

ADDENDUM No. 2
Request for Proposals (RFP)
20RFP003 Notification and Scheduling System

July 17, 2019

Received by bidder:

Date: _____

Name: _____

Signature: _____

Item 1: Question and Answer

Question: Appendix B ask that we ‘Review AISD Standard Documents Including Section 271300 Communications Cable Plant...’. This specification section has not been provided, do we expect this to be released at some point? Will there be any new cabling required for this project?

Answer: Section 271300 has been attached to this addendum.

**COMMUNICATIONS CABLE PLANT
SECTION 271300**

PART 1 GENERAL

1.1 PURPOSE

- A. This section identifies the Communications Cable Plant technical design and specifications requirements for AISD Network Support Services located in Austin, Texas ("Owner").
- B. Responsible Parties
 - 1. Owner (AISD Network Support Services) will have the final approval for Attachment A, any changes in the project scope, and approval of the final installation.
 - 2. Contractor is responsible for the complete Bill of Materials (BOM), installation of the solution, and warranty.
 - 3. Technology Consultant:
 - a. The Technology Consultant will be responsible for coordinating needs assessments, technology design requirements, equipment requirements, and network designs between AISD Construction Management, AISD Network Systems and Support, Technology Vendors, Architects, and General Contractors.
 - b. The Technology Consultant will coordinate with the AISD Network Support Services department and the Contractor to validate all aspects of the Data Communications design and installation.

1.2 AISD RELATED SPECIFICATIONS

- A. Section 272100 Data Communications Network System
- B. Section 273123 VoIP System
- C. Section 275100 PA and Bell Clock
- D. Section 274100 Audio-Visual Systems
- E. Section 275300 IP Clock
- F. Section 280000 Electronic Security
- G. NSS-4 WAN General Naming and Numbering Convention
- H. AISD Guidelines for Completing LAN Install
- I. AISD New Building Installation Checklist
- J. NSS-2 Campus Upgrade Process
- K. NSS-3 General Rack Layout and Design Guidelines
- L. NSS-8 Installation Guidelines for Vendors
- M. NSS-5 Network Labeling Standard v3

- N. Design Standards of the Project Development Manual for GAATN requirements
- O. AISD Network Infrastructure Upgrade
- P. AISD Approved Master Equipment List
- Q. Schematic of Campus Physical Links and Cabling

1.3 CODES, STANDARDS, AND REGULATIONS

- A. American National Standards Institute/Telecommunications Industry Association (ANSI/TIA)
 - 1. ANSI/TIA-568-C.0 "Generic Telecommunications Cabling for Customer Premises".
 - 2. ANSI/TIA-568-C.1 "Commercial Building Telecommunications Cabling Standard".
 - 3. ANSI/TIA-568-C.2 "Balanced Twisted-Pair Telecommunication Cabling and Components Standard".
 - 4. ANSI/TIA-568-C.3 "Optical Fiber Cabling Components Standard".
 - 5. ANSI/TIA-568-C.4 "Broadband Coaxial Cabling and Components Standard".
 - 6. ANSI/TIA-569-C "Telecommunications Pathways and Spaces".
 - 7. ANSI/TIA-606-B "Administration Standard for Commercial Telecommunications Infrastructure".
 - 8. ANSI/TIA-607-B "Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications".
 - 9. ANSI/TIA-758-B "Customer-Owned Outside Plant Telecommunications Infrastructure Standard".
 - 10. ANSI/TIA-862-A "Building Automation Systems Cabling Standard".
- B. Building Industry Consulting Service International (BICSI).
 - 1. BICSI Outside Plant Design Reference Manual.
 - 2. BICSI Telecommunications Distribution Methods Manual (TDMM).
- C. Local, county, state and federal regulations and codes in effect as of the date of the installation.
- D. Equipment of foreign manufacture must meet U.S. codes and standards.

1.4 ASBESTOS / SILICA DUST

- A. The work under this specification may involve the disturbance, removal, handling, or transportation of Asbestos Containing Materials (ACB) including Silica.
- B. The Contractor shall be responsible for reviewing all specifications, drawings, hazardous materials reports or other information to determine the impact of the construction activities on designated or suspect containing hazardous materials.
- C. Should the Contractor suspect, encounter, or have knowledge of any hazards not listed or described in the contract documents, the Contractor shall be responsible for informing AISD Project Management and the General Contractor immediately and prior to the disturbance or any action which could result in the release of any suspected or confirmed hazardous materials.

- D. Contractor is advised that the locations of all hazardous materials may not be clearly known and that he shall proceed with caution in all phases of the work.

PART 2 PRODUCTS

2.1 SCOPE

- A. The following sections specifically list the acceptable equipment types and items for this project. Proposed equivalent items must meet or exceed these specifications and the specifications of the listed item.
- B. In the event a specified manufacturer's part number has changed or is no longer valid, from Attachment A, the Contractor shall obtain Owner's approval prior to substituting alternative equipment or materials.
- C. Owner will have the final determination of the acceptability of all proposed equipment and must approve submitted equipment prior to installation. Where quantities are not noted, they may be obtained from the Technology Consultant. In the event of a discrepancy between the specifications and the drawings, the greater quantity or higher quality shall prevail and be used as the basis of pricing. A subsequent Request for Information shall be submitted by the Contractor to the Technology Consultant for resolution.
- D. Any Owner-furnished materials or equipment not installed in the project shall be returned to the Owner. Contractor shall store all materials and equipment in accordance with manufacturers' instructions in a weather-tight, secure enclosure. Contractor shall be responsible for safety and security of all Owner-furnished materials until the project is complete and accepted by Owner.
- E. All equipment and materials, unless otherwise specified, shall be new, free from any defects, and of the best quality of their respective kinds. All like materials used shall be of the same manufacturer, model, and quality unless otherwise specified.

2.2 FIBER OPTIC CABLE AND COMPONENTS

- A. General Fiber Requirements
 - 1. Fiber shall be certified to meet all parts of TIA-455 and comply with TIA-492, ANSI/ICEA S-83-596, ANSI/ICEA S-83-640 and the NEC.
 - 2. All fiber optic cable submitted for consideration must meet ANSI/TIA-568-C.3 standard for all new cabling.
 - 3. All cable must be suitable for the environment that it is installed in.
 - 4. All fiber must be armored rated.
 - 5. All fiber optic cable will be terminated per ANSI/TIA-598.
- B. 50 Micron OM4 Multi Mode Fiber
 - 1. All fiber optic cable submitted for consideration must be OM4 rated 50 microns with 12 strands and meet ANSI/TIA- 568-C.3 standard for all new cabling.
 - 2. All cable must be suitable for the environment that it is installed in and be armored rated.
 - 3. All fiber optic cable will be terminated per ANSI/TIA-598.
 - 4. Fibers shall have dual wavelength capability; transmitting at 850 and 1300 nm ranges.

5. 50/125 $\mu\text{m} \pm 2.5 \mu\text{m}$ core (OM4)
 6. Maximum Attenuation: 3.5 dB/km at 850 nm and 1.5 dB/km at 1300 nm
 7. Minimum Bandwidth: 2000 MHz per km with laser launch at 850 nm ensured by differential mode delay at 850 nm" in TIA-492AAAC and 500 MHz at 1300 nm. Additional component and transmission requirements for a 50/125 μm fiber cable capable of supporting 10 Gb/s serial transmission up to 984'-0" (300M) using 850 nm nominal wavelength lasers. These cables are suitable for use in accordance with ANSI/TIA-568-B.1
- C. 9/125 μm Single Mode Fiber
1. All fiber optic cable submitted for consideration must be OS2 rated with a minimum of 12 strands and must meet ANSI/TIA-568-C.3 standard for all new cabling.
 2. All cable must be suitable for the environment that it is installed in.
 3. All fiber optic cable will be terminated per ANSI/TIA-598.
 4. Fibers shall have dual wavelength capability, transmitting at 1310 and 1550 nm ranges.
 5. Maximum Attenuation: 1.0 dB/km at 1310 and 1550 nm (inside premises) and 0.5 dB/km at 1310 and 1550 nm (OSP)
 6. Minimum Bandwidth: 20 GHz
- D. Outside Plant Fiber Cable
1. The mechanical and environmental specifications for OSP fiber cable shall be in accordance with ANSI/ICEA S-87-640.
 2. OSP fiber cables shall be of a water-block construction and meet the requirements for compound flow and water penetration as established by ANSI/ICEA S-87-640.
 3. Outdoor cable shall have a minimum pull strength of 2670 N (600 lbs.).
- E. Fiber Optic Patch Cords - Single Mode
1. Single Mode Patch Cables shall be a stepped-index 8.3 μm core with a 125 μm cladding.
 2. The Single Mode Connector (visible portion) and adapter/outlet shall be identified by a blue color ferrule.
 3. Return Loss: -50 dB maximum
 4. Mated Connector Loss: $\mu = 0.35 \text{ dB}$, $\sigma = 0.2 \text{ dB}$
 5. Connection Repeatability: 0.20 dB maximum changes per 200 reconnects.
 6. Made and warranted by the manufacturer of the cabling system installed in this project and shall meet or exceed patch cord specifications as outlined in TIA standards.
 7. Patch cords shall be in original packaging when presented to the Owner.
 8. Aramid yarn and a jacket of flame-retardant PVC shall cover the fiber cladding.
- F. Fiber Optic Patch Cords - Multi Mode
1. Multi Mode patch cables shall be a buffered, graded-index fiber with a 50 μm core and a 125-micron cladding
 2. The Multi Mode connector (visible portion) and adapter/outlet shall be identified by the color beige.
 3. Mated Connector Loss: $\mu = 0.3 \text{ dB}$, $\sigma = 0.2 \text{ dB}$

4. Connection Repeatability: 0.20 dB maximum changes per 100 reconnects
5. Made and warranted by the manufacturer of the cabling system installed in this project and shall meet or exceed patch cord specifications as outlined in the TIA standards.
6. Patch cords shall be in original packaging when presented to the Owner.
7. Aramid yarn and a jacket of flame-retardant PVC shall cover the fiber cladding.

G. Fiber Termination Shelf

1. Modular in design and used in fiber interconnection, cross-connection, and splicing applications
2. 1'-7" (19") rack-mountable
3. 2 Rack Unit (RU) design
4. Splicing should include all associated enclosures and accessories.

H. Fiber splice modules shall be utilized for all OSP cable terminations.

1. The link shall consist of:
 - a. Fiber cable
 - b. Splice
 - c. Splice tray holder/closure
 - d. Fiber panel/coupler
 - e. Pre-manufactured fiber pigtail with pre-polished fiber connector
 - f. Fiber jumper to connect the pigtail-coupled link to the appropriate electronic switch

I. Fiber Fusion Splice

1. Fusion splices shall be mounted in protective trays within the enclosure.
2. Fusion splices shall not exceed a maximum optical attenuation of 0.3 dB when measured in accordance with ANSI/TIA-455-34, Method A (factory testing) or ANSI/TIA-455-59 (field testing).
3. Fiber splices shall have a minimum return loss of 20 dB for Multi Mode.
4. Fiber splices shall have a minimum return loss of 26 dB for Single Mode.

2.3 COPPER CABLING AND COMPONENTS

A. Copper Cable

1. Electric White Colored Jacket unless otherwise noted.
2. Blue Colored jacket for Voice.
3. Plenum-rated cabling
 - a. Cable installed in plenums or air-handling spaces shall meet UL 910 and shall be marked CMP (communications multipurpose plenum) in accordance with the NEC.
 - b. Plenum cable shall consist of #24-AWG solid copper conductors insulated with color-coded FEP.

4. ASP-filled multi-pair copper cables shall be utilized for underground conduit or direct buried applications.
5. Per the National Electric Code (NEC), all OSP cabling shall transition to inside cable within 50'-0" of building entry or within 50'-0" of exiting a conduit body. The metallic portion of the cables, if present, must be bonded to the building ground upon entry.
6. The bending radius and pulling strength requirements of all backbone cables shall be observed during handling and installation.

B. Copper

1. Copper patch cords, verify exact quantities and lengths with Owner prior to purchase
2. Category 5e, Stranded UTP cable Meets FCC Part 68.
 - a. Only to be used in remodel construction projects.
 - b. Standard modular non-keyed, 8-position 8-conductor plug
 - c. 94V-0 rated
 - d. UL listed
 - e. Supports Gigabit Ethernet.
 - f. Plenum rated
 - g. No less than 19.0 dB signal loss@ 100 MHz
 - h. TIA-568-C category 5e rating printed on the jacket.
 - i. Meets the requirements of ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard.
 - j. Will consist #23 AWG copper wiring, stranded conductors, tightly twisted into individual pairs.
3. Category 6, stranded UTP cable meets FCC Part 68
 - a. Use for new construction projects.
 - b. Standard modular non-keyed, 8-position 8-conductor plug.
 - c. 94V-0 rated.
 - d. UL listed.
 - e. Supports Gigabit Ethernet.
 - f. Plenum rated.
 - g. No less than 15.6 dB of signal loss at 250 MHz.
 - h. TIA-568-C category 6 rating printed on the jacket.
 - i. Meets the requirements of ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard.
 - j. Will consist #23 AWG copper wiring, stranded conductors, tightly twisted into individual pairs.
4. Coordinate with the Owner on the active equipment layout prior to the purchase to ensure the correct sizing of the patch cords from the patch panels to the switching equipment.
5. Provide a 10'-0" Station Cord for each work area outlet port.

6. Place each size/length patch cord in a separate container, and mark the containers that hold the patch cords with the length of patch cords contained within.
 7. All rated patch cords shall be round, and consist of #23 AWG copper, stranded conductors, tightly twisted into individual pairs.
 8. Patch cords shall be made and warranted by the manufacturer of the cabling system installed in this project and shall meet or exceed the patch cord specifications as outlined in the TIA standards.
- C. Primary Copper Protectors
1. UL 497, 497A and 497B rated.
 2. Offers both primary and secondary protection of the cabling and circuits
 3. Analog Voice systems will need 240-volt solid-state protection
 4. PA systems will need 75-volt protection
- D. RJ-45 Patch Panels – Data Termination
1. Patch panels shall be rated to match installed cable plant.
 2. The wiring block shall accommodate #23 AWG cable conductors.
 3. All modular cross-connect panels shall be UL-listed.
- E. Data Outlets
1. Universal eight position jack pin/pair assignments.
 2. Jack shall match the rating of the cable plant. Category 5e for remodels, Category 6 for new construction.
 - a. Data: Electric White
 3. Outlet faceplate must match existing, for new construction will match the electrical outlets.
- F. Equipment Rack(s) and Wire Management
1. 1'-7" (19") X 7'-0" relay racks are to be used for mounting and termination of inter-building and intra-building fiber optic/copper cables and components.
 2. The racks shall have adequate horizontal and vertical cable management for the 8P8C patch panels and switches.
 3. Racks with active electronics shall have horizontal rack-mounted power strips.
- G. Cable Support
1. Cable hooks shall be factory assembled for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions
 2. Cable hooks shall have a flat bottom and provide a minimum of 0'-1.625" cable-bearing surface.
 3. Cable hooks shall have 90° radius edges to prevent damage while installing cables.
 4. Cable hooks shall be designed so that the mounting hardware is recessed to prevent cable damage.
 5. Cable hooks for non-corrosive areas shall be pre-galvanized steel. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish.

6. Cable hooks for corrosive areas shall be stainless steel.
7. Cable hooks shall have a stainless-steel cable latch retainer to provide containment of cables within the hook.
8. The retainer shall be removable and reusable.

H. Grounding

1. Communications Grounding Conductors: Copper American Wire Gauge (AWG) wire of the following sizes.
 - a. Bonding Conductor for Telecommunications (BCT): #4/0
 - b. Telecommunication Bonding Backbone (TBB): #3/0
 - c. Telecommunications Equipment Bonding Conductor (TEBC): #4
 - d. Rack Bonding Conductor (RBC): #6
2. All new construction will have a Telecommunications Main Ground Busbar (TMGB). It will:
 - a. Use pre-drilled copper busbar with standard NEMA bolt hole sizing and spacing for the type of connectors.
 - b. Sized for the immediate requirements and allow for 25% growth.
 - c. The minimum dimensions shall be 0'-1/4" thick X 0'-4" wide X 2'-0" long.
 - d. Contain (2) tiers of pre-drilled holes for use with standard sizes of two-hole copper compression lugs.
 - e. ASTM-B187-C11000 Copper bar suitable for use with two-hole compression-type copper lugs.
3. All MDF/IDF rooms will have a Telecommunications Ground Busbar (TGB). It will:
 - a. Use pre-drilled copper busbar with standard NEMA bolt hole sizing and spacing for the type of connectors.
 - b. Sized for the immediate requirements and allow for 25% growth.
 - c. The minimum dimensions shall be 0'-1/4" thick X 0'-4" wide X 1'-0" long.
 - d. Contain (2) tiers of pre-drilled holes for use with standard sizes of two-hole copper compression lugs.
 - e. ASTM-B187-C11000 Copper bar suitable for use with two-hole compression type copper lugs

I. Cable Television

1. Cable Television wiring is no longer installed in AISD facilities

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. During the design phases of the project, the design team must submit, at a minimum, a copy of the 75% Construction Documents to AISD Network Support Services for their review and approval.

- B. Within ten business days of the notice of bid selection from AISD Purchasing the Contractor will complete Attachment A and submit it to the AISD Network Support Services for Approval.
- C. Once Attachment A has been approved by AISD Network Support Services the Technology Consultant will schedule a site survey within 30 days with the Owner and the Contractor.
- D. The Contractor will walk the job site with the Owner and their representative to go over any potential risks or any other known issues with the project within ten (10) days of the Notice to Proceed.
- E. After walking the site with the Owner or their representative, the Contractor will submit a Bill of Materials and any needed design changes to Owner. After the completion of the site survey, the Technology Consultant will schedule a meeting with the Owner and the Contractor to discuss the project schedule, Contractor expectations, and Attachment A.
- F. The Contractor must have an employee on site to receive the delivery of the shipments at their location. All shipments sent to AISD will be refused and returned at the Contractor's expense.
- G. During the Installation of the Project, the Owner or their representative will perform periodic Quality Assessments to ensure that the Project is progressing as needed.
- H. Three weeks prior to completion, the Contractor will notify AISD Network Support Services so the Owner will have sufficient time to schedule the resources that they must have to complete the final Quality Assurance checks once the work has finished.
- I. Prior to acceptance of the Project by the Owner, the Contractor shall have completed the following:
 - 1. Submitted As-Built Documentation based on the installation both in PDF format and editable AutoCAD format. All technology cabling should be included in a separate CAD "technology layer" in the comprehensive AutoCAD As-Built Documentation delivered to AISD.
 - 2. Test results for all installed structured cabling, both in softcopy format (Excel based) and hardcopy printed documentation.
 - 3. Executed warranties from all installed manufacturers.
 - 4. Written certifications attesting the completion of the work installed.

3.2 GENERAL REQUIREMENTS

- A. In the installation of this work, the Contractor shall comply in every way with the requirements of local and City of Austin laws, ordinances, and rules, the laws of the State of Texas, the National Board of Fire Underwriters, and the National Electrical Code. If in the opinion of the Contractor, there is anything in the plans or specifications that will not strictly comply with the above laws, ordinances, and rules, the matter shall be referred to the attention of the Architect/Engineer for a decision before proceeding with that part of the work.
- B. No change in the plans or in the specifications, drawings or construction documents shall be made without full consent in writing from the AISD Network Support Services.
- C. The Contractor shall review the specifications and all associated drawings and construction documents for the location and quantity of drops.
- D. The Contractor shall provide and install a separate J-hook for each cable type (backbone, horizontal, data, video, clock, public address system, speaker, etc.) and shall size the j-hooks for

50% growth. Care must be taken to route STP cabling (PA) away from telephone and data cabling to avoid interference.

- E. The Contractor is responsible for the establishment of all cable pathways supported by J-hooks and as such shall coordinate pathways with all other disciplines. Under no circumstances shall J-hook pathways for communications cable plant be used to support other low-voltage applications such as HVAC, Fire Alarm, etc.
- F. Cable pathways shall be independent of other disciplines and services and shall not touch or be supported by other disciplines or services (i.e., water pipes, electrical pipes, duct work, all-thread, building structure, etc.)
- G. The Contractor shall submit data sheets to the AISD Construction Management or its representatives, for all materials within ten business days of receiving a noticed bid award. Work cannot proceed until the submissions have been approved by AISD Construction Management or its representative.
- H. The Contractor shall not exceed the maximum pulling tension of the manufacturer during the installation of any cable.
- I. All cable used indoors shall be Plenum-rated and shall meet 1996 NEC Article 800 Type CMP Specifications for UTP and NEC Article 770 Type OFNP specification for non-conductive fiber optic cable.

3.3 NEW INSTALLATIONS

- A. Contractor shall complete Attachment A, within ten days of their Notice of the Bid award from the AISD purchasing Department. The Contractor will show all materials, equipment, and labor necessary to provide a complete and functional TIA-568 C Category 6 Cable Plant, which meets or exceeds rates up to 1.2 Gb/s regardless of any materials and/or equipment not listed or described in this specification and/or supplementary drawings.

3.4 INSTALLATION TO AN EXISTING STRUCTURE

- A. Existing campus construction and/or renovation requires the Contractor to complete Attachment A at the time of bid selection and must be completed within 10 days.
- B. The Contractor will match the existing Cabling Plant manufacturer and parts. Any new cabling must at a minimum to meet the TIA-568-C Standard for Category 5e Structured Cable Plant.

3.5 CONTRACTOR REQUIREMENTS

- A. In addition to the cabling for data, the Contractor shall be responsible for providing and installing required cabling for Public Address System VoIP, CCTV and the Television Distribution System.
- B. The cabling system will connect Voice over IP (VoIP), Data, PA, video, and building automation system devices, switching equipment, and other information management systems to one another as well as to outside communications networks. It includes all the cabling and associated distribution components between where the building wiring connects to the outside network and the data and video terminals at work area locations.
- C. After the Owner has approved Appendix A the Contractor shall perform a "site walk through" with the Owner or their representative to verify site conditions, MDF/IDF room locations distances and dimensions at the job site prior to installation.

- D. Contractor shall provide installation in accordance with these written specifications and the installation requirements, recommendations, and guidelines of the product’s manufacturer.
- E. Contractor shall provide in addition to Division 1 requirements, an itemized listing of all equipment, materials, and labor required for the installation of the Communications Cable Plant.
- F. The communication cable plant installation shall include all extended product warranties and assurance warranties offered by the Contractor and Manufacturer.
- G. The Contractor shall be an Authorized Installer for the Manufacturer that they propose in their bid documents, prior to submitting Attachment A. They shall not sub-contract any part of their work without the prior approval of the Owner.
- H. The Contractor must have on staff a full-time BICSI RCDD (Registered Communications Data Designer) to oversee all work.
- I. Installers must be trained and experienced on the specific installation, termination, and testing of the systems that they will install.
- J. The Contractor will have a BICSI Certified Technician on site at all times work is performed.

3.6 CABLING INSTALLATION REQUIREMENTS

- A. All cables shall be installed and terminated in accordance with manufacturer's specifications, guidelines, and requirements. In the case of any discrepancy between these specifications, the Contractor shall immediately bring the discrepancy to the attention of AISD Network Support Services Department or its representative for resolution before proceeding with that portion of the work.
- B. 8 position 8 contact (8P8C) Jack Pin Assignments for all horizontal cable shall match the T-568B wiring scheme.

Pin	T-568B pair	T-568B color
1	2	white/orange stripe
2	2	orange solid
3	3	white/green stripe
4	1	blue solid
5	1	white/blue stripe
6	3	green solid
7	4	white/brown stripe
8	4	brown solid

- C. Data and video cable pathways in classrooms, administrations areas, etc., shall be provided with wall boxes and conduit extending above the applicable areas to an accessible ceiling. The Contractor will also place a string inside the conduit, secured on both ends.
- D. Data drops must include the patch cable if not provided by the data infrastructure subcontractor. The patch cable will match the TIA Category for the wire that has been installed. I.e. Cat 6 cable will have Cat 6 patch cables.

- E. All cables, jacks, patch panels, faceplates, punch down blocks, LIUs, racks and other associated equipment with the cabling system shall be clearly labeled with a unique identification system. Additionally, they will match the ANSI/TIA performance rating for the cable or fiber installed.
- F. All labels shall be a waterproof permanent label with an identification number indicating wiring closet letter and drop number.
- G. Cables in MDF/IDF closets shall be labeled to clearly indicate the locations at the far end.
- H. Labels must be machine generated (i.e. Brady type).
- I. All cable drops shall be within 3 feet of a power source.
- J. All cable used indoors shall be Plenum-rated and shall meet 1996 NEC Article 800 Type CMP Specifications for UTP and 1996 NEC Article 770 Type OFNP specification for non-conductive fiber optic cable.
- K. All cable shall be installed to meet the code and ratings for the environment that it is installed in.
- L. All voice and public-address trunk cables shall be provided with 50% spare pair count capacity.
- M. All data patch panels, voice punch block, and termination blocks shall be provided with 25% spare pair port count capacity.
- N. Cables shall not be tied directly to any building structure and shall be properly supported always using Industry Standard TIA-569 owner approved cable supports such as cable tray, j-hooks, conduits, sleeves, etc.
- O. All J-hooks shall be installed four (4') to five (5') feet on center, using the only manufacturer approved installation methods and materials.
- P. Tie wraps are not to be used on data cable at all, Velcro only in closets.
- Q. Cables shall maintain the following minimum clearances:
 - 1. Fluorescent Lighting: 12 inches
 - 2. Neon Lighting: 12 inches
 - 3. Unshielded Power Cable: 12 inches
 - 4. 2 kVA or less: 5 inches
 - 5. Above 2kVA: 39 inches
 - 6. Transformers: 39 inches
- R. All cable penetrations through walls or floors into rooms shall be sleeved and filled with a re-entenable intumescent fire-retardant putty following the NEC and NFPA standards to maintain the integrity of firewalls, smoke barriers, and walls extending to the underside of the structure. Where wiring requirements exceed that of a single sleeve, multiple sleeves shall be installed.

- S. Cabling concealed by drop tile ceilings shall be run in bundles of a convenient size for ease of installation and shall be supported per TIA-569 standard practices (e.g., conduits, j-hooks) from roof structures, joints, or other building structural members. In no case, shall cable be supported from below by contact with the ceiling system.
- T. Horizontal cabling shall not be exposed where drop ceilings are not available. Cables shall be routed within molding or wall mounted ducts that are securely mounted to permanent structures by mechanical fasteners. Such molding or ducting shall be located to minimize its visual impact.
- U. In areas where drywall construction has been used, vertical cable runs must be run within the wall and not use surface mount molding, or ducts. Power poles should be avoided unless specifically approved by AISD Network Support Services or its representative.
- V. Cables shall not exceed the maximum bend radius of the manufacturer during the installation of any cable.
- W. No more than two (2) 90-degree bends shall occur in a single cable pulling operation. In cases where two (2) 90-degree bends are required, multiple pulling operations shall be performed.
- X. An appropriate cable grip as specified by the manufacturer shall be used for installing cables.
- Y. All cable shall be hand pulled. No cable winches shall be permitted.
- Z. Exposed cables must be protected with overvoltage and/or sneak current protection. When wire pairs from the outside and the cable in which they reside are exposed to lightning, power contact, power induction or ground potential rise, it is necessary to apply electrical protection devices at both ends of the cable.
- AA. Cables demolished due to construction must be removed completely including disconnect from the patch panel and removal of the associated patch cable and panels as necessary.

3.7 MDF/IDF ROOMS

- A. All cable shall be supported inside the MDF and/or IDF via ladder rack either mounted overhead or vertically on the perimeter walls.
- B. Facilities with multiple floors require strain relief for the cable installed in the riser by means of a cable raceway
- C. All cables, jacks, patch panels, faceplates, punch down blocks, LIUs, racks and other associated equipment with the cabling system shall be clearly labeled with a unique identification system. Additionally, they will match the ANSI/TIA performance rating for the cable or fiber installed.
- D. All cables, equipment racks, ladder racks, External IDF, Portable IDF, lightning protection blocks, etc. shall be grounded and bonded per ANSI/TIA-607.

3.8 SYSTEM REQUIREMENTS

- A. Cabling Requirements
 - 1. All cable must have the appropriate jacket rating for the environment that it is installed in.
 - 2. All cable will be installed as a home run to the designated MDF/IDF Room.
 - 3. No cable will be spliced.

4. Cabling should be designed to accommodate 25% growth.
5. All cable will have a 6" service loop unless otherwise noted.
6. All patch panels must be rack-mounted.
7. All 568 C rated cable must not exceed 275' in length.
8. All cable for new construction shall be 4-pair, Category 6 Unshielded Twisted Pair (UTP) cabling meeting or exceeding TIA standards for rates up to 1.2 Gb/s.
9. All cable for existing facilities and/or renovations shall be 4-pair, Category 5e Unshielded Twisted Pair (UTP) cabling conforming to the existing cable plant.

B. Intra-Building Cable Plant

1. Backbone Fiber Optic Cable – Data

- a. All fiber optic cable shall be 50/125 um Multi Mode of the appropriate type for length.
- b. All fiber optic cable shall have the appropriate jacketing for the environment, usage, and location where the cable is installed. Plenum rated inside of the building. Armored and OSP rated for exterior applications or where flooding is possible.
- c. All fiber optic cable shall be home run from the MDF to each applicable IDF.
- d. All fiber optic cable shall be installed with twenty (20) feet of service loop provided at both ends left coiled and secured in the ceiling. Individual cable service loops should be separated, secured by tie wraps and left on the cable tray provided above the lay-in ceiling.
- e. No fiber optic cable shall be longer than 2 kilometers.
- f. All fiber optic cables shall be terminated with ST type connectors in rack-mounted fiber optic Lightguide Interconnection Units (LIU) with a fan-out kit and all panels, covers, connectors, couplings, and blanks installed in each applicable MDF and/or IDF.
- g. All LIUs shall be sized to accommodate 100% growth.
- h. All rack-mounted LIUs shall be installed in 19" x 84" floor mounted open relay racks inside the applicable MDF and/or IDF.
- i. For fiber optic cable, only fusion splicing will be permitted.

2. Backbone High-Pair Count Copper Cable

- a. 100 Ω balanced twisted-pair.
- b. All cable installed shall be rated as appropriate to the environment it is installed in.
- c. Plenum-rated cabling: Cable installed in plenums or air-handling spaces shall meet UL 910 and shall be marked CMP (communications multipurpose plenum) in accordance with the NEC.
- d. Plenum cable shall consist of #24-AWG solid copper conductors insulated with color-coded FEP
- e. ASP-filled multi-pair copper cables shall be utilized for direct buried applications.
- f. All OSP copper cable shall be transitioned to inside cable within 50'-0" of building entry.
- g. The bending radius and pulling strength requirements of all cables shall be observed during handling and installation.

3. Horizontal Cable – Wireless Access Points

- a. All wireless access point outlets shall be electric white and left coiled and secured above the ceiling with twenty (20) feet of service loop. Individual cable service loops shall be separated, secured by one Velcro wrap and left secured above the lay-in ceiling.
- b. All Wireless Access point terminations shall be terminated with a biscuit block (with an appropriate label) and a blue patch cable to the device at a readily accessible location above the accessible ceiling.

C. Video Distribution System

1. General Requirements

- a. For bidding purposes, the Contractor shall submit with bid documents, a complete design of the headend and the distribution system, along with the cut sheets for the proposed materials. The system design shall meet AIA and NCTA standards. Standard CATV and MATV symbols will be the only recognized legend. Riser diagrams will not be accepted. The Contractor may leave off tap values for proprietary purposes but must be able to produce, upon request the design print with values inserted:
- b. Contractor shall provide and install a Television Broadband Distribution System capable of delivering a broadcast quality television signal to all possible points of use as described in these specifications and shown on telecommunications drawings.
- c. The system shall be designed and installed to utilize a two-way sub-split RF broadband spectrum consisting of a forward bandpass of 50 MHz - 750 MHz and a reverse bandpass of 5 MHz - 30 MHz
- d. Contractor shall provide all materials, equipment, labor and all other incidental materials and appliances necessary to provide a complete and functional Television Broadband Distribution regardless of any materials and/or equipment not listed or described in these specifications and/or telecommunications drawings.
- e. Contractor shall provide and install a complete Television Broadband Distribution System that includes headend equipment, cabling, amplifiers, multi-taps, splitters, directional couplers, outlets, and all other distribution equipment required to furnish complete and functional system.
- f. Contractor shall verify conditions and dimensions at the job site prior to installation.
- g. Contractor shall provide installation in accordance with these written specifications and the installation recommendations of products' manufacturer.
- h. Contractor shall provide for any remedial activities resulting from any errors made in the electrical design of the system.
- i. Contractor shall submit complete detailed shop drawings, with equipment rack layouts, system schematics, riser diagrams showing tap and amplifier locations and values and signal levels of each tap and each outlet, prior to the procurement of equipment or commencement of work.
- j. All equipment and material shall be approved by the Owner prior to purchase or installation by the Contractor.
- k. Any Owner furnished equipment or material not installed shall be returned to the Owner.
- l. To maintain the District's distribution system integrity and compatibility with existing systems, all passive devices, line extenders, amplifiers, taps, splitters, etc. shall match the existing installation.

- m. All cable shall have the appropriate jacketing for the environment, usage, and location where the cable is installed.
 - n. All end-of-line taps, line extenders, and amplifiers, power supplies, etc. shall be grounded.
 - o. All splicing of PIII.500 coaxial cable shall utilize integral mandrel steel sleeve connectors.
 - p. All splicing outdoors shall utilize heat shrink to keep moisture out.
2. Video Distribution System Backbone (Trunk) Cable
- a. Contractor shall furnish and install coaxial distribution cable. CATV distribution trunk cabling shall be a PIII 500 Plenum CMP and must meet or exceed SCTE attenuation requirements for analog video applications. Under no circumstance shall RG-11 cable be considered backbone/distribution cable.
3. Video Distribution System Drop Cable
- a. Contractor shall furnish and install RG6 coaxial cable for drops. CATV drop cabling (from tap to the face-plate) shall be 60% RG6 Plenum CMP and must meet or exceed SCTE attenuation requirements for analog video applications.
 - b. All RG6 drops from a tap shall be installed and maintained at a length equal to the longest RG6 drop from that tap, as shown on the communications drawings. Equal drop lengths will maintain similar attenuation for each drop.
4. Video Distribution System Distribution System
- a. An approved cable preparation device or splicing tool shall be used in all splicing.
 - b. The appropriate coring tool will be used in all splicing.
 - c. All connectors must use integral mandrel steel sleeves.
 - d. Housing-to-housing adapters and right-angle fittings shall be used in all locations where necessary. No reverse loops will be allowed. Extension right angle or housing-to-housing adapters shall be used only where there is necessary proper clearance. No other connectors will be used.
 - e. All passive and active devices shall be supported by a use of stand-off brackets when the housing mount cannot be used, or when interconnected to another device by an entry-to-entry connector. The approved stand-off brackets are the LM type manufactured by Utility Products Company or the equivalent. All equivalent substitutions must be approved in writing prior to installation.
 - f. All amplifiers and power supply locations will be grounded as well as every third tap location and end of the line termination points thereafter using a #6 AWG copper wire attaching to either electrical conduit or a copper, cold water pipe.
 - g. All backbone and drop cable must be supported using Category 5 J-Hooks. Tie-wraps and/or stapling drop cable are unacceptable means of attachment.
 - h. Run cables perpendicular or parallel to the building structure.
 - i. Under no circumstances is RG-11 coaxial cable to be considered as a distribution cable. The distribution or "backbone" cable must be plenum .500 hardline and/or as indicated in drawings and these specifications.
 - j. The center conductor shall be clean of any remnants of dielectric or foreign materials prior to installing cables in the device. Wipe center conductor clean with a cloth using a circular motion. If the center conductor has any remaining residue, use a suitable

furnishing means (such as a fine emery cloth, fine steel wool, etc.) to remove any remaining residue and do not remove the copper cladding.

- k. Connectors to amplifiers, multi-taps, and all other devices in feeder system shall be protected against moisture. All devices that are accessible to possible submersion shall be protected against ingress. Approval of the method shall not relieve the contractor of full responsibility for proper application and workmanship of the materials in the manner specifically approved. All connector threads shall be treated with an approved silicone lubricant.
 - l. All entry-to-entry connectors shall be covered with an approved sealant.
 - m. All 90 and 180-degree connectors shall be covered with an aqua seal, elector seal, or equivalent. The center conductor seizing screw port accessibility shall not be hampered by either shrink boots, aqua seal, elector seal, or other materials.
 - n. Shrink tube shall extend over any housing lip designed to facilitate moisture proofing of a connector and at least three inches past the back edge of the connector.
 - o. All unused tap or splitter ports shall be terminated by use of an appropriate terminator.
 - p. Dissimilar metals apt to corrode through electrolysis under the environmental operating conditions specified shall be separated by an inert dielectric material.
 - q. Placement of any/all actives, passives, or both placed above false ceilings must be denoted by affixing a 1/2" dot on the outside grid of the ceiling directly below the device.
 - r. All outlets shall be flush mounted.
 - s. All wiring, materials, and equipment will be delivered and stored in a clean, dry space. They will be properly packaged in factory-fabricated type containers and protected from damaging fumes, construction debris, and traffic until installation or job completion.
 - t. Television Broadband Distribution System drops shall be male "F" interface connectors and they shall meet or exceed SCTE standards.
5. Video Distribution System Head End for Distribution System
- a. The headend shall be provided with the following:
 - 1) One T-channel agile input demodulators
 - 2) One agile modulator @ 550 MHz
 - 3) One 12-channel passive combiner
 - 4) Amplifiers as required, 750 MHz, with reverse capacity
 - 5) Amplifiers shall be placed in MDF or IDF.
 - 6) One 60-volt power supply with surge suppression (Power Technology or equivalent).
 - 7) All other equipment or devices necessary for a complete and functional system.
 - 8) All cabling materials, taps, splitters, line extenders, hardware, etc. necessary to produce a fully operational sub split distribution system at 750 MHz with reverse capability. All splitters, taps, and other passive devices rated at 1 GHz.
 - 9) All materials or equipment furnished by the contractor shall be approved prior to installation. All equipment specified is to be equal to or better than specified. Any owner furnished materials or equipment not installed in the project shall be returned to the AISD. Contractor shall store all materials and equipment in

accordance with the manufacturer's instructions in a weather-tight, secure enclosure. Contractor shall be responsible for safety and security of all AISD furnished materials until the project is complete and accepted by AISD.

6. Video Distribution System AISD Furnished Materials and Equipment

- a. AISD will furnish television sets and/or video cameras to be used with media carts. Final selections will be determined through the Construction Management process.

7. Carts

- a. Contractor shall provide and install one cart per facility as required.
- b. Each cart shall consist of DA-Lite AC-Cart # Av2-42-J and one 6 outlet AC plug.
- c. Each cart shall be provided with cart components, modulators, video cassette recorder and required cabling.
- d. Each cart will require the Contractor to provide and install T-Channel output, agile, and 450 MHz modulators.

8. Activation of Plant

- a. Once the system has been activated, the Contractor shall take signal level readings from the output side of the headend amplifier.
- b. High output amplifier; on amplifier feeding the entire system
 - 1) 37 dB Ch 3 – Low Channel
 - 2) 41 dB Ch 00 at 400 MHz
 - 3) 43 dB at 500 MHz
- c. Low output amplifier; more than one amplifier in the system
 - 1) 35 dB at Ch 3 – Low Channel
 - 2) 38 dB at Ch 00 at 400 MHz
 - 3) 40 dB at 550 MHz
- d. After levels, have been determined, install pads and equalizers needed for balancing.
- e. If the facility has only on the amplifier, proceed with the end of line readings.
- f. If the facility has two or more amplifiers, balance each and then take the end of line readings.
- g. The minimum signal at ports:
 - 1) 10 dB at 550 MHz
 - 2) 3 dB at 54 MHz
- h. Contractor shall produce hard copy evidence of signal generated readings.
- i. Data will become a required part of final system acceptance.
- j. Data will be used for future maintenance and reference.

D. Horizontal Cable – Clock System

1. All horizontal clock system cable shall be a 3 conductor, 16 AWG cable.
2. The clock system shall be designed so the clocks in each applicable MDF and/or IDF wiring boundary are cabled from the applicable MDF and/or IDF.

3. All horizontal clock cables shall be installed from each power supply in each respective MDF and/or IDF to each clock served by the respective power supply within each respective MDF and/or IDF wiring boundary. The maximum number of clock faces shall not exceed ten per power supply.
4. All clocks within each respective MDF and/or IDF wiring boundary shall be daisy chained with a six (6) foot service loop provided at each clock location if the total length does not exceed 295 feet.
5. These cables shall not be terminated by the Cable Contractor but shall be left with six (6) feet of slack for the Clock System Contractor to terminate the cables.
6. The service loop shall be cut and spliced within each respective clock electrical box.
7. Cables more than 295 feet shall terminate in a power supply located in the applicable MDF and/or IDF.
8. From the power supply, the clock cable may continue in a daisy-chained fashion to the last clock service loop if the maximum cable distance from the power supply to the last clock service loop does not exceed 295 feet.

E. Computer Room Cabling

1. Unless instructed otherwise, all computer labs, science labs, library catalog stations and classroom computer stations must be cabled to provide the most efficient use of the existing data drops. The number of computers and printers should be divided by the number of available data drops and the appropriate sized unmanaged switch installed accordingly.
2. Computer labs in renovation or new construction will be configured with dedicated drops for each computer.
3. All cabling must be installed in wire management in cable trays.
4. Cables from lay-in ceiling must be installed on power poles.
5. All power strips must provide adequate protection and be mounted and secured under the furniture.

F. Portable Cabling Specifications.

1. Each portable building must be independently wired to the main facility.
2. The portables cannot be "daisy-chained" since any of the existing portables at the campus can be removed and the remaining portables must continue to have complete technology services.
3. Telephone poles may need to be installed to support the cabling from the main facility to the portable buildings.
4. AISD Construction Management must approve the placement of any poles.
5. Additional equipment and or additional components in the existing equipment may be required to support portables. These systems include data, video and the public-address system.
6. Any changes required to the existing equipment shall be coordinated with AISD Network Support Services to ensure that there are no conflicts with vendors that support the existing warranties and/or support contracts.
7. Any additional equipment or components shall be the same type and brand and shall be approved by the AISD Network Support Services.

G. External IDF (EIDF)

1. The EIDF shall be located on the exterior of the main facility and shall provide connectivity between the MDF in the main facility and the portable buildings.
2. The EIDF provides the ability to connect and disconnect portable building easily.
3. The EIDF shall feed no more than four (4) portable buildings.
4. The EIDF shall be a Raintight (C2420C4) weatherproof box mounted at a height on the exterior of the main facility so as to prevent vandalism.
5. All equipment and terminations provided in the EIDF shall be approved for use in the environment where the EIDF is being utilized.
6. All EIDFs shall be provided with separate lightning protection blocks for the voice and public-address system cabling terminations.

H. Splice Case

1. Splice Cases shall be used in place of EIDF in new portable installations where no portables previously existed.
2. All PA, Fiber and CATV cables shall be direct feeds from the Splice Case to the MDF.
 - a. Voice pairs shall terminate on pairs 1-8 (no longer applicable in VoIP environment)
 - b. PA pairs shall terminate on pairs 11-12.
3. Each Splice Case must be fed with a minimum of 100-pair for voice/ PA and 48-strand fiber.
 - a. Pairs 1-175 are designated Voice (no longer applicable in VoIP environment)
 - b. Pairs 176-200 are designated PA
4. Each Splice Case shall feed no more than eight portables.
 - a. Pairs 1-10 from the portable PIDF are designated voice (no longer applicable in VoIP environment)
 - b. Pairs 11-12 from the portable PIDF are designated PA
5. All Portable voice outlet cable pairs and PA cable pairs must be connected to the PIDF feed cable, splice case and feed cables to the MDF.
6. All copper pairs and fiber strands from PIDF shall be terminated in the Splice Case and continue to the appropriate Voice, PA and Fiber termination point in the MDF
7. All copper cables must be terminated on a lightning protection block in the MDF.
 - a. Pairs 1-175 shall be extended from the lightning protection block to a 110-200 block on the voice termination backboard.
 - b. Pairs 176-200 shall be extended to a 66-block on the PA termination backboard.

I. Portable External IDF (PIDF)

1. The PIDF shall be located on under the gable peak of the portable building.
2. The PIDF provides the ability to connect and disconnect portable building easily.
3. There shall be one (1) PIDF per portable building.
4. The PIDF shall be a NEMA 4X weatherproof box mounted at a height of the portable building so as to prevent vandalism.

5. The PIDF serves as the demarcation point for the speakers, telephones and Ethernet switches located inside the portable building.
6. All equipment and terminations provided in the PIDF shall be approved for use in the environment where the PIDF is being utilized.
7. All PIDFs shall be provided with a 12-pair lightning protection block for the voice and public-address system cabling terminations.
 - a. Pairs 1-10 from the portable PIDF are designated voice (no longer applicable in VOIP environment)
 - b. Pairs 11-12 from the portable PIDF are designated PA
8. All Portable voice outlet cable pairs and PA cable pairs must be connected to the PIDF feed cable, EIDF and feed cables to the MDF.

J. Fiber Optic Cable Plant

1. Backbone Fiber Optic Cable – Portables
 - a. All fiber optic cable installed where 62.5/125 um Multi Mode cabling previously exists shall be 50/125 um Multi Mode of the appropriate type for length.
 - b. All fiber optic cable installed where no portables cabling previously exists shall be 50/125 um Multi Mode of the appropriate type for length.
 - c. All fiber optic cable shall have the appropriate jacketing for the environment, usage, and location where the cable is installed.
 - d. All fiber optic cable shall be armor rated fiber optic cable that is clearly identified and tagged as fiber optic cable.
 - e. All fiber optic cable shall be a home run from the MDF to each EIDF and from each EIDF to each PIDF.
 - f. All fiber optic cable shall be installed with twenty (20) feet of service loop provided at both ends left coiled and secured in the ceiling. Individual cable service loops should be separated, secured by tie wraps and left on the cable tray provided above the lay-in ceiling.
 - g. No fiber optic cable shall be longer than 2 kilometers.
 - h. All fiber optic cable from the MDF to each EIDF shall be 24-strands.
 - i. All fiber optic cable from the EIDF to each PIDF shall be 6-strands.
 - j. All fiber optic cables shall terminate in the MDF with ST type connectors in rack-mounted, fiber optic Lightguide Interconnection Units (LIU) with a fan out kit and all panels, covers, connectors, couplings, and blanks installed.
 - k. All LIUs shall be sized to accommodate 100% growth.
 - l. All rack-mounted LIUs shall be installed in 19" x 84" floor mounted open relay racks inside the applicable MDF and/or IDF.
 - m. All fiber optic cables shall terminate in the EIDF and PIDF with ST type connectors in Lightguide Interconnection Units (LIU) with a fan out kit and all panels, covers, connectors, couplings, and blanks installed in each applicable MDF and/or IDF.
 - n. Fiber optic cable shall only be fusion spliced.

K. Backbone High-Pair Count Copper

1. All cable shall be a home run from the MDF to each EIDF and from each EIDF to each PIDF.
2. All copper cable shall be terminated on lightning protection blocks on both ends.

L. Exterior Horizontal Cable

1. All Cable will be rated to the environment for which it is installed in.
2. All 4-pair UTP voice cabling shall be blue.
3. All 4-pair UTP data cabling shall be Electric White.
4. All cables shall be a home run from the applicable PIDF to the applicable workstation outlet within the applicable portable.
5. All voice cables shall be terminated in a 12-pair lightning protection block.

M. Horizontal Cable – Public Address System (Speakers)

1. For renovation of campuses with existing PA systems these standards apply:
 - a. All horizontal public-address system cable in portable buildings shall be a 1-pair, 22 AWG, Shielded Twisted Pair (STP), solid conductor cable with drain.
 - b. All horizontal public-address system cable shall be provided with six (6) foot service loop at each end and at each speaker where daisy-chained left coiled and secured in the ceiling. Individual cable service loops shall be separated, secured by one tie wrap and left on the cable tray provided above the lay-in ceiling.
 - c. The cables shall be terminated on the last two pairs of the 12-pair lightning protection block.
 - d. The shield from each horizontal cable shall be tied together and grounded to the ground bus bar in each applicable portable.
 - e. These cables shall not be terminated by the cable Contractor at the speaker locations but shall be left with six (6) feet of slack for the PA System/Speaker contractor to terminate the cables on the speakers.
 - f. The PA System/Speaker Contractor shall terminate the cables at the speaker location on the ½ watt tap within each classroom or office and 2-watt tap within each large area, etc.
2. For construction of new facilities, IP based PA systems will follow these standards:
 - a. See PA Section for details of IP based Public Address system specifications.
 - b. Standard Cat 5e data cabling will be deployed for new PA system installations.
 - c. All cables shall be a home run from the applicable MDF/IDF to the applicable workstation outlet within the applicable portable.
 - d. All 4-pair PA cabling shall be pink.
 - e. Standard Cat 5e data cabling will be run to each classroom for PA speaker connection via IP module.
 - f. Hallway PA speakers will use Cat 5e cabling and IP modules connected sequentially.

3.9 Cable Labeling Scheme

A. General

1. The labeling scheme is designed to identify the type of cable (Data, Wireless, Video, Clock, Public Address System, Intrusion Detection, Access Control/Data Gathering Panel and Energy Management), which wiring closet the cable originates in and is unique for the site.
2. All cables shall be provided with a label 12" from the end of each cable in the MDF and/or IDF and the classroom, office, large area, splice point, etc.
3. As room numbers sometimes change, the room number is not used in the scheme.
4. The method for labeling each type of cable is given below with an example.
5. Each cable must be labeled uniquely.
 - a. The label shall be affixed to the faceplate above the drop it represents.
 - b. The location of the label is important since, in the case of voice and data, multiple drops of these two cables will be housed in the same faceplate.
 - c. Each drop shall be clearly identified and labeled on the as-built drawings to be given to AISD before the cabling is accepted.

B. Data Cable

1. The data cables will be labeled by three fields with a dash between each field.
2. The first field will identify the wiring closet origination of the cable. This field will be a letter of the alphabet. The MDF will always be A, IDF 1 will be B, IDF 2 will be C, IDF 3 will be D, and so on in this manner. No school has more than 26 wiring closets.
3. The second field will be a 3-digit cable number (001-999) that is unique for a wiring closet.
4. The third field is a 1 character alphabetic field to identify the cable type (D for data).
5. Example: B103D where B represents IDF 1, 103 is the unique cable number, and D denotes a data cable.
6. Data Cabling Specific Information – In the MDF and IDF, the cables coming in from the drop locations will be terminated on the data patch panel with drop numbers going from left to right and top to bottom, like reading a book. Also, note that the labeling on the faceplate will be the same as what is labeled on the data patch panel.
7. Patch Panel Labeling – In the MDF and IDF all patch panel ports should be labeled with a drop number regardless of their use. They will be labeled in sequence left to right. The first patch panel should be labeled (example) A001D-A048D next A049D-A096D, etc. Drop labels should be above jack.
8. Example: B001D, B002D, B003D----B024D, B025D, B026D, B027D----B048D
9. Data Combos – Duplex faceplates will house 2 data drops. Quad faceplates will house 4 data drops, the drop numbers will go from left to right and top to bottom, like reading a book.
10. Example: A035D A036D A037D A038D

C. Wireless Access Point Cable

1. These devices use standard data cabling as described above.

D. Point of Sale cable

1. These devices use standard data cabling as described above.

E. Public Address System Labeling

1. All speakers shall be labeled with the same designation as PA cables.

2. For renovation of campuses with existing PA systems the PA cabling is terminated in the MDF or IDF on a 66-block.
3. For construction of new facilities, IP based PA systems will follow use standard data cabling
4. The Public Address System designation shall consist of three fields with a dash between each field.
5. The first field shall identify the wiring closet origination of the cable. This field will be a letter of the alphabet with the MDF always being A, IDF 1 being B, IDF 2 being C, IDF 3 being D, etc.
6. The second field shall be a 1 – 3-digit cable number that is unique for that specific wiring closet. The first cable in a wiring closet shall be 1, the second cable shall be 2, the third cable shall be 3, etc.
7. The third field shall be a 1 – 5-character alphabetic field to identify the system the cable supports. For the PA system, it will be D.
8. The fourth field will be a numeric character to identify a specific daisy-chained cable within that daisy-chained group.
9. Example: A035D A036D A037D A038D

F. Clock System Labeling

1. All clocks shall be labeled with the same designation as the clock cables.
2. The clock cabling is terminated in the MDF on a 66-block.
3. The clock system designation shall consist of four fields with a dash between each field.
4. The first field shall identify the wiring closet origination of the cable. This field will be a letter of the alphabet with the MDF always being A, IDF 1 being B, IDF 2 being C, IDF 3 being D, etc.
5. The second field shall be a 1 – 3-digit cable number that is unique for that specific wiring closet. The first cable in a wiring closet shall be 1, the second cable shall be 2, the third cable shall be 3, etc.
6. The third field shall be a 1 – 5-character alphabetic field to identify the system the cable supports. For the clock system, it will be C.
7. The fourth field will be a numeric character to identify a specific daisy-chained cable within that daisy-chained group.
8. Example: A035D A036D A037D A038D

G. CCTV Surveillance System Data Drop Labeling

1. All CCTV data outlets shall be labeled with the same designation as the CCTV data drop cables.
2. The CCTV system designation shall consist of three fields with a dash between each field.
3. The first field shall identify the wiring closet origination of the cable. This field will be a letter of the alphabet with the MDF always being A, IDF 1 being B, IDF 2 being C, IDF 3 being D, etc.
4. The second field shall be a 1 – 3-digit cable number that is unique for that specific wiring closet. The first cable in a wiring closet shall be 1, the second cable shall be 2, the third cable shall be 3, etc.

5. The third field shall be a 1 – 5-character alphabetic field to identify the system the cable supports. For the clock system, it will be CCTV.
6. Example: B-1-CCTV, B-2-CCTV, B-3-CCTV----B-24-CCTV, B-25-CCTV, B-26-CCTV, B-27-CCTV----B-48-CCTV

H. Intrusion Detection System Data Drop Labeling

1. All Intrusion Detection System data outlets shall be labeled with the same designation as the Intrusion Detection system data drop cables.
2. The Intrusion Detection system designation shall consist of three fields with a dash between each field.
3. The first field shall identify the wiring closet origination of the cable. This field will be a letter of the alphabet with the MDF always being A, IDF 1 being B, IDF 2 being C, IDF 3 being D, etc.
4. The second field shall be a 1 – 3-digit cable number that is unique for that specific wiring closet. The first cable in a wiring closet shall be 1, the second cable shall be 2, the third cable shall be 3, etc.
5. The third field shall be a 1 – 5-character alphabetic field to identify the system the cable supports. For the clock system, it will be CCTV.
6. Example: B-1-IDS, B-2- IDS, B-3- IDS ----B-24- IDS, B-25- IDS, B-26- IDS, B-27- IDS ----B-48-IDS

I. Access Control/Data Gathering Panel System Data Drop Labeling

1. All Access Control/Data Gathering Panel System data outlets shall be labeled with the same designation as the Access Control/Data Gathering Panel system data drop cables.
2. The Access Control/Data Gathering Panel system designation shall consist of three fields with a dash between each field.
3. The first field shall identify the wiring closet origination of the cable. This field will be a letter of the alphabet with the MDF always being A, IDF 1 being B, IDF 2 being C, IDF 3 being D, etc.
4. The second field shall be a 1 – 3-digit cable number that is unique for that specific wiring closet. The first cable in a wiring closet shall be 1, the second cable shall be 2, the third cable shall be 3, etc.
5. The third field shall be a 1 – 5-character alphabetic field to identify the system the cable supports. For the clock system, it will be CCTV.
6. Example: B-1-DGP, B-2-DGP, B-3-DGP ----B-24-DGP, B-25-DGP, B-26-DGP, B-27-DGP ----B-48-DGP

J. Energy Management (Net Plus Router/LON) Control System Data Drop Labeling

1. These devices use standard data cabling as described above.
2. All Energy Management Control System data outlets shall be labeled with the same designation as the Energy Management Control system data drop cables.
3. The Energy Management Control system designation shall consist of three fields with a dash between each field.

4. The first field shall identify the wiring closet origination of the cable. This field will be a letter of the alphabet with the MDF always being A, IDF 1 being B, IDF 2 being C, IDF 3 being D, etc.
5. The second field shall be a 1 – 3-digit cable number that is unique for a wiring closet. The first cable in a wiring closet shall be 1, the second cable shall be 2, the third cable shall be 3, etc.
6. The third field shall be a 1 – 5-character alphabetic field to identify the system the cable supports. For the clock system, it will be D.
7. Example: A035D A036D A037D A038D

3.10 COPPER CABLE TESTING

- A. Copper backbone shall exceed ANSI/TIA-568-C.2 Backbone Cabling requirements and meet the manufacturer's specifications for the installed product.
- B. OSP cabling test equipment shall make frequency sweeps at an impedance of 135 Ω at the following frequencies (kHz): 20, 30, 50, 69, 90, 110, 138, 276, 400, 600, 800, 1000, and 1100.
 1. A far-end device shall be used for all frequency measurements.
 2. The loss at 138 kHz shall not exceed 46 dB.
 3. The test set shall store 100 tests and can upload to a PC.
- C. The test set shall be able to measure the resistance between the following conductors: tip to ring, tip to ground, and ring to ground.
 1. All measurements shall be greater than 999 Ω .

3.11 FIBER POST-INSTALLATION TESTING

- A. Contractor to provide all labor, materials, tools, field-test instruments and equipment required for the complete and proper test measurements of the installed fiber cabling.
- B. Contractor shall have successfully attended a fiber testing training program, which includes testing with an OLTS and an OTDR and has obtained a certificate as proof thereof.
- C. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing.
- D. Any testing performed on incomplete systems shall be redone on completion of the work.
- E. Dust caps shall be placed on fiber end faces or adapters for each optical fiber link after all testing is complete on the fiber link.

3.12 PRE-TEST SUBMITTALS

- A. Contractor shall provide the following items for review by the Owner and their representative:
 1. Manufacturers Catalog sheets and specifications for the fiber cable field-test instruments including:
 - a. OLTS (Optical Loss Test Set)
 - b. OTDR (Optical Time Domain Reflectometer)

- c. End-face inspection capture device
2. A schedule (list) of all fiber cables to be tested.
3. Fiber testing training program certificate.
4. Sample test reports.

3.13 FIBER TESTING STANDARDS

- A. The Contractor shall meet or exceed the following standards and guidelines:
 1. ANSI/TIA-568-C.0 Optical Fiber Transmission/Test Requirements, and Annex E: Optical Fiber Field Test Guidelines (Tier 2)
 2. Tier 2 testing is a higher level of testing that provides qualitative measures of the installed condition and performance of the cabling system.
 - a. ANSI/TIA-568-B.3 Optical Fiber Cabling Components Standard
 - b. TIA/TSB-140 Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
 3. Multi Mode requirements
 - a. ANSI/TIA-526-14-A, Method B
 - b. ANSI/TIA-455-50B
 4. Single Mode requirements
 - a. ANSI/TIA-526-7, Method A.1: Optical Power Loss Measurements of Installed Single Mode Fiber Cable Plant-OFSTP-7
 5. The cable installers shall have a copy of these references in their possession and be familiar with the contents
 6. To conform to the overall project event schedule, the Contractor shall survey and coordinate the optical fiber testing with other applicable trades.
 7. In addition to the testing regimen detailed in this document, the Contractor shall notify the Owner of any additional tests that are deemed necessary to guarantee a fully functional system.
 8. The Contractor shall carry out and record any additional measurement results at no additional charge.
- B. The Contractor shall provide all test measurement results two (2) weeks prior to substantial completion in spreadsheet format and native file format from the test instrument.
 1. Software shall also be provided to view the native results.
- C. All tests performed on optical fiber cabling that uses a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
- D. A visible fault locator (VFL) normally uses a Class 2 or 3 light sources and should not be directly viewed.
 1. Safe usage of the tool requires indirect viewing of the light source by pointing the end of the fiber at an adjacent surface (or introducing another surface in front of a fixed mounted connector) until the presence of light is determined.
- E. Link attenuation measurement and allowance calculation

1. The measured link attenuation shall be less than the link attenuation allowance. The link attenuation allowance is calculated as:
 - a. Link Attenuation Allowance (dB) = Cable Attenuation Allowance (dB) + Connector Insertion Loss Allowance (dB) + Splice Insertion Loss Allowance (dB)
 - b. Connector Insertion Loss Allowance (dB) = Number of Connector Pairs X 0.4dB
 - c. Splice Insertion Loss Allowance (dB) = Number of Splices X 0.15dB
 - d. Cable Attenuation Allowance (dB) = Maximum Cable Attenuation Coefficient (dB/km) X Length (km)

3.14 FIBER TESTING REQUIREMENTS

- A. All installed fiber links shall be field-tested and pass the following tests:
 1. OLTS (Optical Loss Test Set) length and dual wavelength attenuation.
 2. OTDR (Optical Time Domain Reflectometer) traces and event tables.
 3. Image captures of connector end-faces.
- B. OLTS (Optical Loss Test Set)
 1. The length and attenuation of each installed fiber link shall be measured and documented.
 2. System loss measurements requirements:
 - a. 850 and 1300 nanometers for Multi Mode
 - b. 1310 and 1550 nanometers for Single Mode
 3. Reflective events (connections) shall not exceed 0.75 dB.
 4. Non-reflective events (splices) shall not exceed 0.3 dB.
 5. The acceptable link attenuation for Multi Mode horizontal fiber is based on the maximum distance of 295'-0".
 6. A horizontal link in a network with a consolidation point may be tested using a fixed upper limit for attenuation of 2.75 dB.
 7. Optical sources shall be turned on for a minimum of 5 minutes prior to referencing.
 8. Fiber links shall be measured and reported for attenuation in each direction and attenuation bi-directionally (averaged in both directions)
 9. Polarity shall be verified for duplex connector systems
 10. Mandrels shall be used when testing attenuation of Multi Mode fiber cabling
 - a. Where mandrels are used, secure the mandrel to the light source by some means such as a cable tie or tape.
 - b. Care should be taken to ensure that the fiber jacket is not deformed or damaged when using a cable tie or tape.
 - c. The light source shall be referenced to the meter a minimum of twice daily (i.e., in the morning and noon).
- C. OTDR (Optical Time Domain Reflectometer)
 1. An OTDR trace shall be taken of each fiber link in one direction to ensure uniformity of cable attenuation and connector insertion loss.

2. Testing shall consist of a bi-directional end to end OTDR trace performed per TIA-455-61.
3. Individual connector, splice and fiber insertion loss shall be evaluated using the OTDR trace.
4. Fibers shall be inspected at 250X for Multi Mode and 400X for Single Mode.

D. End-face Image Capture

1. An image of each fiber optic connector end-face shall be taken, recorded and provided as part of the records.

E. Maximum Attenuation

1. Single Mode ISP (Inside) 1.0 dB/km at 1310 nm and 1550 nm
2. Single Mode OSP (outside) 0.5 dB/km at 1310 nm and 1550 nm
3. Multi Mode 3.5 dB/km at 850 nm and 1.5 dB/km at 1300 nm

F. Test Cords (Jumpers)

1. Testing of the cabling shall be performed using high-quality test cards of the same fiber type and core size as the cabling under test. Use a single patch cord reference for fiber testing.
 - a. OLTS test cords shall be between 3'-3" (1m) and 16'-4" (5m).
 - b. OTDR testing shall be approximately 328'-0" (100m) for the launch cable and at least 82'-0" (25m) for the receive cable. OTDR testing shall be Bidirectional with Pigtailed installed.
2. The test jumper, the adapters, and fiber under test shall be cleaned immediately prior to each fiber being tested.
 - a. After cleaning, cleaning solutions shall be given sufficient time to evaporate (approximately 30 seconds) prior to the mating of fiber test jumper to the fiber under test.
3. Test Failure
 - a. Any fiber link that fails these requirements shall be diagnosed and corrected.
 - b. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link meets performance requirements.

G. Acceptable Testers

1. All fiber optic cable links installed shall be tested in accordance with the field test specifications defined in ANSI/TIA-568-C standard.
2. 100% of the installed cable shall be tested and must pass the requirements of ANSI/TIA-568-B and C
3. Failing links shall be diagnosed and corrected by the Contractor. Corrective actions shall be followed by a new test of the previously failing link(s). The Contractor shall promptly submit all link re-test data to the Owner's representative in both hard and soft copy.
4. Only BICSI Certified Technicians shall perform all fiber optic link testing.
5. Field test equipment for Multi Mode fiber optic cables shall meet the requirements of ANSI/TIA-526-14A.
6. The light source shall meet the launch requirements of ANSI/TIA-455-50B.

7. Field test equipment for Single Mode fiber optic cables shall meet the requirements of ANSI/TIA-526-7.
8. All fiber optic launch cables and test adapters used for testing shall be of high quality and devoid of excessive wear or exhibit anomalies between strand tests. Test results that indicated anomalies between strands within the same sheath shall be declared a failure unless all strands within the same sheath unconditionally pass testing. The Contractor shall diagnose and repair any fiber optic cable exhibiting strand-to-strand anomalies that result in any test failure(s).
9. The Contractor shall test and certify all fiber optic cable plant with approved field tester(s) that are within their calibration period. The Contractor shall be liable for all re-testing required in the event tests are performed with unapproved test equipment or tester(s) that are not within their calibration period.
10. The Contractor shall invite the Owner's representative to witness/verify field testing prior to final acceptance. The Owner's representative shall randomly select 5% of the installed links for test verification purposes. The Contractor shall re-test these links in the presence of the Architect/Engineer and the results shall be compared to the previously Contractor submitted test results. If 2% of the verification tests differ in terms of pass/fail from the previously submitted test results, testing shall be declared a failure and the Contractor shall re-test 100% of the installed links with the cost of such tests borne by the Contractor.
11. Fiber optic connector attenuation shall not exceed 0.75dB.
12. Fiber optic splice attenuation (if allowed) shall not exceed 0.3dB.
13. Multi Mode fiber optic cables shall be tested using the following attenuation coefficient parameters:
 - a. 50/125 Multi Mode 850nm < 3.5dB/km
 - b. 50/125 Multi Mode 1300nm < 1.5dB/km
14. Link attenuation for all fiber optic strands shall be calculated using the ANSI/TIA-568-B Standards formula.
15. All Category 6 cable links installed shall be tested in accordance with the field test specifications defined in ANSI/TIA-568-C standard.
16. 100% of the installed cable shall be tested and must pass the requirements of ANSI/TIA-568-C
17. Failing links shall be diagnosed and corrected by the Contractor. Corrective actions shall be followed by a new test of the previously failing link(s). The Contractor shall promptly submit all link re-test data to the owner or their representative in both hard and soft copy.
18. Only BICSI Certified Technicians shall perform cable testing.
19. All test interfaces used for testing shall be of high quality and devoid of excessive wear or exhibit anomalies between pairs. Test results that indicated anomalies between pairs shall be declared a failure unless all pairs unconditionally pass testing. The Contractor shall diagnose and repair any cable exhibiting pair-to-pair anomalies that result in any Fail or *Pass conditions.
20. The Contractor shall test and certify the entire cable plant with approved field tester(s) that are within their calibration period. The Contractor shall be liable for all re-testing required in the event tests are performed with unapproved test equipment or tester(s) that are not within their calibration period.
21. Any Fail or *Pass result yields a Fail for the link under test. In order to achieve an overall Pass condition, the results for each individual test parameter must pass.

3.15 CERTIFICATION AND WARRANTY

- A. Upon completion of testing, the manufacturer or his representative shall issue to the Owner a letter of Certification attesting to the fact he has tested and adjusted the system, that all components are properly installed and free of defects and that the system is installed in compliance with this specification and manufacturer requirements.
- B. An official Registered Document and a registration number from the manufacturer shall be provided to AISD.
- C. The Contractor shall provide a minimum one-year warranty on all components, outside of the cable plant, to begin upon system acceptance of the site by AISD.
- D. Contractor shall list the length of any warranties over one-year and all components associated with the warranty.
- E. AISD expects the warranty coverage will be no less than the services provided in a full maintenance program at no additional cost to AISD. This includes parts, labor, and on-site maintenance with manufacturer-certified personnel.

3.16 ACCEPTANCE

- A. All systems must be installed and functional, test results, documentation, drawings, and warranty information provided before any site may be accepted.
- B. AISD technicians will test and inspect a 5% random sample of data drops. Any failure will constitute a complete re-test of the entire project by the Contractor.
- C. Payment may be requested upon receipt of documentation and final acceptance by the AISD Network Support Services Department.
- D. The Contractor shall provide the following to the Owner upon final acceptance and completion of the cable plant installation:
 - 1. One Original Reproducible Drawing indicating the “as-built” cable plant denoting cable placements, routing, pathways, outlet labeling and equipment room details. Drawings are to be provided in AutoCAD electronic and hardcopy. Electronic documentation shall be provided by uploading to the project-specific website, thumb drive, or other electronic means as directed by AISD NSS.
 - 2. One set of Power Meter and Light Source Fiber Optic Tests in accordance with this specification in electronic and hardcopy. Electronic documentation shall be provided by uploading to the project-specific website, thumb drive, or other electronic means as directed by AISD NSS.
 - 3. One set of Category 5E or 6 Test results for each cable drop in accordance with this specification in electronic and hardcopy. Electronic documentation shall be provided by uploading to the project-specific website, thumb drive, or other electronic means as directed by AISD NSS.
 - 4. One original Manufacturer Certificate of Warranty for the Structured Cable System.

3.17 INSPECTIONS

- A. Two periodic inspections, at no expense to the Owner, shall be made within the first year's guarantee period to ensure the satisfactory operation of the system.

- B. The Contractor must provide a service call within 24 hours for any possible defective cable.

END OF SECTION 271300

