

**Travis County ITS  
Communications Structured Cabling**



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## ***Architectural***

- In multiple story structures, telecommunication rooms and equipment rooms shall be stacked vertically with a minimum of two walls stacked directly over one another (3 walls preferred) so that riser pathways align.
- The floor and walls of the telecommunications rooms need to be completed as soon as possible due to the remainder of the work that needs to be done installing equipment. These rooms cannot be turned over at the end of construction. Ideally, telecommunications rooms finish out this would be completed by the midway point of construction and turned over for potential equipment installation.
- Communications room walls shall extend from floor slab to ceiling deck and provide an adequate physical barrier/ separation from adjacent spaces.
- Exterior walls shall provide adequate insulation and moisture barrier.
- Windows are not permitted on exterior or interior walls of ANY telecommunication closet.
- To reduce particulate contamination within the telecommunication closet/data center space, the Telecommunications Infrastructure Standard for Data Centers (TIA 942), Section 5.4.8.5 – Treatment, states that “Floors, walls, and ceiling shall be sealed, painted, or constructed of a material to minimize dust.”. Floors will be covered with VCT and or sealed concrete at a minimum.
- All perimeter walls of telecommunications rooms shall be covered with ¾ in. X 4 ft. X 8 ft. AC grade fire retardant plywood from 12 in. AFF capable of supporting mounted hardware and equipment. Plywood shall be affixed to wall studs with screws that penetrate the studs a minimum of 1 in., are spaced not greater than 1 ft. apart in each stud, and with screws one inch from the top and bottom of plywood. Plywood shall be painted with two coats of intumescent latex fire-retardant white paint on all six sides leaving one fire rating stamp per 4x8 sheet unpainted for verification of specification. Smooth side of plywood shall face interior of room.
- All Telecommunication rooms shall have a minimum of one lockable-keyed entrance door, 36 in. wide and 80 in. tall, that opens outward, does not open into another room, is equipped with automatic closer, and includes installed self-latching locks.
- Room dimensions must allow adequate space around rack(s) with a minimum of 36” clearance between front/rear of rack(s) to perimeter walls. Access on minimum one side of rack(s) shall be minimum 36” to allow access from the front to rear of rack(s).
- Locate communications rooms where total standard cable length, as measured by a cable tester, does not exceed 295 ft. including vertical sections at I/O (information outlet), vertical sections at communications rooms, and service loops (10’ at communication room, 3’ at I/O).

## ***Room Sizing Requirements:***

### **Communications Room Sizing:**

- Dimensions -- Building is less than 8000 sq ft – 10' x 8'
- Dimensions -- Building exceeds 8000 sq ft – 10' x 10'
  
- Dimensions -- Floor is less than 5000 sq ft – 10' x 9'
- Dimensions -- Floor is less than 8000 sq ft – 10' x 10'
- Dimensions -- Floor exceeds 8000 sq ft – 10' x 12'

### **Demarcation/Entrance Facility:**

- Dimensions -- min – 10' x 9'

In buildings where Travis county is the sole tenant the entrance facilities or Demarc can be located inside the MDF but in building where Travis County is NOT the sole tenant the Demarc MUST be separate, and have a minimum a 4 – 4" conduits from this room to the MDF.

There must be 2 separate entrances from the exterior of the building to the Demarc room and have 2 -4' conduits dedicated solely to Travis County use.

These rooms if separate from the MDF do not require the cooling and other environment controls that the MDF room requires.

These rooms will be for Travis County only, no other outside Vendors, ( e.g.: Spectrum, level 3, AT&T will be allowed access.

## ***Mechanical***

It is recommended that communication rooms have independent, cooling systems capable of 24/7 availability to keep communication rooms at an average of 68-75 degrees F, with a relative humidity of between 35% to 55%.

- It is recommended that communication rooms HVAC equipment be equipped with temperature sensors that have the capability of notifying ITS of temperature/humidity abnormality.
- Install sensors in the communications rooms with the ability to signal for cooling, independent of requirements of other spaces.
- Piping containing water/fluids/venting shall **not** pass through or over any communications room or be allowed in the walls of any communications room.
- HVAC ducting shall not be placed in or run through any communications room except as required to service those rooms.
- If sprinkler heads are provided installation of wire cages are to be provided to prevent accidental operation. For wet pipe systems, do not place sprinkler heads over equipment or cabling. In the event of a leak this will protect the equipment and cabling.
- Any telecommunications room with “wet” fire suppression shall have the water piping shall be placed over aisles or wall mounted and not directly over equipment.
- If sprinklers are used, recommend dry pipe systems.
- It is recommended that telecommunications rooms over 150 SF or that containing significant quantities of electronic equipment be equipped with a “dry type” fire retardant system. At the minimum, these larger rooms shall have dry pipe sprinkler systems installed.
- Communication rooms served by building HVAC should be provided with a separate zone sensor with programming to call for over-ride cooling after building occupied hours.
- The room should be remotely monitored for fire, smoke and intrusion. The room should also be monitored for high/low temperature (+85 degrees F/+ 55 degrees F).
- Video surveillance cameras shall be placed in each MDF/IDF monitored by ITS – Site Ops.

## ***Electrical***

- Grounding Equalizer (GE) For buildings with more than one communications room on a floor, and greater than three floors, connect the TGBs together at the top floor with a GE and then every three floors. Size this conductor the same as the TBB.
- Bonding Conductor for Telecommunications (BCT) this conductor shall be run from the TMGB isolated to earth ground. We recommend two-hole compression connectors for bonding the TBC, and that the TBC be a minimum 2/0 AWG wire. The minimum size shall be the same size as the TBB. All bonding conductors shall be bonded to busbars in an approved manner. Exothermic welds or two-hole compression connectors are recommended. Final designs of electrical systems are to be approved by electrical engineer of record.
- The BCT shall be installed with no kinks, cuts or abraded insulation, and in as straight a line from point of origin at grounding system to the TMGB as is practical. Any bends in the conductor shall be smooth long radius bends.
- Telecommunications Grounding Busbar (TGB) The grounding terminal for all telecommunications rooms other than the MC. Busbar shall be copper, be at least 4 in. (100mm) in height; ¼ in. (10mm) thick, and at least 12 in. in length. It shall be equipped with rows of bolt holes regularly spaced and sized according to BICSI/TIA standards. The buss bar shall be affixed to the backboard with insulating brackets that stand off of the backboard at least 3 in. If multiple bars are used in one room, they shall be bonded together so as to form a continuously bonded system. Refer to drawings for specific location. The TGB shall be electrically connected to the TMGB with a bonding conductor. If any part of TMBC passed through a metallic sleeve or raceway, that raceway shall be bonded to the building's grounding electrode system at both ends. All ground lugs shall be affixed with stainless steel nuts, bolts, washers, and lock washers per ANSI/EIA/TIA-607B.
- Telecommunications Main Grounding Busbar (TMGB) The main grounding terminal for telecommunications. Install in the MC. Busbar shall be solid copper, be at least 4 in. (100mm) in height; ¼ in. (10mm) thick, and 20 in. length. It shall be equipped with rows of bolt holes regularly spaced and sized according to BICSI/TIA standards. The buss bar shall be affixed to the backboard with insulating brackets that stand it off of the backboard at least 3 in. If multiple bars are used in one room, they shall be bonded together so as to form a continuously bonded system. Refer to drawings for specific location. All ground lugs shall be affixed with stainless steal nuts, bolts, washers, and lock washers per ANSI/EIA/TIA-607B.
- Busbars shall be tin plated copper to resist corrosion.
- Surface mounted electrical panels supplying power to communication rooms shall be used for communications equipment exclusively. The dedicated panel board should be a minimum of 24 breaker spaces, 120/208 Volt. Coordinate with Owner for voltages/ amperages that will be required. These panels shall contain isolated grounding capability for receptacles dedicated to electronic/computer equipment in the rooms.
- The electrical panel shall be located in a corner of the room in order to easily accommodate 3 ft. of clear space needed in front of the panel. Coordinate clearance with data rack placement guidelines.
- No mechanical or general electrical loads shall be supplied from the communications panels.
- Install no electrical panels in the communications rooms that are intended for loads other than telecommunications equipment.

- UPS backup of equipment in telecommunications rooms may be via a stand-alone unit or in combination with emergency generator backup (which is recommended).
- Install **dedicated** receptacle circuits in the communication rooms for standing racks/cabinets. Quad 5-20R outlets shall be installed directly above installed vertical cable managers. Verify specific locations as identified on communication drawings.
- Utility duplex outlets mounted around the perimeter of communications rooms spaced at a maximum of 12 ft. apart (at least one on each wall).
- Provide uniform illumination of at least 50 ft. candles; Light fixtures shall be on emergency power and a minimum of 8 ft. - 6 in. A.F.F.
- Light fixtures in communications rooms are to be positioned for maximum lighting. Do not install over cable tray/ ladder rack, cabinets, and 19 in. standing racks.
- Install separate raceways for voice/data cabling. Do not combine cabling for same raceway. The exception to this requirement is cable tray that has a grounded metal divider to separate the voice/data cabling and the cabling for other services such as Security/Life Safety.
- Separation requirements for voice/data cabling in the building and related equipment in communication rooms:
  - Transformers: Minimum 6 ft. separation
  - Electric Motors: Minimum 4 ft. separation
  - Air Conditioning Units: Minimum 4 ft. separation
  - Electrical Panel boards: Minimum of 3 ft. separation in front of panel boards.
  - Fluorescent fixtures/ballast type fixtures (non-incandescent fixtures): Minimum 1 ft. separation.
  - Transformers over 30 KVA should not be located near communication equipment.

# Communication Pathways

## Conduit

- ☒ A minimum of a 1 inch EMT conduit is needed. When installing the conduit no “hard” 90 turns will be used instead the use of 2 -45 degree bends with a separation of at least 6 inches between bends or sweep 90’s.
- ☒ Only deep 4 square boxes will be allowed no shallow boxes as they do not allow for the bend radius needed to attach the cable to the faceplates.
- ☒ All conduits must include plastic bushing on the end in the ceiling entrance.
- ☒ All conduits will enter the TOP of each box not the side.
- ☒ In areas where a “ring and string” method are going to be used there must be a clear channel of at least 4 inches wide with no sharp edges from channeling of metal studs or headers.
- ☒ Conduit for entrance facilities should be a minimum of 2 -4” conduits coming from separate side of the building into the Demarc location.
- ☒ Conduit from the Demarc to the MDF if separate should be min 4-4” conduits.

- Note: The net effect of this requirement is that rooms should be placed no further than approximately 210 ft. from the farthest information outlet as measured on plans, when measurements follow the most likely routing of corridor cable trays and other cable supports such as J-hook runs.
- Provide and install fire stopping for all floor / wall penetrations.
- Sleeve grounding shall be coordinated with electrical engineer.
- New communication rooms shall be equipped with fire detection and fire-extinguishers. Detection devices should be interlocked with the base building fire alarm system. A minimum of one (1) smoke detector shall be installed in each communications room.
- All horizontal chase openings shall be properly finished with stud-framed openings through walls. Opening sizes shall be coordinated with Communication’s Designer for fire stopping and sizing details.

## Cable Tray

- All cable tray/runway must be prefabricated structure consisting of two side rails connected by individual transverse members. Wire mesh type tray (Panduit WyrGrid) shall be used.
- Install cable tray/runways on the opposite side of main corridors from electrical and plumbing installations. Coordinate layout with electrical, HVAC, and plumbing contractors to insure adequate space for cable tray/runway and cabling installation. Minimum space requirements: 1 ft. above cable tray/runway and a minimum of 3 ft. of unencumbered access every 10 ft.
  - Install/Provide Cable Tray/Runway system for raised floor as per communication drawings. Cable runway shall include components for 45 and 90-degree turns, intersections, support hardware, grounding, etc. Contractor shall be responsible for providing a complete cable runway system.



- Cable tray/runway must meet the following clearances:
- A minimum of 1 ft. vertical clearance is to be maintained above suspended ceiling tiles and T-bars.
- A minimum of 3 in. of vertical clearance is to be maintained above conduits and exposed cabling when crossing perpendicular.
- A minimum of 1 ft. of clear vertical clearance is to be maintained above cable trays/runway.
- When minimum separation distances below the cable tray/runway for parallel installations cannot be met, solid bottom cable tray is to be installed.
- When minimum separation distances below the cable tray for perpendicular 3 in. installations cannot be met, or where cable tray/runway must be placed over electrical devices such as small motors, fluorescent fixtures, fixtures with ballast and cable tray/runway cannot be placed at least 1 ft. above devices, solid bottom cable tray is to be installed.
- Where cable tray/runway must cross perpendicularly to other trades installations tray shall pass below those installations by a minimum of 1 ft. and above by 3 in.
- The cable tray/runway shall be free of any sharp edges or obstructions that can damage the cables.
- All cabling entering or exiting cable tray will be in a sweeping 90-degree angle. All new cabling introduced to tray will not block or trap existing cables.
- Wire basket shall be powder coated BLACK.
- All sections of cable tray/runway on all floors are to be bonded to one another and to an isolated grounding electrode system bus bars in the telecommunication's MC/equipment room and communications rooms using a #6 insulated copper wire.
- For communications rooms, install one slot (a UL approved fire rated assembly) large enough to accommodate cable runway entry from corridor and a fire-retardant system (pillows, bricks, boards, mechanical, etc.). The formed slot shall have no burrs or sharp edges. This opening in the wall will be used to pass data voice, and video services cabling from the corridor cable tray/runway into the communications room.
- Coordinate the height of the slot with the cable tray/runway installer so that there is no vertical transition from the cable tray/runway through the slot. Install cable tray/runway in accessible ceiling space.
- No other cables will be run in or attached to the cable tray installed for voice and data cabling.

# ***Travis County Data/Voice/Video***

## **General Description**

SIO	Single Information Outlets: Two data cables within single faceplate.
Cat6	Legacy Voice Applications (analog telephone, fax, and modem)
Cat6	Legacy Data Applications (LAN, mainframe, midrange moves, add/change work)
Cat6A	VoIP, Data, WIFI Applications – entire floor remodels and new buildings
OM4	Data /Video (LAN) backbones
OS2	Data /Video (LAN) backbones

Solution to support infrastructure for data, telephone, intercom, security/video cabling. The specific scope will be in accordance with applicable EIA/TIA, BICSI and Travis County Structured Cabling Standards. The specific scope of work shall also comply with all mandatory requirements to certify any new installations and maintain existing installation certifications under the ***Panduit Certification Plus System Warranty***

In the past, Travis County has utilized a Category 5E or Category 6 communications cable plant for data and a Category 3 or Category 6 communications cable plant for voice. However, Travis County is currently migrating towards a Category 6a communications cable plant for data and voice communications.

Work performed for new communications cable plants will consist of Category 6a communications cable plant and work performed for existing communications cable plants will match the existing communications cable plants and utilize the Category 6 communications cable plant. The color of the cables and jacks will match the existing cabling in the building.

Travis County expects our cabling vendor to provide a “turnkey” installation including all aspects of each job including but not limited to the following:

*All pathways for a complete installation e.g.: Core drilling, Trenching, Directional boring, Aerial, Setting telephone poles etc...*

*Copper (cat3 –cat6a) inside plant and outside plant installations fiber inside plant and outside plant installations*

*Fire stopping all penetrations*

## Station Cabling

### **Add/Change: Standard Category 6 outlets**

A single outlet is installed to fulfill both voice and data needs- (2) Category 6 grade cable for data. (1) Category 6 grade cable for voice. Station cabling is home run to the nearest designated Intermediate Distribution Facility (IDF) closet and is terminated in the following fashion:

Data                    (Cat6 UTP BLUE) -                    Terminated on rack mount modular patch panel w/ BLUE jacks

### **New Build: Standard Category 6a outlets**

A single 2-port outlet is installed to fulfill both voice and data needs using an angled faceplate. (2) Category 6a grade cables for voice and data. Station cabling is home run to the nearest designated Intermediate Distribution Facility (IDF) closet and is terminated in the following fashion:

Data                    (Cat6A UTP Gray) -                    Terminated on rack mount modular patch panel w/ Blue jacks  
Voice                    (Cat6A UTP Gray) -                    Terminated on rack mount modular patch panel w/ Black jacks

## Backbone Cabling

OM4 – Minimum 12-Strand                    Rackmount Enclosure, UPC LC Fusion Termination  
OS2 – Minimum 12-Strand                    Rackmount Enclosure, UPC LC Fusion Termination

## Copper Tie Cabling

Existing cable plant (Cat 3)                    Terminated on 66 Blocks at D-mark.  
New cable plant (Cat5e 25-pair)                    Terminated on RJ-45 rack mounted patch Panel 1 pair per port.

## MDF/IDF Telecom (typical minimum)

(2) 19"x7' 2-Post Open Rack w/ threaded holes  
10" FRONT/REAR Vertical Management w/ Doors (IDF)  
10" FRONT/REAR Vertical Management w/ Doors (MDF)

2U Front ONLY Horizontal Management dependent on switch layout.  
Rack mount fiber LIU (1U) Expandability 96-Strand LC Minimum  
Appropriate fiber fusion trays/organizers.  
Cable basket/ladder as specified.  
Horizontal Cabling  
Bonding/Grounding

*Following ANSI/TIA-607-D standards. (or latest revision)*

## Telecommunications Contractor Qualifications

Contractor shall be a Panduit PartnerONE Certified Contractor (PCI) in good standing and have held certification for a minimum of five (5) years.

ALL on-site installers shall be certified, trained, and experienced on the specific installation, termination and testing of the systems as specified. Vendor shall provide a list of their installers with their work experience, training history, and manufacturer's certifications provide technical certificates. Subcontracted employees are not allowed.

Contractor shall have a Registered Communications Distribution Designer (RCDD) on staff. Vendor shall provide proof of full-time on staff RCDD.

Contractor shall a dedicated Project Manager an assigned to each Travis County project.

Contractor shall be an established business (with local office within 30-miles of Travis County) and shall have been in business for a minimum of Five (5) years.

Contractor shall have prior experience with projects of a similar size and scope and shall provide a minimum of three (3) references comparable to Travis County.

*The Contractor shall provide the following information for each reference: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.*

Past performance with the Travis County Government - ITS department is a selection criterion. Experience related to any past or present project with the Travis County ITS department shall be disclosed with bid response.

Qualified Bidders shall submit proof of all certifications and experience detail with bid response and product submittals.

Contractor shall provide a list of specialty equipment owned by the company that may be used to complete one or all aspects of potential work for Travis County.

Contractor shall provide a Proposal plan for communication with Travis County and shall relay status of each job on a daily or weekly basis.

Contractor shall provide itemized costs for products listed in the specifications.

## **Submittals (To Be Submitted with Proposal)**

Manufacturer Certifications for Company.

Verification of Panduit certification held a minimum of Five (5) years.

Manufacturer Training Certifications for ALL Installers.

No subcontracted employee acknowledgement.

Project Manager/Superintendent RCDD Certification.

Manufacturer Certification/Warranty offering.

Proof of established business with local support that has been in business for a minimum of Five (5) years.

Project / client references

Past performance with Travis County ITS.

List of test equipment that will be used.

## **Pre-Installation to be Submitted with Each Individual Project:**

Original Equipment Manufacturer (OEM) documentation for each component proposed must be provided to ITS, which certifies performance characteristics. Vendor shall not purchase or install any equipment until OEM documentation has been received and approved by ITS.

Product data sheets for all proposed system components. Product data sheets shall include: an equipment schedule listing of all system components to be installed in the project and the manufacturer's product reference and specification literature for all products to be utilized and/or installed in the project. Vendor shall not purchase or install any equipment until product data sheets have been received and approved by ITS.

Vendor shall provide to ITS shop drawings of the proposed layouts of equipment and cable plant. Shop drawings shall include equipment rack layouts, wall elevations, system schematics and riser diagrams.

## **Post Installation to be Submitted with Each Individual Project:**

Vendor shall prepare, update, and make available to ITS a comprehensive set of drawings accurately depicting the "as-built" condition of the Communications Cable Plant as it was installed. As-Built drawings must be provided on a CD- ROM in PDF and AutoCAD 2008 or higher.

The Vendor shall prepare, update, and make available to ITS a comprehensive set of "as built" drawings using the original scale, indicating exact dimensions and locations of all telecommunication rooms, frames, racks, trays, terminal blocks, patch panels, cable runs, cable pathways, workstation locations, and labeling scheme. These drawings shall be turned over to ITS at the time of Substantial Completion of the cable plant installation. Final payment will not be made until these drawings are received and approved by ITS.

The Vendor shall provide test documentation for the Communications Cable Plant to ITS at the time of Substantial Completion. Test results shall be provided by email in PDF format. Test documentation shall include bi-directional Power Meter and bi-directional Light Source Fiber Optic Tests and Category 6, Category 6a test results for each cable

drop. Final payment will not be made until these test results are received and approved by ITS. Test documentation shall be labeled in the following order:

Inter-Building Outside Fiber Optic Cable  
Inter-Building Outside Copper Cable  
Intra-Building Fiber Optic Cable  
Intra-Building High-Pair Count Copper  
Horizontal 4-Pair UTP Data Cable  
Horizontal 4-Pair UTP Voice Cable

The vendor shall furnish the original Certificate of Certification/Warranty to ITS at the time of final systems acceptance. Final payment will not be made until this Certificate of Warranty is received and approved by ITS.

Vendor shall provide warranty information to include the name, address and phone number contacts for warranty call outs. Final payment will not be made until this warranty information is received and approved by ITS.

Vendor shall provide pictures of major components of an installation.

## **Codes, Standards and Regulations**

1. Contractor is responsible for knowledge and application of current versions of all applicable standards and codes. In cases where listed standards and codes have been updated, Contractor shall adhere to the most recent revisions, including all relevant changes or addenda at the time of installation.
2. ANSI/TIA:
  - a. ANSI/TIA-526-7-A (July 2015) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
  - b. TIA-526.2-A (July 2015) Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable - Adoption of IEC 61280-1-1 ed. 2 Part 1-1: Test Procedures for General Communication Subsystems – Transmitter Output Optical Power Measurement for Single-Mode Optical Fiber Cable
  - c. ANSI/TIA-4994 (March 2015) Standard for Sustainable Information Communications Technology
  - d. ANSI/TIA-526-14-C (April 2015) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
  - e. ANSI/TIA-568.0-D (September 2015) Generic Telecommunications Cabling for Customer Premises (supersedes TIA-568-C.0 and TIA-568-C-1)
  - f. ANSI/TIA-568.1-D (September 2015) Commercial Building Telecommunications Infrastructure Standard (supersedes ANSI/TIA-C.1)
  - g. ANSI/TIA-568.2-D (September 2018) Balanced Twisted-Pair Telecommunications Cabling and Components Standard
  - h. ANSI/TIA-568.3-D (June 2016) Optical Fiber Cabling Components Standard
  - i. ANSI/TIA-568.4-D (August 2020) Broadband Coaxial Cabling Components Standard
  - j. ANSI/TIA-569-E (May 2019) Telecommunications Pathways and Spaces
  - k. ANSI/TIA-598-D (July 2014) Optical Fiber Cable Color Coding

- l. ANSI/TIA-570-C (August 2012) Residential Telecommunications Infrastructure Standard
- m. ANSI/TIA-606-C (June 2017) Administration Standard for Telecommunications Infrastructure
- n. ANSI/TIA-607-D (July 2019) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
- o. ANSI/TIA-758-B (March 2012) Customer-Owned Outside Plant Telecommunication Infrastructure Standard
- p. ANSI/TIA-862-B (February 2016) Structured Cabling Infrastructure Standard for Intelligent Building Systems
- q. ANSI/TIA-942-B (July 2017) Telecommunications Infrastructure Standard for Data Centers
- r. ANSI/TIA-1005-A (May 2012) Telecommunications Infrastructure Standard for Industrial Premises
- s. ANSI/TIA-1005-A-1 (January 2015) Telecommunications Infrastructure Standard for Industrial Premises, Addendum 1- M12-8 X-Coding Connector - Addendum to TIA-1005-A
- t. ANSI/TIA-1183 (August 2012) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems
- u. ANSI/TIA-1183-1 (January 2016) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems, Extending Frequency Capabilities to 2 GHz - Addendum to TIA-1183
- v. TIA-1152 (November 2016) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
- w. TIA-1179-A (September 2017) Healthcare Facility Telecommunications Infrastructure Standard
- x. ANSI/TIA-4966 (May 2014) Telecommunications Infrastructure Standard for Educational Facilities
- y. TIA-455-104-B (February 2016) FOTP 104- Fiber Optic Cable Cyclic Flexing Test (supersedes TIA-455-104-A)
- z. TIA/EIA-455-25-D (February 2016) FOTP-25 Impact Testing of Optical Fiber Cables
- aa. TIA-604-18 (November 2015) FOCIS 18 Fiber Optic Connector Intermateability Standard – Type MPO-16
- bb. TIA-604-5-E (November 2015) FOCIS 5 Fiber Optic Connector Intermateability Standard- Type MPO
- cc. TIA-5017 (March 2016) Telecommunications Physical Network Security Standard
- dd. TIA-TSB-155-A (Reaffirmed 10-6-2014) Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T
- ee. TSB-184 (July 2009) Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling
- ff. TSB-4979 (August 2013) Practical Considerations for Implementation of Multimode Launch Conditions in the Field
- gg. TSB-190 (June 2011) Guidelines on Shared Pathways and Shared Sheaths
- hh. TIA-TSB-162-A (November 2013) Telecommunications Cabling Guidelines for Wireless Access Points
- ii. TSB-5018 (July 2016) Structured Cabling Infrastructure Guidelines to support Distributed Antenna Systems

- jj. TIA-492AAAE (June 2016) Detail Specification for 50- $\mu$ m Core Diameter/125- $\mu$ m Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers with Laser-Optimized Bandwidth Characteristics Specified for Wavelength Division Multiplexing
- kk. TIA-492AAAB-A (November 2009) Detail specification for 50- $\mu$ m core diameter/125- $\mu$ m cladding diameter class 1a graded-index multimode optical fibers
- ll. TIA-455-243 (March 2010) FOTP-243 Polarization-mode Dispersion Measurement for Installed Single-mode Optical Fibers by Wavelength-scanning OTDR and States-of-Polarization Analysis
- mm. TSB-172-A (February 2013) Higher Data Rate Multimode Fiber Transmission Techniques

### 3. ISO/IEC

- a. ISO/IEC TR 11801-99-01 Information technology – Generic cabling for customer premises: Guidance for balanced cabling in support of at least 40 GBit/s data transmission: Parts 1 and 2
- b. ISO/IEC TR 29106 AMD 1 Information technology -- Generic cabling -- Introduction to the MICE environmental classification
- c. ISO/IEC 24764 AMD 1 Information technology – Generic cabling for data centers
- d. ISO/IEC 11801 AMD 1 AMD 2 Information technology – Generic cabling for customer premises
- e. ISO/IEC 15018 AMD 1 Information technology – Generic cabling for homes
- f. ISO/IEC 24702 AMD 1 Information technology – Generic cabling – Industrial premises
- g. ISO/IEC 14763-1 AMD 1 Information technology – Implementation and operation of customer premises cabling – Part 1: Administration
- h. ISO/IEC 14763-2 Information technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation
- i. ISO/IEC 14763-2-1 Information technology – Implementation and operation of customer premises cabling – Part 2-1: Planning and installation – Identifiers within administration systems
- j. ISO/IEC 14763-3 Ed 2.0 Information technology -- Implementation and operation of customer premises cabling -- Part 3: Testing of optical fiber cabling
- k. ISO/IEC TR 24704 Information technology – Customer premises cabling for wireless access points
- l. ISO/IEC TR 24750 Information technology – Assessment and mitigation of installed balanced cabling channels in order to support 10GBASE-T
- m. ISO/IEC TR 29125 IT Telecommunications cabling requirements for remote powering of terminal equipment

### 4. BICSI – Building Industry Consultative Services International – Published Standards

- a. ANSI/BICSI 001-2009, Information Transport Systems Design Standard for K-12 Educational Institutions
- b. ANSI/BICSI 002-2014, Data Center Design and Implementation Best Practices
- c. ANSI/BICSI-003-2014 Building Information Modeling (BIM) Practices for Information Technology Systems



- d. BICSI 004-2012, Information Technology Division Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities
  - e. ANSI/BICSI 005-2016, Electronic Safety and Security (ESS) System Design and Implementation Best Practices
  - f. BICSI 006-2015 Distributed Antenna System (DAS) Design and Implementation Best Practices
  - g. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
  - h. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
5. BICSI – Building Industry Consultative Services International – Manuals
- a. Telecommunications Distribution Methods Manual, 14th Edition (2020)
  - b. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition
  - c. Outside Plant Design Reference Manual, 5th Edition
  - d. BICSI's ICT Terminology Handbook, Version 1.0
  - e. Telecommunications Project Management Manual (TPMM), 1st edition
  - f. Telecommunications Project Management Reference Document (TPMRD), 2nd Edition
  - g. BICSI's Special ICT Design Considerations, Version 1.0
  - h. Essentials of Bonding and Grounding, Version 1.0
6. National Electric Codes
- a. National Electrical Safety Code (NESC) (IEEE C2-2012)
  - b. NFPA 70-2016, National Electrical Code® (NEC®)
  - c. ANSI/IEEE C2-207, National Electrical Safety Code®
  - d. National Electrical Code (NEC) (NFPA 70)
  - e. NFPA 72 National Fire Alarm and Signaling Code
7. ASHRAE
- a. ASHRAE Standard 90.4P, Energy Standard for Data Centers and Telecommunications Buildings
8. OSHA Standards and Regulations – all applicable
9. Local Codes and Standards – all applicable
10. Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.
11. Knowledge and execution of applicable standards and codes is the sole responsibility of the Contractor.

Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense.

In the event of any conflicts between documents referenced herein and the contents of this specification, the Vendor shall notify in writing to ITS of any such occurrences before the purchasing of any equipment, materials and/or installation by the Vendor. ITS will notify the Vendor of any actions required to resolve these conflicts. Such actions may include but are not limited to: design changes, equipment, materials and/or installation changes. In any event Vendor shall not supersede specifications and standards from the latest NFPA and NEC publications.

## **General Requirements**

In the installation of this work, the Contractor shall comply in every way with the requirements of local and Travis County 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.

No change in the plans or in the specifications shall be made without full consent in writing of ITS.

The Vendor shall obtain written permission from ITS before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, or partition ceilings.

The Vendor shall install the materials in accordance with the manufacturers' guidelines and specifications.

The Vendor shall promptly correct all system discrepancies or defects for which the Vendor is responsible.

The Vendor shall coordinate all work with ITS prior to purchase of products or installation of cable plant.

The Vendor shall submit product data sheets for all materials to ITS prior to the purchase or installation of cable plant.

The Vendor shall maintain a work area free of debris, trash, empty cable reels, scrap wire, etc., and dispose of such items daily and return the site to the original state of cleanliness. The Vendor shall not use Owner's facilities for the disposal of excess or scrap materials.

The Vendor shall be certain that all work areas are in compliance with the Occupational Safety and Health Administration (OSHA) regulations.

The Vendor shall have written approval from ITS for any additional work outside the Contract Documents prior to beginning such work.

The Vendor shall not roll or store cable reels without an appropriate underlay.

The Vendor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.

The Vendor shall insure that the maximum pulling tensions of the specified distribution cables are not exceeded at any time during placement. Failure to follow the appropriate guidelines may require the contractor to provide additional material and labor necessary to rectify the situation. This shall also apply to any and all damages sustained to the cables by the installation contractor during the implementation.

The Vendor shall install all equipment as close to the wiring fields as possible, taking into consideration, testing, administration, maintenance, and future growth.

The Vendor shall be responsible for testing all cable prior to the installation of the cable. If the Vendor fails to perform this testing operation, the Vendor shall accept the cable as good and assume all liability for the replacement of the cable should it be found defective at a later date.

The Vendor shall plug ALL penetrations, conduits, sleeves, cable trays, etc., where cabling has been installed through rated walls/floors with an UL listed and approved intumescent re-enterable fire-stop system consisting of a re-enterable putty for sleeves and conduit penetrations and pillow stop systems for cable trays where they pass through rated walls.

The Vendor shall be responsible for returning any and all penetrations through rated walls or floors made for communications cable to their pre-penetration rating.

The Vendor shall maintain a set of working specifications and drawings on site at all times and shall be responsible for keeping the drawings updated on a minimum of a weekly basis. These working drawings shall be made available for inspection at the request of ITS.

Materials shall be consistent throughout the building. Where two or more units of the same class of equipment or wiring are required, these units shall be the standard product of a single manufacturer and shall be the same product with the same material, model, and manufacturer number.

All wiring, equipment and installation materials shall be new and of the highest quality. Cable, equipment, and installation materials shall be delivered and stored in a clean, dry space at the Vendors expense. Materials and equipment will be properly packaged in factory-fabricated type containers and protected from the environment, damaging fumes, construction debris, and traffic, etc. until the job is installed or completion of the project. Labels on all wiring, materials, and equipment must show that a nationally recognized testing laboratory lists these. Original Equipment Manufacturer (OEM) documentation must be provided to the Architect/Engineer, which certifies performance characteristics, and which meet ANSI/TIA/EIA 568-C.0 standard.

All material used in the installation shall be made of corrosion-resistant material, such as plastic, anodized aluminum, or brass and be resistant to fungus growth and moisture deterioration. An inert dielectric material shall separate dissimilar metals apt to corrode through electrolysis under the environmental operating conditions specified.

All cable installed in a plenum rated environment shall meet or exceed the Underwriters Laboratories (UL) fire rated cable insulation requirements.

Any pulling compound or lubricant used in the installation shall not deteriorate the conductor or the insulation of the cable.

All cables will be dressed within the IDF/ MDF and secured with Velcro or similar hook and loop fastener. All horizontal runs shall be neatly routed/bundled throughout the horizontal installation. Cable ties are NOT allowed in any part of the installation. Maximum bundled size of 24 cables permitted.

Coordinate installation with painting/drywall contractor. Any painted cables will be re-pulled. (No exceptions)

All cables shall be supported during install. Any cables found lying on the ground are subject to re-pull.

## ***Service loops:***

Ten (10') feet of service loop for inter-building backbone cable shall be coiled, mounted and stored at each cable end above or on top of the ladder rack in the ER/TR's. (S-Turns)

Ten (10') feet of service loop for intra-building backbone cable shall be coiled, mounted and stored at each cable end above or on top of the ladder rack in the ER/TR's. (S-Turns)

Ten (10') feet of service loop for horizontal cables shall be coiled, mounted and stored above or on top of the ladder rack in each ER/TR's. (S-Turns)

Thirty-six (36") inches of maintenance loop for horizontal distribution cable shall be coiled and stored on the J-hook directly above the workstation outlet. (Figure 8 or concentric circles)

## **Other Requirements**

**Material Storage Areas.** The Contractor shall be responsible for storage of all materials and shall coordinate and obtain approval of a location for storage containers for materials prior to storing any materials on site.

**Drilling, Ditching & Excavation.** The Contractor shall be responsible for contacting the appropriate utility companies (Austin Energy, Spectrum, AT&T, etc.) and/or the Travis County Maintenance Department to check the locations for any utility poles and ditches that may need to be installed. Any damage done as a result of drilling, ditching or excavating will be the sole responsibility of the Contractor.

**Harassment.** Under no circumstance will Travis County tolerate any form of verbal or non-verbal abuse, jeering, whistling, etc. directed toward staff. The Contractor will be informed of any complaints and will be expected to permanently remove the problem employee from the job.

**Dress Code.** Workmen are to be fully clothed at all times. Workmen wearing shorts or without shirts will not be allowed on the Projects. Clothing shall not have any indecent or suggestive logos or words and will not have tobacco or alcohol products advertised.

**ID Badge.** Workmen shall wear a company badge with a photo of the workman, company name, company logo and company address at all times while on site and pass DPS background verification.

**Smoking.** All tobacco products, including smokeless tobacco, are prohibited on all Travis County properties at all times. This must be fully enforced by the Contractor.

**Illegal Drugs and Alcohol.** No alcoholic beverages or illegal drugs shall be brought on Travis County property at any time. Any workmen under the influence of either illegal drugs or alcohol or smelling of alcohol shall be permanently removed from the Project by the Contractor.

## Warranty

Materials and workmanship herein after specified and furnished shall be fully guaranteed by Vendor for minimum twenty years from transfer of title against any defects. Defects which may occur as the result of faulty materials or workmanship within twenty years after installation and acceptance by ITS shall be corrected by The Vendor at no additional cost to ITS. The Vendor shall promptly, at no cost to ITS, correct or re-perform (including modifications or additions as necessary) any nonconforming or defective work within twenty years after completion of the project of which the work is a part. The period of The Vendor's warranty for any items herein are not exclusive remedies, and ITS has recourse to any warranties of additional scope given by The Vendor to ITS and all other remedies available at law or in equity. The Vendor's warranties shall commence with acceptance of/or payment for the work in full. If the Vendor procures equipment or materials under the Contract, The Vendor shall obtain for the benefit of ITS equipment and materials warranties against defects in materials and workmanship to the extent such warranties are reasonably obtainable. The Vendor shall pass along to ITS any additional warranties offered by the manufacturers, at no additional costs to ITS, should said warranties extend beyond the twenty-year period specified herein. This warranty shall in no manner cover equipment that has been damaged or rendered unserviceable due to negligence, misuse, acts of vandalism, or tampering by ITS or anyone other than employees or agents of The Vendor. The Vendor's obligation under its warranty is limited to the cost of repair of the warranted item or replacement thereof, at The Vendor's option. Insurance covering said equipment from damage or loss is to be borne by The Vendor until full acceptance of equipment and services.

## Fire stopping

ALL penetrations to the MDF and IDF will be fire-stopped regardless of the fire rating of these walls. New and existing raceways, cable trays, and cables for data and communications systems penetrating non-rated and fire-rated floors, walls, and other partitions of building construction shall be fire-stopped where they penetrate new or existing building construction.

Fire stopping shall be accomplished by using a combination of materials and devices, including penetrating raceway, cable tray, or cables, required to make up complete UL approved fire-stop system. IDF/MDF penetrations shall utilize firestop pillows (cable tray) or STI EZ-Path systems.

Verify that cabling and other penetrating elements and supporting devices have been completely installed and temporary lines and cables have been removed.

Use materials that have no irritating or objectionable odors when fire stopping is required in existing buildings and areas that are occupied.

Provide damming materials, plates, wires, restricting collars, and devices necessary for proper installation of fire stopping. Remove combustible installation aids after fire stopping material has cured.

All firestopping shall be installed in accordance with the manufacturer's instructions to maintain the specific rating assigned by the independent testing laboratory.

If required by inspecting authorities expose and remove fire stopping to the extent directed by inspecting authority to permit his or her inspection. Reinstall new fire stopping and restore work where removed for inspection.

## **Removal and Replacement of ceiling tiles**

Carefully remove existing ceilings as required to perform the work. Store removed tiles in an area designated by ITS.

Modify and augment existing suspension systems as necessary. Restore ceiling systems to their original finish.

Repair any damage to ceilings due to modifications, removal, and replacement of same.

Replace damaged ceiling tiles, including tiles with holes or openings left as a result of demolition, with materials of like kind.

Damaged/soiled tiles will be replaced at vender expense.

## **Cutting and Patching**

Provide openings, cutting, coring, and patching of openings in existing building construction as required. Patching includes openings and voids left in existing construction as a result of demolition.

The Work shall include necessary assemblies and materials to maintain required fire ratings.

Perform cutting as to not impair structural stability of building construction and systems. Do not drill holes or weld attachments to beams and other structural members without prior written approval from Travis County Facilities Management Department. Contractor must use GPR (Ground Penetrating Radar) before any cutting or drilling will be approved.

The work shall be done by crafts persons skilled in the particular trades affected.

New materials shall match existing materials in type and quality. Patching shall be done in a manner to match appearance of adjacent surfaces.

## **Cleaning**

Cleaning shall be performed to the satisfaction of the ITS Representative.

Unless otherwise indicated, clean shall mean free of dust, dirt, mud, debris, oil, grease, residues, and contamination. Acceptability shall be determined by sight, touch, and wiping with a clean, soft cloth.

## **Painting**

Touch up marred and bared surfaces of primed, galvanized, and finish painted equipment, materials, and accessories installed.

Restore to the satisfaction of Travis County Facilities Management Department patched surfaces as close to the original condition and finish as reasonably possible. Where patching occurs in smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received two coats of primer and two coats of finished paint.

## **Pre-installation Site Survey**

Prior to the start of any installation, meet at the project site with the ITS Representative to examine areas and conditions under which the work will be performed. Do not proceed with the work until satisfactory conditions have been achieved.

## **Installation**

Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local authorities having jurisdiction, and National Electrical Code® (NEC) and with manufacturer's printed instructions.

Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.

Where manufacturer does not provide bending radii information, minimum bending radius shall be 10 times cable diameter. Arrange and mount equipment and materials in a manner acceptable to the engineer and ITS.

Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or galvanized rigid conduit (GRC) sleeves and shall be fire-stopped after installation and testing, utilizing a fire stopping assembly approved for that application.

Install station cabling to the nearest communications closet, unless otherwise noted.  
Install only approved wire, cable, and wiring devices.

Provide neat and uncluttered wire termination.

Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables installed above removable ceilings.

Install adequate support structures for 10-foot cable service loops at each telecom room.

Support riser cables every three (3) floors and at top of run with cable grips.

Limit number of four-pair data riser cables per grip to fifty (50).

Install cables in one continuous piece. Splices shall not be allowed.

## **Grounding**

Grounding shall conform to ANSI/TIA/EIA 607-D - Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code® and manufacturer's grounding requirements as minimum.

Ground equipment racks, housings, armored cables, conduits, wire basket, etc.

## Labeling

A specific labeling scheme will be coordinated with ITS and provided to the Vendor.

The Vendor shall not permanently label any part of the communications cable plant until the specific labeling scheme has been provided to the Vendor.

In general, the Vendor shall be required to provide the following type of labeling:

*Inter-Building Cable:* The Vendor shall furnish and install cable wrap label on each end of the cable indicating origin and destination.

*Intra-Building Cable:* The Vendor shall furnish and install cable wrap label on each end of the cable indicating origin and destination.

*Horizontal Cable:* The Vendor shall furnish and install cable wrap label on each end of the cable indicating origin and destination.

*Terminations:*

Fiber Optic: The Contractor shall label fiber optic distribution shelves in accordance to manufacturer guidelines and ANSI/TIA/EIA-606-C

Copper: The Contractor shall label 110 blocks and protector blocks in accordance to manufacturer guidelines and ANSI/TIA/EIA-606-C

Faceplates: The Contractor shall label workstation faceplates in accordance to manufacturer guidelines and ANSI/TIA/EIA-606-C

Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters including the room # or cube # and location designation.

Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, inside receptacle box at the work area and the communication closet patch panel or punch block.

Use labels on face of data patch panels. Patch panels will be labeled in alphabetical order.

Cable wrap labels shall be machine-printed Panduit "Turn-Tell" type.

Hand-lettered labels are not acceptable.



## Testing Requirements

### ***FIBER OPTIC CABLE:***

All fiber optic cable links installed shall be tested in accordance with the field test specifications defined in ANSI/TIA/EIA-568-C standard.

Failing links shall be diagnosed and corrected by the Vendor.

Corrective actions shall be followed by a new test of the previously failing link(s). The Vendor shall promptly submit all link re-test data to Owner in both hard and soft copy.

Only Certified Technicians shall perform all fiber optic link testing

Field test equipment for fiber optic cables shall meet the requirements of ANSI/TIA/EIA-568-C.3.

The light source shall meet the launch requirements of ANSI/TIA/EIA-455-50B

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 Vendor shall diagnose and repair any fiber optic cable exhibiting strand-to-strand anomalies that result in any test failure(s).

The Vendor shall test and certify all fiber optic cable plant with approved field tester(s) that are within their calibration period. The Vendor 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.

The Vendor shall invite ITS to witness/verify field testing prior to final acceptance. ITS shall randomly select 5% of the installed links for test verification purposes.

The Vendor shall re-test these links in the presence of ITS and the results shall be compared to the previously Owner submitted test results. In the event that 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 Vendor shall re-test 100% of the installed links with the cost of such tests borne by the Vendor.

### ***CATEGORY 6 and 6a UTP Cable***

All Category 6 and 6a cable links installed shall be tested in accordance with the field test specifications defined in ANSI/TIA/EIA-568-C standard.

100% of the installed cable shall be tested and must pass the requirements of ANSI/TIA/EIA-568-C.

Failing links shall be diagnosed and corrected by the Vendor. Corrective actions shall be followed by a new test of the previously failing link(s).

The Vendor shall promptly submit all link re-test data to Owner in both hard and soft copy.

Only Certified Technicians shall perform all Category 6 and 6a testing.

Field test equipment for Category 6 and 6a UTP cables shall meet or exceed the accuracy requirements for enhanced

Level IV testers as defined in ANSI/TIA/EIA-568-C.2

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 Vendor shall diagnose and repair any Category 6 and 6a cable exhibiting pair-to-pair anomalies that result in any Fail, \*Fail or \*Pass conditions.

The Vendor shall test and certify all Category 6 and 6a cables with approved field tester(s) that are within their calibration period. The Vendor 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.

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.

The Vendor shall invite ITS to witness/verify field testing prior to final acceptance. ITS shall randomly select 5% of the installed links for test verification purposes.

The Vendor shall re-test these links in the presence of ITS and the results shall be compared to the previously Vendor submitted test results. In the event that 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 Vendor shall re-test 100% of the installed links with the cost of such tests borne by the Vendor.

Reported test parameters for Category 6 and 6a shall comply with ANSI/TIA/EIA-568-C.2 standard.

Testing shall indicate and record the following for each tested link:

- Wire Map
- Link Length
- Insertion Loss / Attenuation
- Near end cross talk Loss (NEXT)
- Power Sum NEXT Loss (PSNEXT)
- Pair to Pair Loss (ELFEXT)
- Power Sum Pair to Pair Loss (PSELFEXT)
- Return Loss (RL)
- Attenuation to Cross-talk Ratio (ACR)
- Power Sum ACR (PSACR)
- Propagation Delay
- Delay Skew

## **Project Closeout Requirements**

The Vendor shall provide the following to ITS upon final acceptance and completion of the cable plant installation:

One Original Reproducible Drawing indicating the “as-built” condition of the Communications Cable Plant as it was installed. As-Built drawings must be provided on a CD-ROM in PDF and AutoCAD 2008 or higher. The “as-built” drawings shall use the original scale, indicating exact dimensions and locations of all telecommunication rooms, frames, racks, trays, terminal blocks, patch panels, cable runs, cable pathways, workstation locations, and labeling scheme. These drawings shall be turned over to ITS at the time of final systems acceptance of the cable plant installation. Final payment will not be made until these drawings are received and approved by ITS.

One set of Power Meter and Light Source Fiber Optic Tests in accordance with the specification in PDF and hardcopy. Electronics shall be provided on CD. Final payment will not be made until these test results are received and approved by ITS. Test documentation shall be bound, sectioned and tabbed in the following order:

- Inter-Building Outside Fiber Optic Cable
- Intra-Building Fiber Optic Cable

One set of Category 6 or Category 6a Test results for each cable drop in accordance with the specification in PDF by email. Final payment will not be made until these test results are received and approved by ITS.

Approved Panduit Certificate of Warranty for the Structured Cable System.  
Final payment will not be made until this warranty information is received and approved by ITS.

One original Vendor Warranty Letter with information to include the contact name, address and phone number for warranty call outs. Final payment will not be made until this warranty information is received and approved by ITS.

Two duplicate copy sets of the above documentation. Final payment will not be made until this warranty information is received and approved by ITS.

## Travis County, ITS Standard List of Materials

*This list is not meant to be comprehensive*

Part#	Description
<b>CABLE</b>	
PUP6004WH-WLP	Panduit Cat 6 Plenum White
PUP6004BU-WLP	Panduit Cat 6 Plenum Blue
PUP6AHD04YL-G	Panduit Cat 6A Plenum Yellow (.23OD)
PUP6AHD04BL-G	Panduit Cat 6A Plenum Black (.23OD)
PUP6AHD04IG-G	Panduit Cat 6A Plenum Gray (.23OD)
PUO6AS04BL-G	Panduit Cat 6A Indoor/Outdoor Plenum
PUO6C04BL-CEG	Panduit Cat 6 OSP
PFO6X04BL-CEG	Panduit Cat 6A OSP Shielded F/UTP
<b>JACKS AND FACEPLATES</b>	
KWPY	Panduit wall phone plate
NK6X88MBU	Panduit Cat 6A jack (Blue) f/ wall phone application
FP6X88MTG	Panduit Field Term Plug f/ Wireless Aps and Cameras
CJ688TGBL	Panduit Cat 6 jack Black
CJ688TGBU	Panduit Cat 6 jack Blue
CJ688TGGR	Panduit Cat 6 Jack Green
CJ688TGYL	Panduit Cat 6 Jack Yellow
CJ6X88TGBL	Panduit Cat 6A Jack Black
CJ6X88TGBU	Panduit Cat 6A Jack Blue
CJ6X88TGYL	Panduit Cat 6A Jack Yellow
CFPL2IWY	Panduit 2 port faceplate (International White)
CFPL4IWY	Panduit 4 port faceplate (International White)
CFPSL2IWY	Panduit 2 port faceplate SLOPED (International White)
CFPSL4IWY	Panduit 4 port faceplate SLOPED (International White)
CMBIW-X	Panduit Blank Inserts (International White)
CMFIW	Panduit F- adapter (International White)
CFPL4BL	Panduit 4 port furniture faceplate (Black)
<b>SURFACE RACEWAY AND BOXES</b>	
CBXQ1IW-A	1 port surface mount boxes (International White)
CBXQ2IW-A	2 port surface mount boxes (International White)
CBXQ4IW-A	4 port surface mount boxes (International White)
JBX3510IW-A	Panduit Surface Mount Box 1 Gang (International White)
LD10IW8-A	Panduit 1.5" x 8' raceway PER FOOT (International White)
CF10IW-X	Panduit 1.5" coupler fitting (International White)
DCF10IW-X	Panduit 1.5" drop ceiling fitting (International White)
RAF10IW-X	Panduit 1.5" RT angle fitting (International White)

PATCH PANELS AND BLOCKS	
CPPL24WBLY	Panduit 24 port patch panel unloaded
CPPL48WBLY	Panduit 48 port patch panel unloaded
DP245E88TGY	Panduit 24 port patch panel LOADED w/ Voice Tie
DP485E88TGY	Panduit 48 port patch panel LOADED w/ Voice Tie
SRB19BLY	Panduit Rack Mount Extended Strain Relief Bar
RACKS/CABINETS/WIRE MANAGEMENT	
WME6BL	Panduit TrueEdge Vertical Wall Mount Enclosure 6U
WME9BL	Panduit TrueEdge Vertical Wall Mount Enclosure 9U
PZWMC12P	Panduit PanZone Wall Mount Cabinet 12U
PZWMC18P	Panduit PanZone Wall Mount Cabinet 18U
PZCHSM2	Panduit PanZone Horizontal Slack Manager
WBH1	Panduit 1RU wall mount bracket
R2P	Panduit 19" 2 post rack w/ 12/14 Tapped Rails
PR2VWF	Panduit Waterfall Top Plate for 2-Post/\$-Post Racks
PR2VD06	Panduit 6" Front/Rear Vertical Manager w/ F/R Doors
PR2VD08	Panduit 8" Front/Rear Vertical Manager w/ F/R Doors
PR2VD10	Panduit 10" Front/Rear Vertical Manager w/ F/R Doors
PR2VD12	Panduit 12" Front/Rear Vertical Manager w/ F/R Doors
PR2HF2	Panduit 2U Horizontal Manager Front ONLY
PATHWAY MATERIALS	
WG8BL10	Panduit Wyr-Grid Pathway 8" x 10' (Black)
WG12BL10	Panduit Wyr-Grid Pathway 12" x 10' (Black)
WB18BL10	Panduit Wyr-Grid Pathway 18" x 10' (Black)
WGSPL1218BL	Panduit Wyr-Grid Splice
WGINTSPLBL	Panduit Wyr-Grid Intersection Splice
WGESPLBL	Panduit Wyr-Grid Splice w/ Clip
WGESL	Panduit Wyr-Grid Expansion Splice
WGSW2BL	Panduit Wyr-Grid Sidewall 2"
WGSW4BL	Panduit Wyr-Grid Sidewall 4"
WGSW6BL	Panduit Wyr-Grid Sidewall 6"
WGSWF4BL	Panduit Wyr-Grid Side Waterfall
WGBTMWFBL	Panduit Wyr-Grid Bottom Waterfall
WG2PRB12BL	Panduit Wyr-Grid 2 Post Channel Rack Mount Bracket (12")
WG2PRB18BL	Panduit Wyr-Grid 2 Post Channel Rack Mount Bracket (18")
WGTBS8BL	Panduit Wyr-Grid Trapeze Bracket (8")
WGTBS12BL	Panduit Wyr-Grid Trapeze Bracket (12")
WGTBS18BL	Panduit Wyr-Grid Trapeze Bracket (18")
WGCB12BL	Panduit Wyr-Grid Cantilever Bracket (12")
WGCB18BL	Panduit Wyr-Grid Cantilever Bracket (18")

WGIBRC2BL	Panduit Wyr-Grid Intersection Bend Radius (2")
WGIBRC4BL	Panduit Wyr-Grid Intersection Bend Radius (4")
WGIBRC6BL	Panduit Wyr-Grid Intersection Bend Radius (6")
WGWMTB8BL	Panduit Wyr-Grid Wall Termination Bracket (8")
WGWMTB12BL	Panduit Wyr-Grid Wall Termination Bracket (12")
WGWMTB1830BL	Panduit Wyr-Grid Wall Termination Bracket (18-30")
CWF400	Panduit 4" conduit waterfall
CMW-KIT	Panduit Waterfall for ladder rack
JP75W-L20	Panduit 3/4" J Hook wall mount
JP131W-L20	Panduit 1 1/4" J-hook wall mount
JP2W-L20	Panduit 2" J-hook wall mount
JP75WP2B-L20	Panduit 3/4" J Hook ceiling mount W/ Bracket
JP131WP2B-L20	Panduit 1 1/4" J-hook ceiling mount w/ Bracket
JP2WP2B-L20	Panduit 2" J-hook ceiling mount w/ bracket
JP75SBC50RB-L20	Panduit 3/4" J Hook w/screw on 360 beam clamp
JP131SBC50RBL20	Panduit 1 1/4" J-hook w/ screw on 360 beam clamp
JP2SBC50RB-L20	Panduit 2" J-hook w/ screw on 360 beam clamp
<b>BOXES AND ELIMINATORS</b>	
ARLV1	In Wall 1 Gang Mounting Bracket (Like MPLS)
<b>FIBER CABLE</b>	
FOPPZ12Y	Panduit Indoor OM4 Fiber 12 Strand Plenum Interlocking Armor
FOPPZ24Y	Panduit Indoor OM4 Fiber 24 Strand Plenum Interlocking Armor
FSPP912Y	Panduit Indoor OS2 Fiber 12 Strand Plenum Interlocking Armor
FSPP924Y	Panduit Indoor OS2 Fiber 24 Strand Plenum Interlocking Armor
FOLPZ12	Panduit Indoor/Outdoor OM4 Fiber 12 Strand Plenum Interlocking Armor
FOLPZ24	Panduit Indoor/Outdoor OM4 Fiber 24 Strand Plenum Interlocking Armor
FSLP912	Panduit Indoor/Outdoor OS2 Fiber 12 Strand Plenum Interlocking Armor
FSLP924	Panduit Indoor/Outdoor OS2 Fiber 24 Strand Plenum Interlocking Armor
FOWNZ12	Panduit Outdoor OM4 Fiber 12 Strand Single PE Jacket w/ Armor
FOWNZ24	Panduit Outdoor OM4 Fiber 24 Strand Single PE Jacket w/ Armor
FSWN912	Panduit Outdoor OS2 Fiber 12 Strand Single PE Jacket w/ Armor
FSWN924	Panduit Outdoor OS2 Fiber 24 Strand Single PE Jacket w/ Armor
<b>CONNECTORS/PIGTAILS/FAN OUT</b>	
FZTBN1NNNSZM001	Panduit OM4 LC-UPC 12 Strand Pigtail (1 Meter)
F9TBN1NNNSZM001	Panduit OS2 LC-UPC 12 Strand Pigtail (1 Meter)
FO12CB	Panduit 12 Strand Fan Out Kit
<b>SPLICE SLEEVES</b>	
FSSD60	50pk Leviton 60mm heat shrink sleeves
<b>SPLICE TRAYS/SPLICE HOLDER</b>	
FOSMF	Panduit 24 strand splice tray

FOSMH1U	Panduit Splice Tray Holder f/ FCE1U
FOSMH2U	Panduit Splice Tray Holder f/ FCE2U
FOSMH4U	Panduit Splice Tray Holder f/ FCE4U
<b>FIBER BOXES</b>	
FCE1U	Panduit Rackmount 1RU Fiber Box
FCE2U	Panduit Rackmount 2RU Fiber Box
FCE4U	Panduit Rackmount 4RU Fiber Box
<b>ADAPTER PANELS</b>	
FAP6WAQDLCZ	Panduit 6 port Duplex UPC LC OM3/OM4 FAP (12 Strands)
FAP12WAQDLCZ	Panduit 12 port Duplex UPC LC OM3/OM4 FAP (24 Strands)
FAP6WBUDLCZ	Panduit 6 port Duplex UPC LC OS2 FAP (12 Strands)
FAP12WBUDLCZ	Panduit 12 port Duplex UPC LC OS2 FAP (24 Strands)
FAPB	Panduit Blank Insert
FMP6	Panduit Multi-Media FAP Pane; (Accepts 6 Minicom Inserts)
<b>MISC MATERIALS</b>	
R100X150X1J	Panduit Cable Wrap Sheet Labels (2500PK) "Turn Tell"
C195X040Y1J	Panduit Faceplate Sheet Labels (1000PK)
PST-FO	Fiber labels Package of 5
<b>FIRE PROTECTION PRODUCTS</b>	
FS100	STI Ready Sleeve - Fire Barrier Sleeve Kit 1"
FS200	STI Ready Sleeve - Fire Barrier Sleeve Kit 2"
FS400	STI Ready Sleeve - Fire Barrier Sleeve Kit 4"
SSP100	STI Fire Puddy
SSS100	STI Fire Caulk
EZDP133CWK	STI EZ-Path 4" w/ Circular Mounting Plate
RFG1	STI EZ-Firestop Grommet (1 Cable)
RFG2	STI EZ-Firestop Grommet (2 Cable)
PM4	3M fireproof packing materials 4"
SSB14 - PILLOW	STI Firestop Pillow: 1x4x9
SSB24 - PILLOW	STI Firestop Pillow: 2x4x9
SSB26 - PILLOW	STI Firestop Pillow: 2x6x9
SSB36 - PILLOW	STI Firestop Pillow: 3x6x9
<b>EMT PARTS AND PIECES</b>	
EMT100	1" Pop on bushing
EMT200	2" Pop on white bushing
EMT400	4" Pop on white bushing
<b>GROUNDING</b>	
GB4B0612TPI-1	Panduit BICSI/TIA Ground Bar 1/4 X 4 X 12
GB4B0624TPI-1	Panduit BICSI/TIA Ground Bar 1/4 X 4 X 20
LCC6-14AW-L	Panduit Long Barrel # 6 compression lugs

LCC2-14AW-Q	Panduit Long Barrel # 2 compression lugs
HTCT2-2-1	Panduit H-Tap #2-#6
ACG24K	Panduit Armored Fiber Grounding Kit



