SECTION 27 0000

VOICE AND DATA COMMUNICATION CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

 Related Documents: Division 00 – Procuring and contract documents, General and Supplementary Conditions of the Contract, Division 01 General Requirements, Division 27 0000 and Division 28 1300 and Drawings are applicable to this Section.

1.2 SUMMARY OF WORK

- A. Furnish and install a warranted and certifiably functioning telecommunications distribution system, complete with all accessories, for the project described in the request.
- B. Wiring utilized for data and voice communications will originate at Owner provided telecommunications equipment either wall mounted, in vertical free standing equipment racks, and/or enclosed wall mounted vertical equipment racks located at the MDF location. Wiring, terminations and patch bays between these designated demarcation points and outlet locations designated on the plans will be considered part of the contract. Work area outlets (WAO) will be furnished, wired and installed by the system Contractor.
- C. The system will utilize a network of unshielded twisted pair station cables and fiber optic backbone. Cables and terminations will be provided and located as shown and in the quantities indicated on the drawings.
- D. All cables and terminations will be identified at all locations.
- E. All cables will terminate in a Longview ISD approved scheme at all termination locations.
- F. Station cables will terminate on one, two or three gang wall plates equipped as shown on the drawings.

1.3 REFERENCES

- A. ANSI/TIA/EIA 568-B.1 Commercial Building Telecommunications Cabling Standard Part 1: General requirements, April 1, 2001
- ANSI/TIA/EIA 568-B.1-1 Commercial Building Telecommunications Cabling Standard Part
 1: General Requirements Addendum 1 Minimum 4-Pair UTP and 4-Pair ScTP Patch
 Cable Bend Radius, July 1, 2001
- C. ANSI/TIA/EIA 568-B.2 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted Pair Cabling Components, April 1, 2001
- ANSI/TIA/EIA 568-B.2-1 Commercial Building Telecommunications Cabling Standard Part
 2: Balanced Twisted Pair Components Addendum 1 Transmission Performance
 Specifications for 4-Pair 100 Ohm Category 6 Cabling, June 1, 2002
- E. ANSI/TIA/EIA 568-B.2-2 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components Addendum 2, December 1, 2001
- F. ANSI/TIA/EIA 568-B.2-3 Commercial Building Telecommunications Cabling Standard Part
 2: Balanced Twisted-Pair Cabling Addendum 3 Additional Considerations for Insertion
 Loss and Return Loss Pass/Fail Determination, March 1, 2001
- G. ANSI/TIA/EIA 568-B.3 Optical Fiber Cabling Components Standard, March I, 2000
- ANSI/TIA/EIA-568-B.3-1 Optical Fiber Cabling Components Standard Addendum 1 -Additional Transmission Performance Specifications for 50/125 um Optical Fiber Cables, April 1, 2002

- I. ANSI/TIA/EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces.
- J. ANSI/TIA/EIA 606-A Administration Standard for Commercial Telecommunications Infrastructures, June 21, 2002
- K. International Standards Organization/International Electro technical Commission (ISO/IEC) DIS 11801, January 6, 1994.
- L. Underwriters Laboratories (UL®) Cable Certification and Follow up Program.
- M. National Electrical Manufacturers Association (NEMA).
- N. American Society for Testing Materials (ASTM).
- O. National Electric Code (NEC®), Latest Issue
- P. Institute of Electrical and Electronic Engineers (IEEE).
- Q. UL Testing Bulletin.
- R. American National Standards Institute (ANSI) X3T9.5 Requirements for UTP at 100 Mbps.

1.4 **DEFINITIONS**

- A. AP Access Point An apparatus providing network communications to wireless devices such as computers with Wi-Fi cards. The AP is connected to the wired network. Also known as WAP – Wireless Access Point.
- B. Administration Subsystem The Administration Subsystem provides for the identification and management of all of the subsystems. It includes labeling hardware for providing circuit identification and cross-connects used for creating circuit connections at the termination points and all associated records.
- C. Backbone Telecommunications cable connecting the MDF to each IDF. May also be referred to as Trunk cable.
- D. Campus Backbone: A Campus Backbone is used when a distribution system encompasses more than one building. The components and cables that provide the connective link between buildings constitute the Campus Backbone. This subsystem includes the backbone transmission media, associated connecting hardware terminating this media, and electrical protection devices. It is normally a first-level backbone cable beginning at the MDF of the hub building and extending to the MDF/IDF of satellite building(s).
- E. Equipment Rack Open support system used for mounting telecommunications equipment.
- F. Equipment Subsystem: The Equipment Subsystem consists of shared (common) electronic communications equipment in the all telecommunication rooms and the transmission media required connect this equipment to the SCS.
- G. Horizontal Cable cable to connect the IDF/MDF to the work area outlet.
- H. Horizontal Subsystem: The Horizontal subsystem provides connections from the telecommunications equipment room cross connect to the information outlets in the work areas. It consists of the horizontal transmission media, the connecting hardware and information in the work area.
- I. IDF Intermediate Distribution Frame A room in a building that houses networking components for a predefined area of that building or campus. LAN service drops in the predefined area should originate/terminate from this point.
- J. Insert (Jack) a device to terminate a single cable, either fiber optic or UTP. Also see Work Area Outlet

- K. LAN Local Area Network A geographically limited data communications system for a specific user group consisting of a group of interconnected computers sharing applications, data, and peripheral devices intended for the local transport of data, video, and analog.
- L. MDF Main Distribution Frame A room in a building that houses the central networking components. Main point of termination for all backbone cable from IDF's and termination point for all LAN service drops within a predefined area.
- M. Pathway The vertical and horizontal route of telecommunications cabling.
- N. POS Point of Sale areas in the Cafetorium.
- O. Riser Backbone: The Riser Backbone subsystem provides the connection from the main distribution frame (MDF) to the intermediate distribution frame (IDF). It includes the backbone transmission media and the terminating hardware for the media. It is normally installed in a star topology originating from the MDF to each IDF location.
- P. Structured Cabling System (SCS): A SCS is defined as the set of transport media and connectivity devices required to provision the analog, data, multimedia and building management signals. The SCS includes the complete physical channel which supports all standards compliant technologies in an open architecture (non-proprietary) design. It also includes the supporting and delivery products requited for an installation which adheres to local and national codes and standards.
- Q. Termination connection of cable to an individual insert and/or cross-connects equipment (e.g., patch panel or punch-down block).
- R. VOIP Voice-Over IP. Transmission of voice communications over the data network.
- S. WAN Wide Area Network A collection of LAN's connecting multiple buildings across a certain geographical area.
- T. Work Area the building space where the connection is made between station equipment and the information outlet. It includes cords, adapters, connective devices and other transmission electronics.
- U. Work Area Outlet A device placed at user workstation for termination of horizontal media and for connectivity of network equipment. Number of drops at each outlet varies.

1.5 BID OR PROPOSAL

- A. Contractor is invited to submit bids or proposals if Contractor meets the certification and other requirements detailed below.
 - 1. CommScope Uniprise Category 6
- B. The Bidder will be required to provide the following documents with the bid response:
 - 1. Proof of certification from the Manufacturer. For this project the bidder <u>must</u> be certified by CommScope as a Uniprise Certified Installer (UCI). Bidder on probation with this program may not be selected.
 - 2. Bidder must be able to provide a system certification covering link/channel specifications from the manufacturing company for a minimum period of twenty-five (25) years for the products they are installing.
 - 3. Bidder shall provide a sample of the warranty that is applicable to the project when complete and documentation of the support procedure for warranty issues.

SUBMITTALS FOR BIDS

C. Successful Contractor will submit four (4) copies, one (1) Master plus three (3) copies, of submittal packages in a 3-ring binder within 15 days of written notification to proceed or other written documentation from the Architect or General Contractor. Binders will be organized into the following sections:

- 1. Cover Sheet and Section 1 Information, Pricing and Material
 - a. Cover sheet containing the Company Name and/or logo, Title of submittal package, client name, and contractor work address with a point of contact (POC) and phone number.
- 2. Section 2 Product Data
 - a. Manufacturer's catalog information showing dimensions, colors, and configurations.
 - b. Submittals will include all items called for in PART 2 PRODUCTS of this document and the manufacturers cut sheets for each item listed in the specifications and the bill of materials.
 - In cases of multiple product numbers on a single cut sheet, the contractor will identify the proper part number with a black X, arrow, or check mark.
- 3. Section 3 Pre-Qualification Certificate
 - a. Contractor will submit the following documents with project proposal:
 - 1) A letter of approval from the manufacturer indicating completion of pre-qualification requirements.
 - 2) Training certificates for design, engineering and installation of the proposed products.
- 4. Section 4 Warranty Documentation
 - a. Warranty will be for life of the installed product.
 - b. Complete documentation regarding the manufacturer's warranty will be submitted as part of the proposal. This will include, but is not limited to, a sample of the warranty that would be provided to the customer when the installation is complete and documentation of the support procedure for warranty issues.
- 5. Section 5 Record Drawings
 - a. Contractor shall provide record drawings for the submittal package that will be used throughout the inspection process and into substantial completion / final acceptance. The drawings shall include the following information:
 - 1) All shown drop locations shall be labeled in accordance with the specifications.
 - 2) Provide an example of the required labeling for the workstation faceplate.
 - 3) Provide the IDF cabinet elevation detail demonstrating the locations of the fiber termination shelves, copper patch panels etc. Show the labeling of the copper patch panel and the fiber patch panels as they will appear in the field.
 - b. Drawings will be used as part of the overhead inspections to ensure labeling in the field is matching the proposed design documents.
 - c. Any and all changes to the scope of work during the project shall be included in the drawings upon completion of all cable testing and will be used as part of the substantial completion process. Reference the section on close out documentation for additional information on the substantial completion process.

SUBMITTALS FOR PROPOSALS

Notwithstanding other requirements outlined in the Request for Quotes or Proposals, successful Contractor will submit one copy of submittal package in an electronic format within 15 days of written notification to proceed or other written documentation from the Architect, General Contractor or Longview ISD Contact. Submittals will be organized into the following sections:

6. Cover Sheet and Section 1 – Information, Pricing and Material

- a. Cover sheet containing the Company Name and/or logo, Title of submittal package, client name, and contractor work address with a point of contact (POC) and phone number.
- 7. Section 2 Product Data
 - a. Submittals for Quotes or Proposals will include a list of items and materials to be be used including manufacturer's part numbers. Cut sheets are not required for Quotes or Proposals.
- 8. Section 3 Pre-Qualification Certificate
 - a. Contractor will submit the following documents with project proposal:
 - 1) Proof of manufacturer certification for all products used.
 - 2) Training certificates for design, engineering and installation of the proposed products are not required for Quotes or Proposals.
- 9. Section 4 Warranty Documentation
 - a. Warranty will be for life of the installed product.
 - b. Complete documentation regarding the manufacturer's warranty will be submitted as part of the proposal. This will include, but is not limited to, a sample of the warranty that would be provided to the customer when the installation is complete and documentation of the support procedure for warranty issues.
- 10. Section 5 Record Drawings
 - a. Contractor shall provide record drawings for the submittal package that will be used throughout the inspection process and into substantial completion / final acceptance. The drawings shall include the following information:
 - 1) All shown drop locations shall be labeled in accordance with the specifications.
 - 2) Provide an example of the required labeling for the workstation faceplate.
 - 3) Provide the IDF cabinet elevation detail demonstrating the locations of the fiber termination shelves, copper patch panels etc. Show the labeling of the copper patch panel and the fiber patch panels as they will appear in the field.
 - b. Drawings will be used as part of the overhead inspections to ensure labeling in the field is matching the proposed design documents.
 - c. Any and all changes to the scope of work during the project shall be included in the drawings upon completion of all cable testing and will be used as part of the substantial completion process. Reference the section on close out documentation for additional information on the substantial completion process.
 - d. Record Drawings may not be required for Quotes or Proposals.

1.6 CLOSEOUT DOCUMENTS

A. See PART 3 of this specification for all closeout requirements.

1.7 QUALIFICATIONS

- A. Manufacturer
 - 1. Reference PART 2 for information pertaining to the acceptable manufacturer for this project.
- B. Contractor
 - 1. The Contractor selected to provide the installation of this system shall be certified by the manufacturing company in all aspects of design, installation and testing of the products described herein.

- 2. The contractor shall utilize the authorized manufacturer components in provisioning this Project.
- 3. Contractor shall have a minimum of five (5) years of recent experience on structured cabling systems of similar type and size.
- 4. Contractor must have a documented quality assurance program. This program must have internal inspection team(s) to measure the service and product quality produced by the contractor's technicians against internal and Industry standards.
- 5. Contractor shall be in compliance with all federal, state and local statutes regarding qualifications of firms.
- 6. The contractor shall be experienced in all aspects of this work and will be required to demonstrate direct experience on recent systems of similar type and size.
- 7. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of optical and Category 6 metallic premise distribution systems.
- 8. The contractor shall have personnel who are adequately trained in the usage of such tools and equipment.
- 9. Longview ISD reserves the right to reject the bid of any bidder who has previously failed to perform properly, or complete on time, contracts of a similar nature.
- 10. Contractor will submit a resume of qualification with the Contractor's proposal indicating the following:
 - a. A technical resume of experience for the Contractor's Project Manager and on-site installation supervisor (project foreman) who will be assigned to this project. Project Manager should have a minimum of 5 years of experience on projects of similar size and design. Project Foreman will have a minimum of 3 years project experience working crews of 4 or more personnel.
 - b. A list of technical product training attended by the Contractor's personnel that will install the system.
 - c. A list of any Sub-Contractor(s), with contact information, who will assist the SCS Contractor in performance of this work. Sub-Contractors must have the same training and certification as the SCS Contractor.

1.8 CABLING – BASIC REQUIREMENTS

- A. Hardware
 - 1. Required hardware includes, but is not limited to, UTP cable, copper and fiber backbone, patch panels, fiber termination shelves, copper and fiber patch cords, equipment racks, cable tray, horizontal and vertical wire management, termination blocks, fastening devices, data outlets, voice outlets, connectors and all required accessories to comply with this specification and provide a complete and working system.
- B. See section 3 Execution for all workmanship requirements and expectations concerning materials and pathways.

1.9 GROUNDING AND BONDING

- A. All grounding and bonding will meet the National Electrical Code (NEC®) as well as local codes, which specify additional grounding and/or bonding requirements.
- B. Bonding and Grounding Communication bonding and grounding will be in accordance with the NEC® and NFPA. Horizontal cables will be grounded in compliance with ANSI/NFPA 70 and local requirements and practices. Horizontal equipment includes cross connect frames, patch panels and racks, active telecommunication equipment and test apparatus and equipment. When required by local code, provide a Telecommunications Bonding Backbone utilizing a #6-AWG or larger bonding conductor that provides direct bonding between equipment rooms and telecommunications rooms. This is part of the grounding and bonding infrastructure (part of the telecommunications pathways and spaces in the building structure), and is independent of equipment or cable.

1.10 PRODUCT WARRANTY AND APPLICATION ASSURANCE

- A. Structured Cabling System Extended Product Warranty and Application Assurance Program
 1. Extended Product Warranty
 - a. The Extended Product Warranty covers product defects for all Contractors provided and installed components of the SCS. The manufacturer will warrant, from the date the project warranty certification is issued by the manufacturer to the end-user, the following:
 - b. The products that comprise the registered SCS will be free from manufacturing defects in material or workmanship under normal and proper use;
 - c. All SCS products that comprise the registered SCS solution exceed the specification of TIA 568-B.1, B.2, B.3 and exceed ISO/IEC 11801, 2nd Edition standards and will conform to the performance specifications of the manufacturer's associated product data sheet in effect at the time the warranty certification is issued;
 - d. The installation will exceed the insertion and return loss, attenuation and near end crosstalk (NEXT) requirements of TIA 568-B and the ISO/IEC 11801, 2nd Edition standards for cabling links/channel configurations specified in these standards.
 - That each channel comprised exclusively of manufacturer's Category 6 passive products end-to-end will be capable of delivering 1.0 Gbps to the workstation in accordance with application standards.
 - e. Under the Product Warranty, manufacturer will either repair or replace the defective product itself at manufacturer's cost. The manufacturer will pay an Authorized Installation Company for the cost of labor to repair or replace any such defective product on behalf of the manufacturer.
- B. Term of Warranty
 - 1. Contractor will provide a 25-year product and performance warranty under the CommScope Uniprise program.
- C. Persons / Entity Covered
 - 1. This Limited Warranty will be for the benefit of the person or entity to which the manufacturer's Registration Certificate is issued and any successor (Transferable) in interest to the site in which such System was originally installed by the manufacturer or an Authorized manufacturer's Reseller.

1.11 SPECIAL REQUIREMENTS FOR CABLE ROUTING AND INSTALLATION

- A. Cabling
 - 1. All communications cabling used throughout this project will comply with the requirements as outlined in the National Electric Code (NEC®) Articles 725, 760, 770, and 800 and the appropriate local codes.
 - 2. All copper cabling will bear CMP (Plenum Rated) and all other appropriate markings for the environment in which they are installed.
 - 3. All fiber optic cabling will bear OFNP (Plenum Rated) and all other appropriate markings for the environment in which they are installed.
- B. Cable Pathway Reference section three Execution of this specification for all pathway requirements and workmanship expectations.
- C. Fire Stopping
 - 1. Fire stopping equipment and practices will comply with applicable national and local codes.
 - 2. Sealing of openings between floors, through rated fire and smoke walls, existing or created by the Contractor for cable pass through will be the responsibility of the Contractor.

- 3. Sealing material and application of this material will be accomplished in such a manner which is acceptable to the local fire and building authorities having jurisdiction over this work.
- 4. Creation of such openings as are necessary for cable passage between locations as shown on the drawings will be the responsibility of the Contractor's work.
- 5. Any openings created by or for the Contractor and left unused will also be sealed as part of this work.
- 6. All penetrations shall be sleeved and where allowed by code, will include fire stop pillows.
- D. Contractor Responsibility
 - 1. The Contractor will be responsible for damage to any surfaces or work disrupted as a result of his work. Repair of surfaces, including painting, will be included as necessary.
 - 2. The Contractor will rectify damaged caused at the Contractor's sole expense.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements indicated herein, provide products to the selected structured cable system:
 - 1. CommScope Uniprise Category 6

2.2 GUARANTEED CHANNEL PERFORMANCE

- A. Category 6 Guaranteed Performance
 - 1. All copper cable and apparatus shall conform to the Category 6/classD Channel Performance Specification.
 - 2. The Category 6 channel performance shall be measured over the full installed length and include 4 connection points.
 - 3. The Category 6 channel shall consist of all cable and components with four connections that comprise the full installed circuit from the Hub/Server/LAN Electronics port located in the Telecommunications Equipment Room or the main data administration location to the voice/data/video/imaging device port located at the User Work Station.
 - 4. The Category 6, 4 pair UTP channel shall support emerging high-bandwidth applications, including 1 Gbps Ethernet, potentially 1.2 Gbps ATM and 2.4 Gbps ATM, Multi-Tasked Split Screen Computing, Virtual Holographic Video Conferencing, Instant Access Telemedicine, 3D CAD/CAM Engineering, Internet-Intranet Communications/Commerce, as well as all 77 channels (550 MHz) of analog broad band video.
 - 5. The warranty shall be a transferable warranty and include all labor to replace any defective components as well as the component replacement.
 - The Category 6 channel with two (2) connection points shall have a minimum of 10dB Attenuation to Crosstalk Ratio (ACR), across the full frequency range of 1MHz -149.1MHz. At no point across the frequency range of 1MHz - 149.1MHz shall the ACR drop below 10dB.
 - 7. The Delay Skew on the 100-meter channel shall not exceed 30 ns.
 - 8. The Category 6 cable and components shall be electrically backward compatible with existing Category 3, 5e, 6 plus future networks.
 - 9. The Category 6 cable and components shall be physically compatible with existing installed base of equipment.
 - 10. The Category 6 cable and components shall not require special cords, specialty tools or special installation requirements.
- B. Outlet Locations

- 1. Unless otherwise noted on the floor plans or within this document, all voice and data wall outlets for 24 AWG copper cables will be:
 - a. 8-position/ 8-conductor modular outlets
 - b. Insulation displacement connectors
 - c. Support Universal applications in a multi-vendor environment, accepting modular RJ-45 plugs.
 - d. Provide blank module inserts for all unused module locations. Jack module arrangement is shown on the drawings. Provide color-coded inserts at each outlet, termination block and at patch panels as shown on the drawings.
 - e. Mounted in one, two or three gang utility outlet boxes as per the T series drawings.
 - f. Equipped with EIA/TIA-T568A and EIA/TIA-T568B universal wiring labels.

2.3 CATEGORY 6 OUTLETS

- A. Acceptable Manufacturer(s) and Part Number:
 - 1. CommScope UNJ600-(Color Code)
- B. Colors:
 - 1. In a four-cable location the upper left outlet shall be red (UNJ600-RD). The other three outlets shall be white (UNJ600-WH)
 - 2. In a two-cable location both outlets shall be white (UNJ600-WH)
 - 3. Security Camera outlets shall be green (UNJ600-GR)
 - 4. Access point outlets shall be blue (UNJ600-BL)
 - 5. Copper backbone outlets shall be violet (UNJ600-VL)
- C. All Category 6 outlets will meet or exceed NEXT, PS NEXT, FEXT, ELFEXT, PS ELFEXT and Category 6 transmission requirements for connecting hardware, as specified in ANSI/TIA/EIA 568-B.1 Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and be part of the UL® LAN Certification and Follow-up Program.
- D. The Category 6 outlets will be capable of being in a modular patching situation or as a modular telecommunication outlet (TO) supporting current and evolving high-speed, high-bandwidth applications, including Ethernet, 1000BASE-T, Token Ring, 100 Mbps TP-PMD, 155 Mbps ATM, 622 Mbps ATM using parallel transmission schemes.
 - 1. The outlet will provide for the use of either the EIA/TIA-T568A or EIA/TIA-T568B wiring. Terminate cables using 568B wiring scheme.
 - 2. The Category 6 outlets will be capable of being installed at either a 45° or a 90° angle in any approved manufacturer modular faceplate, frame, or surface-mounted box avoiding the need for special faceplates.
- E. Work area outlets shall be installed with the appropriate insert to accept specified horizontal cable.
- F. Work area outlets installed in furniture shall adhere to the standards set forth by BICSI and TIA/EIA.

2.4 FACEPLATES – WORK STATION LOCATIONS

- A. Acceptable manufacturer:
 - 1. CommScope Stainless Steel Labeled Faceplates
 - 2. Part #: UNF-MFM-(X) P-L-ST (X is placeholder for number of ports code)
- B. For all typical outlet locations, the flush–mount faceplates will be available in duplex arrangement in a single gang configuration.

- C. All unused ports will be filled in with a rear-loading blank module. The blank module will match the faceplate for color.
 - 1. Acceptable manufacturer: CommScope
 - 2. Part Number: M81-262 BLANK

2.5 HORIZONTAL STATION CABLE

- A. Acceptable Manufacturer:
 - 1. CommScope Uniprise UltraMedia 400 MHz Category 6
 - 2. Part # 7504
- B. Jacket color shall be Orange
- C. Cables shall be plenum rated
- D. Service loops will be installed at the work area outlet above the conduit stub-up in a J-hook. Loop will be 36" of cable and configured in an industry standards compliant arrangement.
- E. Category 6 UTP cables will extend between the station location and its associated MDF/IDF and consist of 4 pair, 24 gauge, UTP, and will terminate on 8 pin modular jacks provided at each outlet. The contractor is responsible for knowing which outlets terminate at the proper IDF or MDF. Refer to the T-series Sheets for outlet locations terminating in the MDF/IDF.
- F. All 4 pair Category 6 cables will conform to ANSI/TIA/EIA 568-B.1 Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and be part of the UL® LAN Certification and Follow-up Program.
- G. Applications standards supported should include, but not limited to, IEEE 802.3, 1Base5, 10BASE-T; IEEE 802.5, 4 Mbps, 16Mbps (328 ft. [100m], 104 Workstations) and TP-PMD. In addition, cables will be capable of supporting current and evolving high-speed, high-bandwidth applications, including Ethernet, 1000BASE-T, Token Ring, 100 Mbps TP-PMD, 155 Mbps ATM, 622 Mbps ATM using parallel transmission schemes.

2.6 FIBER OPTIC BACKBONE – MDF TO IDFS

- A. If required, Contractor shall provide and install a fiber optic backbones as shown on the drawings.
- B. Acceptable Manufacturer:

1.

- 1. CommScope,
- C. Backbone Cable Physical Specifications:
 - Backbone Cable Physical Specifications:
 - a. Interlocking Aluminum Armored
 - b. Indoor/outdoor
 - c. Plenum rated
- B. Backbone Cable Type and Strand Count:
 - 1. Twelve (12) strands of 50/125 µm Multimode, OM4, graded index Fiber Optic Cable
 - 2. Six (6) strands of Singlemode, tight-buffered Fiber Optic Cable
 - 3. It is preferred the single and multimode cable be of a composite configuration if available. Contractor to notify architect and owner regarding any lead times that could cause delays in construction schedule.
- C. All fiber optic cable installation and products shall adhere to current BICSI and ANSI/TIA/EIA standards.
- D. All cable shall be continuous and non-spliced from termination point to termination point.
- E. Cable may not exceed allowable bend radius according to manufacturer, BICSI and ANSI/TIA/EIA standards.

F. Fiber optic cable shall have service loops of 30' at each end and each service loop shall be properly secured above ceiling or directly below the rack location.

1.2 OUTSIDE PLANT TEXTILE INNERDUCT

- A. Acceptable Manufacturer:
 - 1. Maxcell 3 Chamber, 4" Innerduct
 - 2. Standard Outdoor Textile Innerduct: Micro (33mm), 2-inch, 3-inch and 4-inch single or multi-cell polyester/nylon textile innerduct containing 1250lb polyester flat woven pull tape.
- B. Textile Innerduct Installation
 - 1. Provide textile innerduct in conduit and wire ways, and place textile innerduct within and under cable trays using continuous un-spliced lengths of textile innerduct between maintenance holes, pull boxes, and/or termination points as indicated on the drawings.
 - 2. Conduit provided and installed by others.
 - 3. Follow manufacturer installation instructions
 - 4. Provide suitable textile innerduct slack in the maintenance holes, hand holes, pull boxes, and at turns to ensure there is no kinking or binding of the product.
 - 5. Textile Innerduct Mountings, Hangers and Attachments: When exposed indoors or in maintenance holes, hold firmly in place using independent support.
 - a. Design & install hangers and other similar fittings adequate to support loads and so as to not damage innerduct.
 - b. Do not fasten textile innerduct to steam, water, or other piping, ductwork, mechanical equipment, electrical equipment, electrical raceways, or wires
 - 6. Maintenance Hole and Hand Hole Installation:
 - a. At locations where textile innerduct will be continuous through a manhole or hand hole, allow sufficient slack so that the innerduct may be secured to the side of the vault maintaining the minimum bend radius.
 - b. At maintenance holes serving as the junction location, pull the exposed end of the innerduct to the far end of the vault, install termination bag, and secure to the vault.
 - 7. Penetrations
 - a. Seal all conduit and textile innerduct entering structures at the first box or outlet to prevent entrance into the structure of gasses, liquids or rodents.
 - b. Install proper firestopping products.
 - c. Exposed Textile Innerduct Penetrations: Install conduit sleeves or fire barrier sealing systems in all openings where open and exposed textile innerduct passes through fire-rated walls and floors. After installation, install intumescent fire barrier penetration sealing material (Hilti system) between textile innerduct and sleeves or fire barrier system.
 - d. Raceway Penetrations: After textile innerduct installation, install intumescent fire barrier penetration sealing material (Hilti system) between textile innerduct and conduit or wire way at all exposed penetration locations.
 - e. Protect adjacent surfaces from damage during water seal or fire stop installation. Repair any damage.
 - 8. Document entire installation process for future referrals.

1.3 FIBER OPTIC CABLE ENCLOSURES

A. Acceptable manufacturer:

1.

- OCC rack mount enclosure (with blanks to cover any unused area)
 - a. Part number: RTC36B

- B. Contractor shall provide all applicable parts for fiber termination enclosures provisioning for terminating strands. These parts may include, but are not limited to, connectors, adapter panels, bulkheads, termination kits, and consumables.
- C. Coordinate the installation of the fiber backbone termination shelf in the cabinet with LISD Technology prior to installation.
- D. Terminate the fiber in the MDF and IDFs as detailed in the drawings.
- E. Label all shelves as per specs.

1.4 FIBER OPTIC CABLE CONNECTORS

- A. Acceptable manufacturer: CommScope
- B. Termination shall be done with SC connectors.

1.5 FIBER OPTIC PATCH CORDS

- A. Acceptable manufacturer: Part #: RFJ-02ZC-16/29-5L-SCU-05-LCU & RFJ-02ZC-16/29-8W-SCU-05-LCU
- B. Contractor will supply cords in in each MDF/IDF location:
 - 1. Two (2) multimode 50/125 µm 10' duplex SC-to-LC fiber optic patch cords
 - 2. Two (2) singlemode 10' duplex SC-to-LC fiber optic patch cords
- C. Fiber optic patch cord shall be factory terminated.

1.6 CATEGORY 6 PATCH PANELS

- A. Acceptable manufacturer:
 - 1. CommScope Uniprise Modular Angled 48 Port (PN:UNP-MOD-V-48P)
- B. Contractor will calculate the number of ports based on the number of LAN outlets served by the IDF or MDF. All voice and data station cables will terminate on the same patch panel. Patch panel density must provide for an additional 10% growth capability.
- C. Provide and install rear patch panel cable support system
- D. The Category 6 patch panels will meet or exceed Category 6 requirements in ISO/IEC 11801, CENLEC EN 50173, FCC Part 68, and ANSI/TIA/EIA-568B.1 and will be UL Listed.
- E. Patch panel will provide labeling for all ports on the patch panel and will have a port identification that is visible with cords in place.

1.7 CATEGORY 6 PATCH CORDS

- A. Acceptable manufacturer
 - 1. CommScope Uniprise
 - a. Part #: UNC6-GY-7F
- B. Patch cords shall be of the same, or better, cable type as the installed horizontal cable.
- C. Patch cords are an integral unit in the channel and shall be handled with the same care and adhere to the same standards as the horizontal and backbone cable.
- D. Patch cords shall be provided by the Contractor at each terminated point in a building.
 1. All work area patch cords shall be gray and 7' in length except:
- E. Coordinate all other colors with LISD IT Staff.
- F. Division 27 Contractor to supply patch cords for both ends of any surveillance camera installations associated with the project.. Coordinate with Division 28 contractor for final quantities.

- G. All patch cords must be pre-manufactured to specified length and may not be lengthened, shortened, spliced, or field terminated by Contractor.
- H. Contractor shall install the patch cables at each Work Area Outlet above ceiling for surveillance. The contractor will connect the patch cable to the faceplate and leave the rest of the cable above ceiling at the faceplate location.
- I. Provide the patch cables for all locations and deliver them to the LISD Technology Department through the general contractor's transmittal process.

1.8 MOD-V PATCH PANELS

- A. Acceptable manufacturer:
 - 1. CommScope Uniprise Modular Angled 48 Port (PN: UNP-MOD-V-48P)
- B. Contractor shall mount outlets in an angled configuration
- C. Contractor will calculate the number of ports based on the number of LAN outlets served by the IDF or MDF. All voice and data station cables will terminate on the same patch panel. Patch panel density must provide for an additional 10% growth capability.
- D. ANSI/TIA/EIA-606-A Compliant
- E. Outlets are positioned so patch cable connectors are installed in a rotated/vertical position
- F. Outlets can be snapped into the modules on an angle to create an "angled panel" type configuration
- G. Uniprise information outlets can be independently installed and removed
- H. Equipped with 6-port bezels that can be easily removed from the front of the panel
- I. Includes large front facing labels and clear label covers
- J. Patch panel will provide labeling for all ports on the patch panel and will have a removable port identification strip that is visible with cords in place.
- K. Blank icon insert shall be provided and installed at all locations (outlet, blank insert and patch panels)

1.9 A/V COAXIAL BACKBONE CABLING

- A. Acceptable Manufacturer:
 - 1. CommScope Part #: 5916R
- B. Provide and install A/V Backbone Cable as identified in project drawings
- C. Terminate with BNC Connector on MOD-V patch panels next to Copper Backbone outlets.

1.10 MDF/IDF PLYWOOD

- A. Provide and install 3/4" fire-resistant plywood on walls as noted on drawings.
 - 1. Plywood shall be Paint-Grade Birch
 - 2. Plywood shall be painted white
 - 3. Finish side shall be on surface
- B. Plywood shall meet all applicable codes.

1.2 NON-CONTINUOUS CABLE SUPPORTS

A. Requirements

- 1. Non-continuous cable supports shall be ERICO CableCat J-HOOK series CAT12, CAT21, CAT32, CAT64, CAT21SS, CAT32SS, CAT64SS;
- 2. Adjustable non-continuous cable support sling: ERICO CADDY CableCat CAT425;
- 3. Multi-tiered non-continuous cable support assemblies: ERICO CADDY CATHBA and CableCat J-Hooks with screws; or approved equal.
- B. Description
 - 1. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.
 - 2. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
 - 3. Non-continuous cable supports sized 1 5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.
 - 4. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.
 - 5. Stainless Steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply.
 - 6. Constructed from steel and woven laminate; sling length can be adjusted to hold up to 425 4-pair UTP; rated for indoor use in non-corrosive environments. Rated to support Category 5 and higher cable, or optical fiber cable; cULus Listed.
 - 7. Adjustable non-continuous cable support sling shall have a static load limit of 100 lbs.
 - 8. Adjustable non-continuous cable support sling shall be suitable for use in air handling spaces.
 - 9. If required, assemble to manufacturer recommended specialty fasteners including beam clips, flange clips, C and Z purlin clips.
 - 10. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; cULus Listed.
 - 11. If required, the multi-tier support bracket may be assembled to manufacturer recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips.
 - 12. **No support may be secured to the drop ceiling grid support wire.** Contractors installing their support devices to the grid wire will replace the assembly at no cost to the Owner, the Architect or the General Contractor.

1.3 UNSPECIFIED EQUIPMENT AND MATERIAL

A. Any item of equipment or material not specifically addressed on the drawings or in this document and required to provide a complete and functional SCS installation will be provided in a level of quality consistent with other specified items.

1.4 GROUNDING SYSTEM AND CONDUCTORS

- A. Telecommunications Rack Ground Bar (RGB)
 - 1. Install Rack Ground Bar Kit to each new wall mounted equipment rack or cabinet.
 - 2. The contractor shall furnish and install a RGB in each new rack.
 - 3. Coordinate location of RGB prior to installation with the Technology Dept.
 - 4. Contractor shall ensure the RGBs are installed using only manufacturer-approved installation methods and materials.
 - 5. Contractor is responsible for proper grounding of RGB.
 - 6. Acceptable manufacturer: Chatsworth
 - 7. Part Name: Rack Ground Bar Kit
 - a. Part Number: 40172-001

- B. Grounding Conductor from Busbar to equipment
 - 1. The Contractor will provide a #6 AWG stranded copper wire cable insulated with a green jacket between the ground bars located at the IDF and the equipment, termination, equipment rack, ladder and computer equipment grounding points using proper end attachment hardware.
 - 2. Contractor shall attach grounding cable to appropriate end connecting hardware using manufacturer-approved materials and methods.
- C. Bonding and Grounding
 - 1. Communication bonding and grounding will be in accordance with the NEC® and NFPA.
 - 2. Horizontal cables and equipment will be grounded in compliance with ANSI/NFPA 70 and local requirements and practices.
 - a. Horizontal equipment includes cross connect frames, patch panels and racks, cable support ladder rack, active telecommunication equipment and test apparatus and equipment.
- D. Telecommunications Bonding Backbone
 - The Electrical Contractor, under a separate contract, will provide a Telecommunications Bonding Backbone between the TGB in each new IDF or concession building IDF and both an approved building ground (structure) and an approved panel ground. The Electrical Contractor will repeat this action for each IDF room TGB.
 - a. Electrical will size the grounding backbone as per the NEC and the measured distance from the ground bar to the building ground and to the panel ground.
 - b. Coordinate with the General Contractor on working with the electrical contractor on the new construction projects.
 - 2. Telecommunications Bonding Backbone shall be in compliance with NEC Article 250 and ANSI/TIA/EIA-607.
 - 3. Always provide Telecommunications Bonding Backbone when using non-shielded backbone copper cable.
- E. Grounding Lugs
 - 1. All grounding lugs shall two-hole lugs
 - 2. Both holes in the lugs shall be secured with appropriate hardware
 - 3. Attaching hardware shall be firmly secured
 - 4. Grounding lugs shall have a metal to metal attaching connection
 - 5. Painted and coated surfaces shall be neatly prepared for grounding lugs. Excessive removal of painting and/or coating shall be corrected with new product at Contractor's sole expense.
 - a. Contractor shall follow manufacturer's technical instructions for installation
 - 6. Outside plant cable, conduit, and terminals shall be grounded per manufacturer's instructions at all ends.

1.5 EQUIPMENT RACKS

2.

- A. MDF/IDF Equipment Racks
 - 1. Acceptable manufacturer: Chatsworth
 - Part Name: 7' Standard Rack with Vertical Wire Management
 - a. Rack Part # 55053-703
 - b. Vertical Wire Management 35521-703
 - Contractor will provide and install Equipment Racks in location and quantity per T Series drawings. Each two post rack shown will need its own set of vertical wire managers.

- B. The equipment racks will be made of high strength 6061-T6 aluminum construction, black in color and include all required mounting hardware and vertical wire management on both sides of the rack.
- C. RMU spaces are marked and numbered on the channels of all equipment racks
- D. Racks will be mounted on an isolation pad and utilize non-conductive washers to secure the rack to the floor.
- E. Floor mounted open racks will be secured from the top rail to the backboard in the room with a length of cable runway to prevent movement.
- F. All racks will be grounded to the isolated ground bar within the MDF /IDF using a standard ground lug and #6 jacketed green cable.

1.6 EQUIPMENT RACK ACCESSORIES

- A. Provide and install equipment rack accessories in locations and quantity shown on. Contractor to provide all necessary mounting hardware.
- Provide and install Chatsworth (CPI)1-port LCD Console with no KVM switch CPI PN 13380-729

1.7 LADDER RACK

- A. Acceptable Manufacturer: Chatsworth ladder rack 10250-712 and E-bends 10822-712
- B. Contractor will install 12" ladder rack in the MDF/IDF as shown on drawings.
- C. Ladder rack will be black in color.
- D. Contractor will ground all ladder rack in the MDF/IDF.
- E. Contractor will secure the ladder rack to the top of the equipment rack with the proper mounting plate.
- F. Contractor will install protective boots at each end of the rack assembly.
- G. Contractor will be responsible for providing the required amount of support equipment including but not limited to wall angle brackets, triangle support brackets, butt splice kits, junction splice kits, cable runway E-bends, rack to runway mounting plates etc.

1.8 THREADED ROD PROTECTOR

- A. If contractor uses threaded rod for cable support systems including tray, hooks, and slings a protector shall be installed
- B. A protector must be installed on any threaded rod that cable or cable bundle touches.
- C. Any cable which comes into contact with unprotected threaded rod shall be replaced at Contractor's expense.
- D. Chatsworth 11085-001 or approved equal

PART 2 - EXECUTION

2.1 WORKMANSHIP

- A. Components of the system will be installed in a neat, professional manner.
- B. Wiring color codes will be strictly observed and terminations will be uniform throughout the system.
- C. Identification markings and systems will be uniform.

D. ANSI/TIA/EIA 568-B wiring codes will standardize all SCS wiring.

E. Cable ties are not allowed on-site.

- 1. Category 6 cable can be irrevocably harmed with the use of cable ties.
- 2. Cables bundled with tie wraps during any phase of the installation will be removed and replaced with new product at the Contractor's expense.
- 3. Contractor must receive written authorization from Longview ISD to use tie wraps for any purpose.

2.2 GENERAL DESCRIPTION

- A. The wiring system components for Longview ISD will comply with all product specifications contained in PART 2.
- B. The structured cabling system will consist of the Work Area, Horizontal, and Backbone Riser, Backbone – Campus, Main Distribution Frame (MDF) Intermediate Distribution Frame (IDF), Entrance Facility (EF) and Administration elements.

2.3 WORK AREA

- A. Wiring and cords
 - 1. Contractor will supply the wiring or cords that connect terminal devices to information outlets in the proper lengths as outlined in PART 2.
- B. Transmission electronics
 - 1. Contractor will supply the necessary transmission electronics equipment listed under "Requirements by Floor" (if applicable) in order to complete the system successfully.

2.4 HORIZONTAL PATHWAYS AND WORKMANSHIP

- A. Horizontal Cabling
 - 1. Contractor will supply horizontal cables to connect each information outlet to the backbone subsystem on the same floor.
 - Unless otherwise noted on the floor plans or within this document, the type of horizontal cables used for each work location will be 4-pair unshielded twisted pair (UTP).
 - 3. The 4-pair UTP cables will be run using a star topology format from the administration subsystem (MDF/IDF) to every individual Telecommunication Outlet.
 - 4. The length of each individual run of horizontal cable from the administration subsystem (MDF or IDF) on each floor to the Telecommunication Outlet will not exceed 295 ft (90 m).
 - 5. Cable shall be installed using manufacturer and Category 6 standards based practices.
 - 6. Any cable installed in violation of above practices and additional guidelines in this specification shall be removed and new cable installed at Contractor's expense.
 - 7. Contractor will coordinate all final outlet locations for all cameras with the LISD Police Representative, the LISD Program Manager (CPS). In new construction areas this coordination will also include the electrical contractor and General Contractor. Notify the Program Manager and GC if conflicts arise in the pathways of the data cabling.
 - 8. During initial cable installation, or "rough-in," cable shall be protected.
 - a. Cable shall not be left exposed on the floor.
 - b. Cable shall be protected with open-top boxes, properly used slings, and approved barricades.
 - c. Cable shall not be suspended by tie wraps or any other means which cause cable deformation
 - d. Use wide-based support systems appropriate to bundle size to support cable during rough-in phase.

- 9. In suspended ceiling and raised floor areas where duct, cable trays or conduit are not available, the Contractor will bundle, in bundles of 48 or less, station wiring with Velcro straps snug, but not deforming the cable geometry.
- 10. Cable bundles will be supported via "J" hooks and/or saddles/slings attached to the existing building structure and framework at 48" 60" intervals.
- 11. Velcro straps will be used in the pathway for bundling cables. Plastic tie wraps are not permitted in the pathway for structured cable. All cables bundled by plastic tie wraps during any phase of the installation will be replaced at Contractor's expense.
- 12. Contractor shall not install cable in any conduit prior to the installation of conduit bushings.
 - a. For new construction areas only the contractor shall coordinate the installation of conduit bushings with electrical contractor. In all other areas of this project the contractor shall be responsible for obtaining and placing the bushings on any sleeves or conduits used.
 - 1) Use of a split bushing will not be accepted. Where found, it will serve as indication the cabling was pulled through without the bushing being in place, and the cables in these locations will be replaced at the contractor's expense.
 - b. Any anticipated delay of cable installation because of conduit or conduit bushing installation shall immediately be brought to the attention of the LISD Program Management (CPS) and the Architect. For sites where the general contractor will be involved in new construction the contractor shall report any issues to the GC.
- 13. All conduits must be free of debris prior to placing cable.
 - a. Cable that is placed in conduits with debris will be replaced at Contractor's sole expense.
- 14. Contractor will observe the recommended bending radius and pulling strength requirements of the 4pair UTP cable during handling and installation.
 - a. Bends which deform the cable jacket must be avoided. Violation of bend radius shall be remedied with the replacement of the cable at the Contractor's sole expense.
 - b. Cables pathways leaving J-hooks to conduit stub outs shall be a gradual sweep.
- 15. Each run of cable between the termination block and the information outlet will be continuous without any joints or splices.
- 16. Cable pathways will avoid crossing over electrical rooms.
- 17. Cable runs shall not be parallel to electrical pathways without proper separation.
- 18. In suspended ceiling and raised floor areas where walker duct, cable trays or conduit are not available, the Contractor will bundle station wiring with hook-and-loop (Velcro) cable straps at appropriate distances.
 - a. The cable bundling will be supported via J-hooks attached to the existing building structure and framework.
 - b. Each J-hook shall contain only one type of transmission media.
 - c. Do not support j-hooks with grid wire that supports the ceiling grid.
- 19. Cables shall not be support by or come in contact with HVAC ductwork.
- 20. Cables shall not wrap around or touch in anyway the building structural systems.
- 21. Cables will not be attached to lift out ceiling grid supports or laid directly on the ceiling grid. Cables will not touch ceiling grid support lines.
- 22. Cables will not be attached to or supported by fire sprinkler heads or delivery systems or any environmental sensor located in the ceiling air space including duct work.
- 23. Cables will not touch all thread. Areas where all thread come within 6" of the pathway will require the cabling contractor to place a manufactured split sleeve protection on the all thread in the area of the pathway.

- 24. Contractors that violate these standards will be required to remove the cable at fault, correct the pathway and re-install the cabling at Contractor's sole expense.
- 25. If the interior of walls is not obstructed, the Contractor will conceal horizontal distribution wiring internally within the walls. If such obstructions exist, Contractor will secure approval by the Architect and Longview ISD prior to the use of an alternate method.
- 26. Every effort will be made to schedule the requirements under this Contract in such a manner so as to complete all above ceiling work prior to ceiling tile installation. In the event Contractor is required to remove ceiling tiles, such Work will not break or disturb grid and must be coordinated with the General Contractor.
- 27. The 4 pair UTP cable will be Underwriter's Laboratories (UL) listed type MPR, MPP, CMR, or CMP as stated in this specification document.
- 28. Conduit runs installed by the contractor should not exceed 100 feet or contain more than two 90-degree bends without utilizing appropriately sized pull boxes.
- 29. Station cables and tie cables installed within ceiling spaces will be routed through these spaces at right angles to electrical power circuits.
- 30. <u>In new construction areas only.</u> All workstation and patch panel outlets must be protected from construction related dust by using dust-proof barriers. Outlets not protected will be replaced at Contractor's expense.

2.5 RISER BACKBONE

- A. Contractor will supply and install the transmission media and terminating hardware to provide interconnection between the MDF and each IDF if shown on the drawings.
- B. All cable routes to be approved by the Architect or Longview ISD prior to installation.
- C. All fiber optic cable will be of interlocking armored construction, and terminated in the MDF/IDF with the proper fiber connector in rack mounted fiber shelves as described in PART 2 of this specification.
- D. Contractor will run the riser cables in a star topology, terminated in the MDF at one end and each IDF at the other end.
- E. The cable will support voice and data applications.
- F. Contractor will observe the bending radius and pulling strength requirements of all backbone cables during handling and installation and all pathway requirements established in section 3.4.

2.6 EQUIPMENT ROOM

- A. Terminations
 - 1. Contractor will not be responsible for connecting the trunk crossconnect and the distribution crossconnect to the common equipment such as PABX or host computer in the equipment room.
- B. Cleaning all MDF and IDF rooms in the new construction areas shall be wiped down by the contractor prior to substantial completion and final acceptance.

2.7 ADMINISTRATION

- A. The administration subsystem will consist of wiring blocks and patch panels for termination of copper cables or low profile fiber optic patch panels for the termination of optical fibers.
 1. All wall field layouts to be approved by the Architect prior to installation.
- B. Fields
 - 1. Voice and data station cabling will terminate on the same patch panel.
- C. Cross-connect wire, patch cords

- 1. Contractor will supply cross-connect wire, copper and fiber patch for crossconnection and interconnection of termination blocks, patch panels, fiber shelves and fiber interconnection units per PART 2.
- D. Jumper type
 - 1. The type of jumper cables will depend on ANSI/EIA/TIA Category 6 applications, or fiber application and the termination block used, i.e. a punch panel, a patch panel termination block, or fiber patch panel.

2.8 INSTALLATION

- A. All installation will be done in conformance with ANSI/EIA/TIA 568-B.1 standards, federal and local standards and manufacturer design and installation guidelines.
 - 1. The Contractor will ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines will require the Contractor to provide, in a timely fashion, the additional material and labor necessary to properly rectify the situation. This will also apply to any and all damages sustained to the cables by the Contractor during the implementation.
- B. Bonding and Grounding
 - 1. The Contractor will be responsible for providing an approved ground at all newly installed distribution frames, and/or insuring proper bonding to all required installed equipment, devices, and support systems.
 - 2. The Contractor will also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, and framework.
 - 3. All grounds will consist of an insulated #6 AWG copper wire and will be supplied from an approved building ground and bonded to the main electrical ground.
 - 4. Grounding must be in accordance with the NEC, NFPA and all local codes and practices.
- C. Power Separation
 - 1. The Contractor will not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.
- D. Miscellaneous Equipment
 - 1. The Contractor will provide any necessary screws, anchors, clamps, bundling straps, distribution rings, wire molding (MDF & IDF locations), miscellaneous grounding and support hardware, etc., necessary to facilitate the installation of the System.
- E. Special Equipment and Tools
 - 1. It will be the responsibility of the Contractor to furnish any special installation equipment or tools necessary to properly complete the System.
 - a. Tools will include, but are not limited to:
 - 1) Tools for terminating cables,
 - 2) Communication devices,
 - 3) Supports for cable reels,
 - 4) Cable wenches.
- F. Labeling General
 - 1. Cable and pathway labeling will comply with ANSI/TIA/EIA-606-A-2002. This includes, but is not limited to the following systems:
 - a. Spaces
 - b. Pathways
 - c. Cable
 - d. Termination Hardware
 - e. Termination Position
 - f. Grounding & Bonding System

- 2. Format of cable, faceplate insert, and patch panel port label will be the same
- 3. All labeling shall be machine generated (Brady or equivalent).
- 4. Labels shall not be hand-written.
- 5. Labels shall be white with black letters. Font size will be standardized at all locations.
- 6. Contractor to verify this nomenclature with the District, as well as the District room numbers, prior to labeling.
- 7. The MDF identifier is "M"
- 8. Each IDF will have a unique alpha character (e.g. IDF "I1" or "I2")
- 9. Numeric identifier will be determined by MDF/IDF-Room Number-Position on faceplate.
 - a. Cable terminated to upper left port on first faceplate shall be "A", upper right shall be "B", lower left shall be "C", and lower right shall be "D" on a four-plex faceplate. The next faceplate in the room shall begin with "E" and continue in like manner.
- 10. Rooms and cables within rooms shall appear in sequential order on the patch panel.
- 11. Examples:
 - a. M-102-A
 - b. I2-312-G
- G. Labeling In plenum Face Plates
 - 1. The Contractor will label wall outlet covers on top or front with the cable drop identifier described above.
 - 2. Affix a machine printed label on the faceplate to identify the insert channel.
 - 1. Access Points and Cameras shall be labeled as to identify their purpose.
 - a. Access Point labeling shall add "AP" in the labeling and outlets in the plenum space shall have an additional label on the ceiling grid runners directly below the faceplate for the AP drop, viewable from the finished floor side.
 - b. Cameras shall have "CAM" in the labeling and outlets in the plenum space shall have an additional label on the ceiling grid runners directly below the faceplate for the camera drop, viewable from the finished floor side.
- B. Equipment Labeling and Administration
 - 1. Equipment Racks and Frames with MDF or IDF and Rack/Frame number
 - 2. Patch Panels (port identifiers)
 - 3. Fiber termination shelves
 - 4. Telecommunications grounding/bonding system
 - 5. Media Distribution cables
- C. Cable Storage
 - 1. The Contractor will not roll or store cable reels without an appropriate underlay and the prior approval of Longview ISD, the Architect or the General Contractor.
- D. Cable Records
 - 1. The Contractor will maintain conductor polarity (tip and ring) identification at the main equipment room (switch room), risers, and station connecting blocks in accordance with industry practices.

1.11 TESTING

- A. All copper cable channels will comply with, and be tested to, ANSI/TIA/EIA 568-B standards for Category 6 channel installations as appropriate.
 - 1. Testing of all copper wiring will be performed prior to system cutover.
 - 2. Contractor is required to notify Architect three (3) days prior to testing.
 - 3. 100 percent of the horizontal wiring pairs will be tested for opens shorts, polarity reversals, transposition and presence of AC voltage.
 - 4. Horizontal wiring pairs will be tested from the installed information outlet station cord to the MDF/IDF patch cord.

- 5. The Category 6 cable runs will be tested for conformance to the specifications of EIA/TIA 568-B.1 Category 6 (channel test).
- 6. Category 6 horizontal cables will be tested according to test set manufacturer's instructions utilizing the latest firmware and software.
 - a. The tester will be certified to be in compliance with Category 6 testing standards.
- 7. Testing will include all of the electrical parameters as specified in the Products Section of this Section 27 0000.
- 8. Any pairs not meeting the requirements of the standard, including an asterisk in results, will be accurately documented and immediately communicated with Longview ISD, the Architect and the General Contractor.
- 9. Channels passing with an asterisk are not acceptable and shall be replaced with new product and re-tested.
- 10. Contractor will provide one (1) electronic copy of all test documentation in native format and the PDF individual results on CD ROM to the structured cable manufacturer(s) with the final documentation.
 - a. Final documentation shall be delivered within five (5) working days following completion of all cable testing.
- 11. Contractor will provide one (1) electronic copy of all test documentation in native format and the PDF individual results on CD ROM to the architect for substantial completion purposes.
 - a. Final documentation shall be delivered within five (5) working days following completion of all cable testing.
- B. All fiber optic cable/connector channels will comply with, and be tested to ANSI/TIA/EIA 568-B standards for fiber optic cable installations.
 - 1. All fiber testing will be performed on all fibers in the completed end-to-end system.
 - 2. Testing will consist of a bi-directional end to end OTDR trace performed per EIA/TIA 455-61.
 - 3. The system loss measurements will be provided at 850 and 1310 nanometers for multimode fibers and 1310 and 1550 for single mode fibers.
 - 4. Loss Budget
 - 5. Fiber links will have a maximum loss of:
 - a. Allowable cable loss per km) (km of fiber in link) + (.4dB) (number of connectors) = maximum allowable loss
 - b. A mated connector to connector interface is defined as a single connector for the purpose of this RFP.
 - 6. Taking the sum of the bi-directional measurements and dividing that sum by two will calculate loss numbers for the installed link.
 - 7. Any link not meeting the requirements of the standard will be accurately documented and immediately communicated with Longview ISD, the Architect and the General Contractor.
 - 8. Contractor will provide (1) CD ROM copy to the Architect with the final documentation.
 - a. Final documentation <u>must</u> be delivered within five (5) working days of completion of the testing of the installed cable plant. This is critical for successful implementation of network implementation and for substantial completion inspections.
 - 9. In the event of a test failure, the Contractor will be required to re-test the failed cable or strand with a tester which meets the standard for Category 6 or fiber optic cable testing as appropriate.
 - 10. Tests results will be under the observation of LISD's Technical Staff or Architect/Engineer.
 - 11. Notification for, and assent of, re-test must be given and received no less than 48 hours prior to re-test.

- 12. Documentation of successful re-test will delivered to LISD within 48 hours subsequent to the re-test.
- 13. All replacement/repair/re-testing necessary to produce a channel that meets the requirements specified in this document shall be included in base bid price.

1.12 ENGINEERING

1.

- A. Planning meetings and schedule
 - An initial planning meeting will be held with the successful bidder to:
 - a. Clarify all requirements (systems, services, distribution methods, etc.),
 - b. Identify responsibilities,
 - c. Schedule the events that will transpire during the implementation of the project.
 - 2. Within a timeframe set by the Contractor and Architect of the initial meeting, the contractor will provide a written report and project schedule to clearly document the events and responsibilities associated with the project to both the General Contractor and the Architect.

1.13 DAMAGES

- A. The Contractor will be liable for any and all damages to portions of the building caused by it, its employees or subcontractors; including but not limited to:
 - 1. Damage to any portion of the building caused by the movement of tools, materials or equipment.
 - 2. Damage to any component of the construction of spaces "turned over" to the Contractor.
 - 3. Damage to the electrical distribution system and/or other space "turned over" to the Contractor.
 - 4. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of Contractor.
 - 5. Other damage to the materials, tools and/or equipment of Longview ISD, its consultants, General Contractor, subcontractors, Architect, other contractors, agents and lessees.

1.14 PENETRATIONS OF WALLS, FLOORS AND CEILINGS

- A. Prior consent
 - 1. The Contractor will make no penetration of floors, walls or ceiling without the prior consent of the Architect, General Contractor or District.
- B. Sealing penetrations
 - 1. Where penetrations through acoustical walls or other walls for cableways have been provided for the Contractor or made by the Contractor, such penetrations will be sealed by the Contractor in compliance with applicable code requirements and as directed by the General Contractor.
 - 2. Where penetrations through fire-rated walls for cableways have been provided for the Contractor or made by the Contractor, the Contractor will seal such penetrations as required by code and as directed by the General Contractor.

1.15 PROJECT DIRECTION

- A. Single Point of Contact
 - 1. Contractor will provide a single point of contact, i.e., Project Manager, to speak for the Contractor and to provide the following functions:
 - a. Initiate and coordinate tasks with Longview ISD, its General Contractor, Architect, and others as specified by the Architect or General Contractor.
 - b. Provide day-to-day direction and on-site supervision of Contractor personnel.
 - c. Ensure conformance with all Contract provisions.

- If the Project Manager is unable to remain continuously on site a project foreman will be required to remain. The project foreman will be responsible for day-to-day activities and reporting all status to the Project Manager.
 a.
- B. Manufacturer Warranty
 - 1. Contractor will provide the warranty for all installed products as covered by the structured cabling solution manufacturing Warranty Platform.
 - 2. Contractor will provide the warranty for all other installed products as covered by the respective manufacturers.
- C. Additional Warranty
 - 1. Contractor will state any additional Contractor supplied warranty.

1.16 PRE-COMPLETION REQUIREMENTS

A. The contractor will provide all test and record drawings at the time of patch cable delivery. This requirement must be met prior to the start of any final acceptance process. Delays in completing this documentation will result in a delay in the final acceptance process. See all relevant information in this section for more information.

1.17 DOCUMENTATION AND FINAL ACCEPTANCE

- A. Project Record Documentation
 - 1. Closeout documents will be submitted under provisions of Section 01 7700 and 01 7800 with the following provisions.
 - 2. Upon completion of final engineering and incorporation of the Architect review comments, Contractor will provide to the Architect for its records the following close out documentation:
 - a. Master Floor Plans (drawings) shall include:
 - 1) Cable routing for all horizontal and backbone pathways.
 - i) Pathways will be shown in separate colors
 - ii) Provide a key legend distinguishing the colors with the specific route.
 - iii) Pathways will show the cable plant from the work area outlet to the nearest MDF/IDF and the fiber and copper backbone (if applicable) pathways from each IDF to the MDF
 - iv) Pathways will include all work area locations including wireless access points, surveillance cameras or other drop locations.
 - 2) Rack elevations
 - i) Rack elevations shall show all components as installed under this contract.
 - ii) Contractor will label each component describing the particular component. (Examples: Fiber termination shelf, copper backbone patch panel, voice station patch panel, data station patch panel etc).
 - 3) Detailed layout of the wall field (only if applicable)
 - b. Show all drop locations with their approved labeling at the actual locations they were installed. Drawing labels will match the actual label used on the faceplate at each work area outlet, on the ceiling grid and at the patch panel.
 - c. Drawings will contain the contractor's own title block on the edge of the drawing and will include:
 - 1) Company name,
 - 2) Company address and phone number for service.
 - 3) Date on the drawings will match the date of acceptance for warranty purposes.
 - 4) Use of any part of the Huckabee title block is not acceptable at any time.

- 3. Drawing documentation will be in the following format:
 - a. One (1) hard copy of all diagrams and drawings in "E" size (30" x 42").
 - b. Two (2) electronic copies on CD-ROM.
 - 1) CD-Rom will be identified with a machine-generated label with the Project Name, Client Name, Contractor Name and date of production.
 - 2) Drawings will be in both CAD and PDF format and the contractor will include all files on each CD.
- 4. Drawings shall be provided to the architect two weeks prior to the installation of the District active network equipment. Coordinate with the owner during the pre-construction meeting for low voltage contractors to schedule this delivery date.
- 5. The drawings will be reviewed on site with the architect and the owner prior to the final acceptance process. Drawings rejected for any reason will delay the final acceptance process until resolved.
- B. Testing Results
 - 1. In addition to the project record drawings, the contractor shall provide the testing information for all horizontal station cabling and all fiber backbone cabling.
 - a. Test results shall be provided to the architect two weeks prior to the installation of the District active network equipment. Coordinate with the owner during the pre-construction meeting for low voltage contractors to schedule this delivery date.
 - b. The drawings will be reviewed on site with the architect and the owner prior to the final acceptance process. Test results rejected for any reason will delay the final acceptance process until resolved.
 - 2. In addition to the above copies the contractor shall provide the required documentation to the structured cable manufacturer(s) with the final documentation as part of the warranty process.
- C. Once accepted by the architect and owner all documentation becomes the property of LISD.

1.18 COMPLETION OF WORK

- A. At the completion of the Work, the Contractor will clean all the provided and installed equipment as well as the work spaces, MDF, IDFs, all aspects of the project site and on a daily basis, will remove all waste and excess materials, rubbish debris, tools and equipment resulting from or used in the services provided under this Contract.
- B. All clean up, restoration, and removal noted above will be by the Contractor and at no cost to Longview ISD, the Architect or General Contractor.
- C. If the Contractor fails in its duties under this paragraph, Longview ISD or the General Contractor may upon notice to the Contractor perform the necessary clean up and deduct the costs thereof from any amounts due or to become due to the Contractor.
- D. Contractor will coordinate through the General Contractor for dumpsters and material storage locations.
- E. It will be the Contractor's responsibility to remove trash from the areas it is working in and bring trash and debris to the dumpster.
- F. The Contractor will not use the General Contractor's dumpsters or trash disposal without prior approval of the General Contractor.

1.19 INSPECTION

- A. The Project Manager and/or Manufacturer System Manager will perform on-going inspections during construction. All work will be performed in a high quality manner and the overall appearance will be clean, neat and orderly.
- B. The following will be examined and will comply satisfactorily in all instances.

- 1. Is the design documentation complete?
- 2. Are all cables properly labeled, from end-to-end?
- 3. Is the cable type suitable for its pathway?
- 4. Have the pathway manufacturer's guidelines been followed?
- 5. Are all cable penetrations installed properly and fire stopped according to code?
- 6. Have the Contractors avoided excessive cable bending?
- 7. Have potential EMI and RFI sources been considered?
- 8. Is cable pathway fill ratios correct for installed quantities?
- 9. Are hanging supports within 48-60 inches (4-5 feet)?
- 10. Does suspended cable exhibit some sag?
- 11. Are telecommunications MDF/IDF terminations compatible with applications equipment?
- 12. Have Patch Panel instructions been followed?
 - a. Jacket removal point
 - b. Termination positions
 - c. All pair terminations tight with minimal pair distortions
 - d. Twists maintained up to Index Strip within ¹/₂" of termination
- 13. Have Modular Panel instructions been followed?
 - a. Cable dressing first
 - b. Jackets remain up to the Connecting Block
 - c. All pair terminations tight and undistorted
 - d. Twists maintained up to the Connecting Block
- 14. Are connectors properly turned right side up in the Jack Panels without cables wrapped or twisted around the Mounting Collars?
- 15. Have the correct outlet connectors been used?
- 16. Have outlets been wired correctly? (T568A or T568B)?
- 17. Is the cable jacket maintained up to the insert?
- 18. Are identification markings uniform, permanent and readable?
- 19. Has all grounding been properly installed for all required equipment and locations?
- 20. Are the IDFs and the equipment installed and provided completely clean?

END OF SECTION