, for each link.
 - 4) Tested values for attenuation.
 - E. Coaxial Cable Tests: Conduct tests according to Section 27 51 00 - Distributed Audio-Video Communications Systems.
 - F. HDMI Cable Test - Conduct approved cable tests on all HDMI cables and provide written results to Board. All HDMI cables should meet or exceed industry standards for HDMI cable performance (based on the HDMI Specification Version the specified installed cable is rated to). At a minimum the report shall contain picture confirmation of connectivity between all endpoints of the HDMI or CAT6A/HDMI locations.
 - G. Document data for each measurement. Data for submittals shall be transferred from the instrument to the computer, saved as CSV files to a CD, DVD, or portable drive and submitted.
 - H. End-to-end cabling will be considered defective if it does not pass tests and inspections. Correct failures and retest to demonstrate compliance; otherwise, remove and replace with new components and retest to demonstration compliance with requirements.
 - I. Prepare test and inspection reports.
- 3.03 FIRESTOPPING
- A. Inspect and verify all fire stopped locations comply with:
 - 1. Requirements in Section 07 84 00 - Firestopping.
 - 2. Comply with TIA-569-D, Annex A, "Firestopping."
 - 3. Comply with BICSI TDMM, "Firestopping Systems" Article.
 - B. Correct any deficiencies.
- 3.04 GROUNDING
- A. Inspect and verify all grounding and bonding has been installing according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter, and complies with TIA-607-C.
 - B. Verify all floor-mounted racks, overhead ladder rack and concentrator enclosures are bonded to communications bus bar.
- 3.05 IDENTIFICATION
- A. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
 - B. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for MDF, [IDFs,] concentrator enclosures, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Furnish electronic record of all drawings, in software and format selected by the Board.
- 3.06 DEMONSTRATION

- A. Train Board designated maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets. Schedule training with at least seven days' notice.

3.07 CLEANING

- A. Comply with requirements of Section 27 05 03 - Communications General Requirements for cleaning.

END OF SECTION

| | | |
|----------------------------------|--------------|------------------------------------|
| NAME OF SCHOOL
PROJECT NUMBER | 27 08 00 - 6 | COMMISSIONING OF
COMMUNICATIONS |
|----------------------------------|--------------|------------------------------------|