



## Cabling Specification

**Department of Technology Services**

**4/1/2020**

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**Chris Ball**  
**Infrastructure Engineer**

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## I. GENERAL

### A. Purpose

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1. The purpose of this document is to provide a standard defining the structured communications cabling systems to be installed within Williamson County facilities. It is geared toward leveraging our legacy cabling infrastructure while upgrading to more recent technologies in new installations. The goal is to accomplish this in the most economic and systematic fashion possible, and in a manner compliant with the latest codes, cabling standards and industry best practices.
2. Within this document, the facilities owner is Williamson County, and shall be referred to as such, or as "Wilco", or as "Technology Services". Bidding low-voltage installers shall be referred to as "Contractor".
3. This specification defines quality standards and practices common to all Williamson County network cabling specifications.
4. In addition to this global cabling standard, individual projects will also have associated documentation such as Requests for Proposals (RFP), facility drawings, project schedules and requirements pertaining to that job. Such collateral will be referred to in this document as "Project-specific Documentation", "Project Documentation", or simply "Construction Documents". Any conflict between this general specification and any project-specific documentation shall be brought to the attention of Williamson County by the Contractor and must be resolved in writing.
5. It is the responsibility of the installing contractor to evaluate these general recommendations and adapt them effectively to actual projects. Contractor is responsible for identifying and bringing to the attention of Williamson County any design directions that may be improved. All such changes shall be approved in writing from Technology Services.
6. Note that while many portions of this global specification are addressed to "The Contractor", these requirements apply equally to anyone doing the network cabling and infrastructure work within Williamson County, whether those persons are outside contractors or persons directly employed by Technology Services.

### B. Scope of Work - Typical

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1. Contractor shall be solely responsible for all parts, labor, testing, documentation and all other processes and physical apparatus necessary to turn over the completed cabling system and associated infrastructure fully warranted and operational for acceptance by Technology Services.
2. This specification includes structured cabling design considerations, product specifications and installation guidelines for low-voltage network systems and associated infrastructure including, but not limited to:
  - a. Cabling Sub-system 1 – Horizontal Copper
  - b. Cabling Sub-system 2 - Intrabuilding Fiber Backbone Cabling

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- c. Cabling Sub-system 3 – Interbuilding Fiber Backbone Cabling
  - d. Telecommunications Pathways
  - e. Communications Racks and Cable Managers
  - f. Communications Grounding Systems
  - g. Cabling Labeling and Administration
3. In addition to systems specifications, this document also addresses applicable codes and standards, contractor qualifications and requirements, system warranties and system testing and acceptance.
4. Products to be used in Williamson County network infrastructure projects are listed in “Appendix C” at the end of this document.

### **C. Applicable Regulatory References**

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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. TIA-526-7 (OFSTP-7) (2008) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
  - b. TIA-526-14-B (2010) (OFSTP-14) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
  - c. ANSI/TIA/EIA-598-C (January 2005) Optical Fiber Cable Color Coding
  - d. ANSI/TIA-568-C.0 (September 2010) Generic Telecommunications Cabling for Customer Premises
  - e. TIA-568-C.0-1 (September 2010) Generic Telecommunications Cabling for Customer Premises- Addendum 1, Updated Reference for Balanced Twisted-Pair Cabling
  - f. ANSI/TIA-568-C.1 (February 2009) Commercial Building Telecommunications Cabling Standards
  - g. TIA-568-C.1-2 (November 2011) Commercial Building Telecommunications Cabling Standard, Addendum 2 General Updates
  - h. ANSI/TIA-568-C.2 (August 2009) Balance Twisted Pair Communications and Components Standards
  - i. TIA-568-C.2-2 (November 2014) Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 2: Additional Considerations for Category 6A Patch Cord Testing
  - j. TSB-155-A: Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T
  - k. TSB-184: Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling

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- l. ANSI/TIA-568-C.3 (June 2008) Optical Fiber Cabling Components Standard
- m. ANSI/TIA-568-C.3-1 (December 2011) Optical Fiber Cabling Component Standard- Addendum 1, Addition of OM4 Cabled Optical Fiber and array connectors
- n. TSB-4979 (August 2013) Practical Considerations for Implementation of Multimode Launch Conditions in the Field
- o. TIA, TSB-140 Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
- p. ANSI/TIA-1183 (August 2012) Test Fixtures for Balun-Less Measurements of Balanced Components and Systems
- q. ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard
- r. ANSI/TIA-942-A (August 2012) Telecommunications Infrastructure Standard for Data Centers
- s. ANSI/TIA-942-A-1 (March 2013) Telecommunications Infrastructure Standard for Data Centers, Addendum 1 - Cabling Guidelines for Data Center Fabrics
- t. TIA-569-C (May 2012) Telecommunications Pathways and Spaces
- u. TIA-569-C.1 (February 2013) Telecommunications Pathways and Spaces Addendum 1- Revised Temperature and Humidity Requirements for Telecommunications Spaces
- v. TSB-190: Guidelines on Shared Pathways and Shared Sheaths
- w. ANSI/TIA-606-B (June 2012) Administration Standard for Telecommunications Infrastructure
- x. TIA-607-C (November 2015) Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises
- y. TIA-607-B-1 (January 2013) Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises - External Grounding Addendum
- z. TIA-607-B-2 (August 2013) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises Addendum 2 – Structural Metal
- aa. TIA-758-B (April 2012) Customer-Owned Outside Plant Telecommunication Infrastructure Standard
- bb. ANSI/TIA-598-C-2005, Optical Fiber Cable Color-coding
- cc. TIA-1152 (September 2009) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
- dd. ANSI/TIA-862-A (April 2011) Building Automation Systems Cabling Standard
- ee. TIA-1005-A (June 2012) Telecommunications Infrastructure Standard for Industrial Premises
- ff. TSB-162-A (November 2013) Telecommunications Cabling Guidelines for Wireless Access Points
- gg. ANSI/TIA-4966 (May 2014) Telecommunications Infrastructure Standard for Educational Facilities

### 3. ISO/IEC

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- a. ISO/IEC 11801 Edition 2.2: Information Technology – Generic Cabling For Customer Premises
  - b. ISO/IEC TR 11801-99-1 – Balanced cabling for 40Gbps channels – (2014-2015)
  - c. ISO/IEC 24764 Edition 1.0: Information Technology – Generic Cabling Systems For Data Centres
  - d. ISO/IEC 24764-1 - Data Centers - Amendment to add Intermediate Distributor (ID) for large or modular data centers
  - e. ISO/IEC 14763-2 Edition 1.0: Implementation and Operation of Customer Premises Cabling – Part 2: Planning and Installation
  - f. ISO/IEC 14763-3 Edition 2 – Testing of Optical Fiber Cabling – methods for inspection and testing of installed optical fiber
  - g. ISO/IEC TR 29125:2010 Information technology -- Telecommunications cabling requirements for remote powering of terminal equipment
4. National Electric Codes
- a. National Electrical Safety Code (NESC) (IEEE C2-2012)
  - b. ANSI/NFPA 70-2011, National Electrical Code® (NEC®)
  - c. ANSI/IEEE C2-207, National Electrical Safety Code®
  - d. National Electrical Code (NEC) (NFPA 70)
5. OSHA Standards and Regulations – all applicable
6. Local Codes and Standards – all applicable
7. BICSI – Building Industry Consultative Services International
- e. ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices
  - f. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition
  - g. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
  - h. Network Systems and Commissioning (NSC) reference, 1st Edition
  - i. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
  - j. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
  - k. BICSI-003-2014 Building Information Modeling (BIM) Practices for Information Technology Systems
  - l. Telecommunications Distribution Methods Manual, 13th Edition
  - m. AV Design Reference Manual, 1st Edition
  - n. Network Design Reference Manual, 7th Edition

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- o. Outside Plant Design Reference Manual, 5th Edition
  - p. Wireless Design Reference Manual, 3rd Edition
  - q. Electronic Safety and Security Design Reference Manual, 3rd Edition
  - r. Commercial Installation On-the-Job Training Booklet
  - s. Telecommunications Project Management (TPM) reference, 1st Edition
8. 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.
9. Knowledge and execution of applicable standards and codes is the sole responsibility of the Contractor.
10. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense.

### **D. Wilco Substitution Policy**

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1. This is a performance-based specification developed from the experience of Technology Services in providing exceptional solutions for all our facilities and departments. As such, substitution of specified systems is discouraged, but allowed if Contractor strictly follows Substitution Policy outlined below.
2. Contractors offering product substitutions or equivalents are responsible for proving equal or superior mechanical and transmission performance to those products listed herein.
3. The process for substituting products other than those specified is as follows:
  - a. Any Contractor wishing to offer structured cabling or associated infrastructure products other than those specified shall submit a request for product substitution in writing no less than one week in advance of bid.

Written requests for substitution shall be accompanied by three samples of the substitution product along with associated drawings, specification sheets and engineering documents for evaluation by Technology Services.

Any copper or fiber cabling products that carry signal shall be accompanied by third party laboratory performance test reports from an ITS/ETL proving equivalency in transmission performance.

4. Equal product acceptance must be received from Wilco in writing to be valid.
5. Contractor shall assume all costs for removal and replacement of any substituted product installed without prior written approval. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

### **E. Contractor Qualifications**

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## 1. General

- a. Contractor must have at least 5 years documented experience installing and testing structured cabling systems of similar type and size. Contractor must also provide a list of key installation personnel, their hire dates, and a resume of their experience. Key installation personnel shall include at least one foreman and one journey level installer or technician. By submitting the names of these personnel, the contractor is committing them to the execution of the project outlined in this specification. No temporary labor shall be allowed, all contractor employees shall be full time, and proof showing full time employment must be on file.
- b. Contractor shall have offices and service personnel based with a fifty-mile radius of Williamson County and be capable of same-day response to service calls.
- c. At anytime Wilco can request background checks on personnel working on county property.

Contractor shall employ at least one BICSI Registered Communication Distribution Designer "RCDD". The RCDD shall provide approval on the design, installation, and documentation of this communications system along with making sure all Panduit Certification Plus System Warranty documentation and requirements are met and submitted to Panduit upon completion of the project. The RCDD must be local to the office where work is taking place.

The contractor shall not subcontract voice/data/video/fiber cabling, termination or testing without the written permission of Panduit and Williamson County. If any work is subcontracted it shall be to [an approved Panduit PartnerONE Certified Installer \(Silver/Gold/Platinum\) in good standing](#).

Contractor shall have all necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations.

Contractor shall be a current [Panduit PartnerONE Certified Installer \(Silver/Gold/Platinum\)](#) or accepted substitute manufacturer (See Substitution Policy). A copy of the corporate manufacturer certification must be included with all quotes.

At least 30 percent of the technicians on the job must have a current Panduit Certified Copper Technicians certificate, or accepted substitute manufacturer, to install copper distribution systems.

At least 30 percent of the technicians installing any Fiber Distribution Systems must have a current Panduit Certified Fiber Technicians certificate, or accepted substitute manufacturer certificate, to install fiber distribution systems

The Telecommunications contractor must provide a project manager to serve as the single point of contact to manage the installation, speak for the contractor and provide the following functions:

- Initiate and coordinate tasks with the Williamson County Project Manager and others as specified by the project schedule.
- Provide day to day direction and-site supervision of Contractor personnel.
- Ensure conformance with all contract and warranty provisions.
- Participate in weekly site project meetings.
- This individual will remain project manager for the duration of the project. The contractor may change Project Manager only with the written approval of Williamson County.

Contractor Project manager must be manufacturer certified in the copper and fiber information transport systems to be installed.



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## 2. References

- a. Communications Contractor shall provide with bid, a list of three reference accounts where similar Data, Voice, Fiber Optic Cable, and related equipment installation work was performed within the last year (twelve-month period).

## 3. Termination of Services

- a. Williamson County reserves the right to terminate the Communication Contractor's services if at any time the Technology Services Engineer or Facilities Project Manager determines the Communication Contractor is not fulfilling their responsibilities as defined within this document.

Contractor's appearance and work ethics shall be of a professional manner, dress shall be commensurate with work being performed.

Dress displaying lewd or controversial innuendos will strictly be prohibited.

Conduct on Williamson County property will be professional in nature.

Any person in the Contractor's employ working on a Williamson County project considered by Williamson County to be incompetent or disorderly, or for any other reason unsatisfactory or undesirable to the Department of Technology Services, such person shall be removed from work on the Wilco project.

Upon termination, the Communications Contractor shall be restricted from the premises and compensated for the percentage of work completed satisfactorily.

## 4. Other Contractor Responsibilities

- a. All Contractors working within a Wilco facility are fully responsible for understanding and adhering to all rules and requirements listed in Appendix A – "Wilco Contractor/Vendor Rules and Regulations".
- b. All Contractors working within a Wilco facility department is fully responsible for understanding and adhering to all rules and requirements listed in Appendix B – "POLICY & PROCEDURE CONCERNING ALL ELECTRICAL, TELECOMMUNICATIONS AND NETWORKING INSTALLATIONS AND/OR MODIFICATIONS".
- c. Confirmation of Pathway and Cable Manager Sizing:
  - Wherever cabling pathways or managers are installed, it is the Contractor's responsibility to confirm pathway or manager sizing to represent no more than 35% fill according to manufacturer's fill charts based on projected cable densities when racking systems and cabling pathways are fully populated.
  - Pathways overfilled upon installation will not be accepted and shall be remedied at Contractor expense.
- d. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job. All work areas will be cleaned at the conclusion of the workday and no tools or materials shall be left in a manner as to pose a safety hazard.

Contractor must remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards, recycling these materials where possible. Removal of orphaned cable is mandatory. Contractors must consider this when placing bids.

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Contractor shall abide by the regulations set by local Williamson County's Security Policy pertaining to access and conduct while on Wilco property.

Contractor shall all obey all posted speed limits and parking regulations at the Williamson County facilities where the work is being performed.

## F. Warranty

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### 1. General

- a. Contractor shall provide a [Panduit Certification Plus Warranty](#) on all copper and fiber permanent cabling links.

It is understood the [Panduit Certification Plus Warranty](#) is a system performance warranty guaranteeing for 25 years from acceptance that the installed system shall support all data link protocols for which that Category of copper cabling system or fiber OM/OS designation of fiber optic system is engineered to support according to current and future IEEE and TIA standards.

The [Panduit Certification Plus Warranty](#) may be invoked only if the cabling channel links are comprised of continuous [manufacturer approved](#) components, including patch cords, equipment cords and fiber jumpers.

Upon acceptance of Warranty, Panduit will mail a notification letter to the installer and a notification letter and warranty certificate to Williamson County.

### 2. Contractor Warranty Obligations

- a. Installation firm (Contractor) must be a current [Panduit PartnerONE Certified Installer \(Silver/Gold/Platinum\)](#) or approved equivalent manufacturer in good standing and shall include a copy of the company installation certification with the bid.

Contractor shall name a supervisor to serve on site as a liaison responsible to inspect and assure all terminations are compliant to factory methods taught in Panduit Technician Certification Training, or approved equal, and according to all Standards cited in the Regulatory References section of this document.

Contractor liaison (project supervisor) shall have a current, up-to-date Panduit Certified Technician (PCT) certificate in both copper and fiber. Copies of the copper and fiber certificates of the Panduit liaison shall be submitted with the bid. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.

Fiber optic cabling system additions and upgrade to existing facilities shall match the fiber type (OM/OS designation) of the system to which it is being installed. Contractor shall under no circumstances mix different OM/OS classes of cable or termination devices (connectors) within the same system.

All intra-building new fiber optic installations shall utilize an appropriate cable construction as specified herein.

All UTP cable pulled and terminated shall be Category 6/[6A](#) cable and connectivity whether new or legacy systems.

All UTP terminations within the Williamson County (new) projects shall be terminated using the T568B pin-out (wire map). Legacy additions shall match the copper pin-out of the facility to which cabling is being added-to or upgraded.

Contractor shall install all racking and support structures according to cited Standards in such fashion as to maintain both cited industry standards as well as manufacturer recommendations for uniform support, protection, and

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segregation of different cable types,

Contractor is responsible for maintenance of maximum pulling tensions, minimum bend radius, and approved termination methods as well as adhering to industry accepted practices of good workmanship.

Contractor is responsible for understanding and submitting to Panduit all documents required prior to project start to apply for the [Panduit Certification Plus Warranty](#). These include but are not limited to the project information form and SCS warranty agreement. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.

Contractor is responsible for understanding and submitting to Panduit all documents required at project end. These include, but are not limited to completed warranty forms, passing test reports and drawings of floor plans showing locations of links tested. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.

Test results shall be delivered in the tester native format (not Excel) and represent the full test report, summaries shall not be accepted. Contact your Panduit representative for a current list of approved testers, test leads and latest operating systems.

The Communications Contractor will correct any problems and malfunctions that are warranty-related issues without additional charge to Williamson County for the entire warranty period.

The warranty period shall commence following the final acceptance of the project by Williamson County and written confirmation of Warranty from Panduit. These requirements are the same for accepted equivalent manufacturers. See "Substitution Policy" for mandatory procedure when offering substitutions.

<END OF SECTION>

## II. Installation and Maintenance Guidelines

### A. Maintenance of Patch Fields

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1. Any persons, whether with a Contractor or Williamson County, adding or moving copper or fiber optic patch (equipment) cords shall do so in a neat, workmanlike fashion in keeping with the intended cable management concept and according to all industry best practices as outlined in cabling standards and applicable BICSI publications referenced in this document.
2. Persons performing such moves, adds or changes (MACs) shall further adhere to the following:
  - a. Use existing cabling management pathways and take care to place cable like with like, maintaining original segregation strategies for separating fiber and copper cables as well as any separation necessary between different types of copper cables.

Cables shall be dressed neatly within patch management pathways with care taken to maintain minimum bend radius of not less than 4 times the cord outer diameter for copper and not less than a 1" bend radius for fiber jumpers as per ANSI/TIA 568-C.0.

All patch cords used shall be of same copper Category or fiber OM/OS designation as the media used in the permanent cabling links.

Patching in all cases shall be done using factory terminated cords manufactured for that purpose. Hand terminated patch cords will not be accepted.

All patch cords or jumpers must be completely contained within supplied cable management paths. Cables draped across the front cabinets or racks will not be accepted and shall be remedied at Contractor's expense.

Any persons installing or moving fiber optic patch cords for any reason will clean the connector with lint-free wipes and 99% or higher isopropyl alcohol before replacing the connector in a patch or equipment port.

Any technicians, whether with Williamson County or Contractors performing moves, adds or changes within patch field will label additions to the system according to the labeling conventions in place at that facility.

Any persons with Williamson County or installing Contractor performing moves, adds or changes within patch field will record the move according to record system in place at that facility.

### B. Cable Pulling and Termination

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1. General
  - a. Contractor is responsible for installing systems according to all applicable codes and the standards cited in this document.

Contractor shall use grommets/[bushings](#) to protect the cable when passing through metal studs or any openings that can possibly cause damage to the cable. This includes grommets on ends of hard conduit where used.

Do not deform the jacket of the cable. The jacket shall be continuous, free from pinholes, splits, blisters, burn holes or other imperfections.

Install proper cable supports, spaced less than 5 feet apart, and within manufacturer's requirements for fill ratio and

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load ratings.

Leave a pull string to the end of each conduit run. Replace pull string if it was used for a cable pull.

Note service loops may not touch the drop-ceiling assembly. Any portion of the communications cabling contacting ceiling structures must be remedied at the Contractor expense.

Label every cable within 12 in. of the ends with self-laminating wire wrap cable appropriate to that cable size. Use a unique number for each cable segment as required by the project documentation and the labeling section of this document.

Dress the cables neatly with hook and loop [fire retardant](#) cable ties. Plastic ties are **NOT** approved

Contractors installing cabling systems in Williamson County facilities shall install plenum rated cable in all instances. Non-plenum cable is not allowed and shall be removed at Contractor's expense.

## 2. Copper

- a. When making additions to legacy systems, Contractor shall match the cabling configuration (pinout) of the existing systems. Legacy systems at Williamson County are in most cases T568B.

Within all new installations within Williamson County facilities, contractor shall use copper pinout T568B.

All four pair Category 6/[6A](#) cable runs shall be kept to a maximum permanent link length of 83 meters when using a total 10 meters of 28 awg" small diameter" patch cords.

Use low to moderate force when pulling cable. Maximum tensile load may not exceed 25' lbs. maximum pulling force per 4 pair cable.

No pathway, including conduits shall have greater than a 35% fill per manufacturer fill charts. Contractor is responsible for bringing to the attention of Williamson County project manager any insufficiently sized conduit or cable pathways discovered on site or in project documentation.

Keep Category 6/[6A](#) cables as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as required in cited TIA Standards.

All copper horizontal cabling shall have slack service loops no less than 12" at the work area (equipment outlet) and not less than 3 feet in the telecommunications room.

Service loops may be wall mounted or contained in pathways or racking systems if done in a neat, workmanlike fashion [using concentric circles or s-turns](#).

All UTP patching shall be accomplished using modular patch panels as indicated elsewhere in this document.

All removed copper cable is to be disposed of in a Williamson County recycling bin designated for "copper" or removed from the property to be disposed of by Contractor if this is the instructions in the project documentation.

## 3. Fiber

- a. When making additions to legacy systems, Contractor shall match the fiber type and fiber connectors used within that system.

Within all new fiber installations within Williamson County, contractor shall [utilize an approved fusion splice termination method](#). See product section and Appendix C for details.

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When installing fiber cable, Contractor shall maintain a minimum bend radius, both under pulling load and static (installed), per requirements outlined within TIA standards, or manufacturer's recommendations, whichever is the most stringent.

Fiber terminations shall be done according to recommendations of TIA, manufacturer's requirements and accepted industry best practices.

All unjacketed fiber shall be contained within appropriate fiber enclosures. Exposed tight-buffered or loose-tube strands will not be tolerated and shall be remedied at Contractor's expense.

Contractor shall perform test setup and testing according to guidelines in the "Testing and Acceptance" section of this document.

<END OF SECTION>

### III. Cabling Systems and Associated Infrastructure

#### A. Cabling Subsystem I – Horizontal Cabling System

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1. Horizontal Cabling systems will NOT be utilized within the Rackspace. There will be 1U between the Patch Panel and the next to allow a 48P Switch to fit in-between and the utilization of 1ft Cables will be used.
2. Metal Conduit
  - b. Contractor shall size conduit large enough to accommodate at least 50% growth. I.e. conduit for 4 cables shall be sized to accommodate 6 cables at less than 40% calculated fill based on cable OD.
3. Equipment Outlets (Faceplates)
  - a. When adding horizontal cabling to existing facilities within Williamson County, Contractor shall match the existing cable plant regarding color of existing raceway and faceplates.

Flush mount faceplates in new projects shall be Panduit Mini-Com® faceplates (or approved equivalent) with label fields as called for in the project documentation.

- Faceplates with no labels shall include painted combination head screws.
  - The faceplates shall mount to standard U.S. NEMA boxes and adapters with screw-to-screw dimensions of 3.28" (83.3mm).
  - Faceplates shall be available with or without labels.
  - Dedicated sloped versions shall be available for improved bend radius control and decreased requirements in wall depth.
  - Each faceplate shall accept Mini-Com ® modules that can be individually inserted and removed as required.
- b. See Appendix C for faceplate part numbers.
4. Equipment Outlets – Surface Boxes
  - a. Wireless access points on walls and ceilings utilize Category 6A horizontal runs (drops)
    - Terminated at location with TX6A™ Category 6A Field Term RJ45 Angled Plug
  - b. IP Cameras on walls and ceilings utilize Category 6A horizontal runs (drops)
    - Terminated at location with Two-hole Boxes (Ceiling) or Junction Box with Mini-Com single gang vertical faceplate (Wall).
  - c. Two-hole boxes shall further meet the following requirements:
    - Boxes shall be in electric ivory or international white as called for in project-specific documentation.
    - Able to accept all Mini-com ® Modules
    - Include mounting screws and adhesive tape

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- Be compatible with Panduit® LD3, LD5, and LD10 Raceway.

### 5. Copper Jacks

- a. Modular jacks shall be Panduit Category 6/6A Mini-Com® TG-Series Jack Modules (or approved equivalent) and have the following characteristics.
  - The eight position modules shall be used in all work areas and shall meet the connector requirements of the TIA/EIA Category 6/6A standard.
  - The wiring scheme label shall be available with both T568A and T568B wiring schemes.
  - The modules shall terminate four pair 24 and 22 AWG 100-ohm solid unshielded twisted pair cable.
  - The modules shall be universal in design, including complying with the intermate ability standard IEC 60603-7 for backward compatibility.
  - Category 6/6A modules shall have UL and CSA approval. The modules shall have ETL verified Category 6/6A performance and ISO Class E performance (as defined in ISO/IEC 11801) in both the basic and channel links.
  - They shall be rated for 75°C maximum operating temperature heat capacity.
  - They shall be universal in design, accepting six or eight pair modular plugs without damage to the outer module contacts.
  - The modules shall be able to be re-terminated a minimum of 10 times and be available in 11 standard colors for color-coding purposes.
  - The module shall snap into all Mini-Com® outlets and patch panels.

Consult project documentation for jack color coding in use for that installation.

See Appendix C at the end of this document for part numbers.

### 6. Category 6/6A Unshielded Twisted Pair Cable

- a. Category 6/6A UTP cable shall be plenum jacket.

For cable colors on actual project, consult the project documentation.

See Appendix C at the end of this document for cable part numbers.

### 7. Distributor I (Horizontal Patch Panels) – standard density patch panels

- a. Williamson County copper patch panels in the horizontal patch fields shall be flat 1 RU or 2 RU Mini-Com® type with frames of either metal or molded polymer.
  - Patch panels shall be available in standard density 24 and 48-port configurations.
  - Patch panels include pre-numbered labels with writable surface

For instructions for which patch panel to use consult project-specific documentation.

For detailed part numbers see “Appendix C” at the end of this document.



## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

### 8. Small Diameter Category 6/6A Copper Patch Cords

- a. Copper patching of Category 6/6A links in Williamson County facilities shall use Panduit 28 awg “small diameter” patch cords having the following characteristics:
  - Cable diameter not more than 0.150 in. (3.8mm) nominal.
  - FCC and ANSI compliance: Meets ANSI/TIA/EIA-1096-A; contacts plated with 50 micro inches of gold for superior performance.
  - IEC compliance: Meets IEC 60603-7 c (UL) US listed: UL 1863, CSA standard C22.2.
  - PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications in bundle sizes up to 48 cables.
  - Operating temperature: 14°F to 140°F (-10°C to 60°C).
  - Storage temperature: -40°F to 158°F (-40°C to 70°C).
  - Plug housing: UL94V-0 rated clear Polycarbonate.
  - Contacts: Gold plated phosphor bronze.
  - RoHS compliance: Compliant.
  - Flammability rating: CM/LSZH dual rated.

For in telecom patch fields, Wilco projects use color coded small diameter patch cords to indicate various circuits. These colors and circuits they represent are as follows:

**Blue = Common Data Drops**  
**Black = Utility (AC/Building Maint.)**  
**Yellow = Security (Cameras/Door Access)**  
**White = Wireless AP**  
**Red = Public Safety**

Consult project documentation for how color coding is to be used on that job.

See Appendix C for part numbers.

### 9. Surface Mount Raceway – Wall Mount

- a. Panduit LD-Series or T-Series Raceways.

### 10. Modular Furniture Raceway

- a. Office and administrative areas repurposing used modular furniture may require additional cable pathway space and shall utilize Pan-Way ® Office Furniture Raceway System, or approved equivalent.
- b. Such modular furniture raceway shall provide cable paths along the top of modular furniture partitions dropping services (equipment outlets) at work surface level.

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

c. Modular furniture raceway must meet the following requirements:

- UL listed in accordance with UL-5C requirements for Class 2 Communication Cable Management Systems.
- Maintains bend radius control throughout the entire office furniture raceway system as required by TIA/EIA-568-B and 569-B.
- Faceplates are compliant with the labeling requirements of the TIA/EIA-606-A standard.
- Robust design and tamper resistant closure increases product stability and prevents damage to cabling during and after installation.
- Product supplied with adhesive backing for fast and easy installation.
- Creates a virtually invisible solution for routing data cables on panels from all common manufacturers with a top cap width between 1.88" and 2.30".
- Designed for use with Mini-Com ®Connectivity, also accepts all common manufacturers' connectivity with use of a NEMA standard 70mm faceplate or module frame.

Consult Appendix C for part numbers.

### 11. Power and Communications Poles

- a. Many Wilco offices use power/communications poles to deliver power and data cables from the ceiling into the work area space below.
- b. See Appendix C for part numbers for 11' and 13' power/communications poles.

## **C. Cabling Subsystem II – Intrabuilding Fiber Backbone**

---

- a. Intrabuilding single mode Fiber Trunks are for Use within Buildings.
- b. On additions to existing Williamson County fiber cable plant, Contractor shall match existing fiber and connector types.
- c. In new Williamson County projects, backbone fiber running between telecom spaces within buildings (cabling subsystem II) shall be single mode Opti-Core® Fiber Optic Indoor **Plenum Rated** Interlocking Armored Cable **and** shall further have the following characteristics:
  - Used in intrabuilding backbone, building backbone, and horizontal installations for riser (OFCR), plenum (OFCP), and harsh environments
  - Interlocking aluminum armor eliminates the need for inner duct or conduit to provide a smaller crush resistant pathway for design flexibility and a lower installed cost
  - Fiber strand count listed in drawings.
  - Sheath markings provide positive identification, quality traceability, and length verification
  - 900µm standards-based color-coded buffer coating protects fibers during handling and allows for easy identification and stripping
  - Cable design and flexible buffer tubes allow for quick breakout and ease of routing

# WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

Contractor shall terminate tight-buffered cable constructions with Panduit Opti-cam LC fiber connectors.

See Appendix C for part numbers.

## **D. Cabling Sub-system III – Interbuilding Fiber Backbone**

---

### 1. Single mode Fiber Trunks for Use Between Buildings

- a. On additions to existing Williamson County fiber cable plant. Contractor shall match existing fiber and connector types.

In new Williamson County projects, backbone fiber running between buildings (cabling subsystem III) shall be Panduit Opti-Core® Gel-Free Fiber Optic Indoor/Outdoor All-Dielectric Cable, or approved equivalent.

Loose tube outside plant cable shall be terminated in the entrance facility using [approved](#) Panduit [fusion pigtails](#) with appropriate [Panduit fan-out kits](#), [splice trays](#), and [splice holders](#).

Fanout kits shall have the following properties:

- Used to build up 250µm fiber to 900µm loose buffered coating size for connector termination
- • Include 900µm hollow tubing and plastic housings
- • Include adhesive tape for mounting
- • Include TEFLON\* powder for easy insertion of fibers

Refer to Appendix C for part numbers.

Interbuilding fiber trunks must have the following features:

- Allows installation using loose tube cable methods within buildings and outdoor environments for transitional aerial and duct applications, and in entrance facilities that require plenum (OFNP) rated cable
- Eliminates the need for building entrance transition point
- All-dielectric cable construction requires no grounding or bonding
- UV resistant cable sheathing meets the light absorption requirement defined by Telcordia GR-20, Issue 2 to withstand harsh outdoor environmental demands
- Dry water-blocking technology allows rapid cable preparation and termination for lower termination costs and time (no messy gel required)
- Available in 6 and 12-fiber counts in “central loose tube” design, and in 24, 36, 48, 72, 96 and 144-fiber counts in a “stranded loose tube” design
- Sheath markings provide positive identification, quality traceability, and length verification
- 250µm buffer coating protects fibers during handling and allows for ease of stripping

See Appendix C part numbers.

# WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

## E. Fiber Connectivity

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### 1. LC Fiber Connectors

- a. All LC terminations shall be done with Panduit fusion splice pigtails See Appendix C for part numbers on fiber connectors.

### 2. Fiber Enclosures

- a. Fiber cable terminations shall be contained in 2 RU or 4 RU Panduit FCE series rack mount fiber enclosures, or Wilco approved equal.
- b. Contractor shall select enclosure size as needed for the number of fibers projected to be in that telecommunication space when fully populated.
- c. Contractor shall fill any unused enclosure space with a blank fiber adapter panel (FAP).
- d. FCE enclosures shall further have the following properties:
  - Be able to hold QuickNet™ Fiber Optic Cassettes, Opticom® Fiber Adapter Panels, or splice modules.
  - Have a slide-out, tilt-down drawer to provide full front access to all fibers and cables.
  - Employ integral bend radius control and cable management appliances for fiber optic patch cords.
  - Have rear cable management for proper slacking/spooling of trunk cable breakouts and interconnect cables.
  - Have multiple trunk cable entry locations and include fiber optic cable routing kit (grommets, cable ties, spools, strain relief bracket, and ID/caution labels) for different installation configurations.

See Appendix C for part numbers.

### 3. Fiber Adapter Panels

- a. FCE fiber enclosures shall be populated with fiber adapter panels containing either 6 LC single mode duplex fiber adapters, or 12 LC single mode duplex fiber adapters depending on the density needs of the telecom room.
- b. Consult project documentation to determine whether 6 or 12 LC single mode duplex adapters are to be used on a given job.

Contractor is responsible to blank out any enclosure spaces where adapter panels are not used.

Adapter panels shall further have the following features:

- Loaded with TIA/EIA-604 FOCIS-10 compatible adapters.
- Exceed TIA/EIA-568-B.3 requirements.
- Adapter housing colors follow TIA/EIA-568-C.3 suggested color identification scheme.
- Snap quickly into the front of all Opticom® components
- Accept FOCIS-10 compatible senior LC connectors at either end or FOCIS-10 junior LC connectors at the inside end for behind the wall applications.

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

- Both ends accept FOCIS-10 compatible senior LC connectors.
- Junior end also accepts FOCIS-10 compatible junior (fixed ferrule/springless) SC connectors.
- Choice of phosphor bronze or zirconia ceramic split sleeves to fit specific network requirements; zirconia ceramic split sleeves are recommended for OM4/OM4 multimode and OS1/OS2 single mode applications.
- Every adapter is laser marked with Q.C. number to assure 100% traceability.

Consult Appendix C for fiber adapter panels and blank adapter panels.

### 4. Fiber Patch Cords

- a. Fiber patch fields within Williamson County facilities shall utilize riser rated singlemode LC fiber jumpers (fiber patch cords) that have the following properties:
  - LC Duplex Fiber Optic Patch Cords, to allow users easy accessibility in tight areas when deploying very high-density LC patch fields.
  - Jumpers shall be available in OS1, OS2 and single-mode and be available in in riser (OFNR), plenum (OFNP), and low smoke zero halogen (LSZH) rated jacket materials.

See "Appendix C" at the end of this document for single mode LC jumper part numbers.

## F. Cable Pathways

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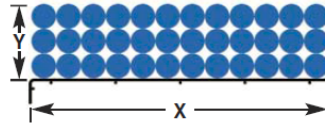
### 1. Overhead Metallic Pathway

- a. Cable delivery over racking systems in telecommunications rooms shall be done with Wyr-Grid® overhead cable tray routing system or College approved equal.
- b. Any pathway offered must have the following properties:
  - Wyr-Grid® Pathways are provided in four widths: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm).
  - Wyr-Grid® System incorporates non-integral Snap-On sidewalls which minimize specification requirements and are offered in three different heights: 2" (50mm), 4" (102mm), and 6" (152mm).
  - Wyr-Grid® Splice Connectors have an integral bonding screw that creates a mechanical-electrical bond between cable tray pathway sections.
  - Wyr-Grid® Waterfalls are offered in two different configurations that attach to all pathway sections: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm) to facilitate bend radius control and cable management.
  - Wyr-Grid® Support Brackets are offered in various widths to accommodate pathways: 12" (305mm), 18" (457mm), 24" (610mm), and 30" (762mm); have integral quick-clip retention; accommodate 1/2" or 12 mm threaded rods.
- c. All metallic cable trays must be grounded, and all sections bonded in accordance with listing requirements for the system and per TIA 607-B including most recent revisions, TSB and addenda.

# WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

- d. Contractor is responsible sizing all pathways to represent no more than a 35% fill upon installation per manufacturer's fill chart below:

## Wire Fill for Wyr-Grid® Overhead Cable Tray Routing System



X (in.)	Y (in.)	Internal Area (in²)	Category 6A (SD) Diameter 6.1mm 0.240"	Category 6A Diameter 7.6mm 0.300"	Category 6 Diameter 6.1mm 0.240"
12.2	2	24.3	269	172	269
	4	48.7	538	344	538
	6	73.0	807	516	807
18.2	2	36.3	401	257	401
	4	72.7	804	514	804
	6	109.0	1205	771	1205

"Y" equates to the height of the Wyr-Grid® Optional Sidewalls. The internal area defines the allowable fill capacity based on the Wyr-Grid® Pathway width and optional sidewall height. The Wyr-Grid® Pathway cable fill is based on NEC allowable fill of 50%. The above cable diameters represent the nominal Panduit cable diameter per performance level.

All cable trays and grounding conductors should be clearly marked in accordance with manufacturer's instructions, applicable codes, standards and regulations.

Contractor shall take care to segregate and protect armored fiber from copper cabling in metallic pathway.

Bundled copper and fiber backbones shall be dressed to maintain segregation of cable types throughout the pathway. Innerduct or separate fiber duct is not necessary, due to armored construction on fiber backbone.

See Appendix C for part numbers.

## 2. J-Hooks

- e. J-hook systems used by Williamson County shall be Panduit "J-Pro" series, or approved equivalent.

Contractor installing J-hook systems shall space them no more than 5 feet apart as per TIA 569-C standard.

J-Hook Sizing shall be no greater than 2" and a maximum bundle size of 24 cables. If J-hooks are deemed too small by above criteria, Contractor shall bring this to the attention of Williamson County for resolution in writing.

J-hook systems used by Williamson County shall have the following properties:

- Patented design provides complete horizontal and vertical 1" bend radius control that helps prevent degradation of cable performance.
- UL 2043 and CAN/ULC S102.2 listed and suitable for use in air handling spaces.
- Pre-riveted assemblies allow for attachment to walls, ceilings, beams, threaded rods, drop wires and underfloor supports to meet requirements of a variety of applications.
- Wide cable support base prevents pinch points that could cause damage to cables.
- Cable tie channel allows user to easily install 3/4" (19.1mm) Tak-Ty® Cable Ties to retain cable bundle.

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

- Durable non-metallic J Hook materials provide the ability to manage and support a large number of cables.
  - Material: Black Nylon 6.6 J Hook with metal attachments.
- f. See Appendix C for part numbers.

### **G. 19" Racks and Rack-mount Cable Managers**

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#### 1. General:

- a. Wilco will often use a "active rack/passive rack" strategy, putting all active electronics on one rack and all associated patching on an adjacent rack. Consult project documentation for details on job.

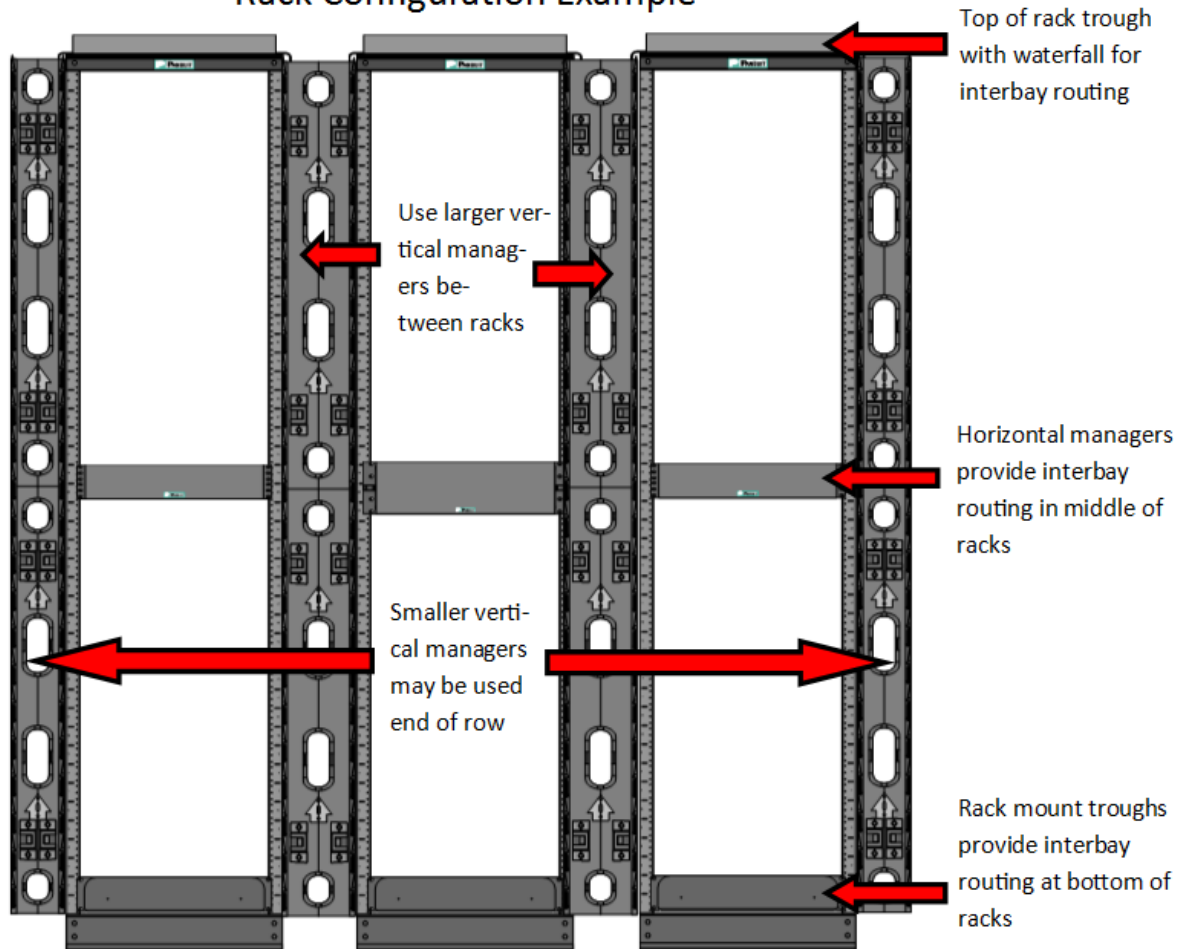
#### 2. Two-post Communications Racks

- a. 2-post racks will be Panduit black-powdered aluminum (or Wilco approved equivalent) and have the following properties:
- 19" EIA rack, aluminum.
  - Dimensions : 84.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).
  - Rack units numbering up from bottom to allow quick and easy location of rack mount items
  - UL listed for 1,000 lbs. load rating.
  - Double-sided #12-24 EIA universal mounting hole spacing with 24 #12-24 mounting screws included.
  - Accepts all Panduit cable management and patch panel products in addition to any industry standard 19" components.
  - Includes paint piercing washers for assembly to assure electrical continuity between components as per TIA 607-B Bonding and Grounding Standard.

In telecommunications rooms with multi-bay rack rows configured such that patching will take place between racks, Contractor is responsible to include in design interbay routing pathways at the top, middle and bottom of each bay to provide efficient and neat routing between any two points within rack rows.

Interbay routing shall be provided in the form of top troughs, interbay mid-rack path and flanged shelf at the bottom. See rack configuration example below.

### Rack Configuration Example



Size all cable managers to contain no more than 35% fill per manufacturer's fill tables upon installation



# WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

Contractor shall use 4RU trough CMLT19 at the base of each rack.

All racks shall be outfitted with a vertical grounding busbar along one rail, with all equipment bonded to ground according to TIA 607-B Bonding and Grounding Standard. See Bonding and Grounding section of this document for details.

See Appendix C for part numbers.

## 3. 4 Post Racks

a. Racks in large equipment rooms and data centers may require 4 post racks. These racks shall have the following properties:

- Independent adjustable front and rear mounting rails can be adjusted while the rack is secured to the floor
- Printed rack space identification on all equipment rails allows for quick location of rack spaces, speeding
- installation of rack mount items (shipped numbers up per TIA606 specifications; can be set to number down by flipping the rails)
- Rack is UL listed for 2,500 lbs. load rating
- Rear rail construction provides a clear ventilation path for side ventilated switches
- Multiple mounting holes in top flanges for securing ladder rack
- Weld nut construction eliminates the need for a second wrench increasing speed and ease of assembly
- Multiple mounting locations for vertical power strips on any of the four posts or on the adjustable mounting rails
- Paint piercing washers included

See Appendix C for 4 post racks part numbers.

## 4. Rack-mounted Cable Management – Vertical Managers

a. Vertical cable managers shall be PatchRunner™2 Vertical Cable Management System in sizes 6" wide, 8" wide, or Wilco approved equivalent.

Contractor will use double sided (front and back) vertical managers on 2-post racks.

All vertical cable managers shall have dual hinged doors.

Contractor shall choose vertical cable manager width according to manufacturer's fill tables to not represent more than a 35% fill at installation based on projected worst-case density when racks are fully populated.

Contractor shall bring to the attention of Wilco any case where the populated rack will exceed 35% upon installation for resolution from the Department of Information Technologies.

Vertical cable managers shall have the following features:

- Large finger openings accommodate up to 24 Category 6 cables

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

- Integral cable retainers on the end of each finger to help contain cables within each rack unit
- Bend radius fingers align with rack spaces to support cables as they transition to the vertical pathway
- Dual hinged covers can be opened 110° to the left or right to provide complete access to the cables inside the vertical pathway
- Snap-on cable retainers can be placed on to fingers to help retain cables in channel during installation and maintenance
- Vertical managers include hinged covers, cable retainers, mounting brackets and #12-24 screws

Part numbers are listed in Appendix C.

### 5. Rack-mounted Cable Management – Horizontal Managers

- a. No horizontal managers will be used, unless there is an absolute need for them.

## H. Cable Accessories

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### 1. Cable Ties

- a. Cable bundles on racks and in pathways shall be bundled with re-enterable hook and loop cable ties that come in continuous rolls. **NYLON CABLE TIES ARE NOT PERMITTED UNDER ANY CIRCUMSTANCES.**
- b. Contractor is responsible for using plenum hook and loop ties in air-return spaces.

See "Appendix C" for part numbers.

### 2. Physical Security Devices

- a. Some portions of Williamson County networks require additional physical security devices. These take three forms:
  - Devices that block-out copper and fiber ports in patch fields and faceplates that require a special tool for removal.
  - Devices that lock-in copper patch cords and require a special tool for removal of those patch cords.
  - Devices that temporarily or permanently block USB ports on laptops and computers.

Areas where such devices are required will be called out in the project documentation.

**See Appendix C for part numbers.**

## I. Communications Grounding Network

---

### 1. General

- a. Contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA 607-B Standard.

# WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

## 2. Room Busbars

- a. All Telecommunications spaces and distributor rooms shall have installed an appropriately sized wall-mount busbar with BICSI hole spacing that bonds to the building bonding backbone.
- b. See Appendix C for appropriate room telecommunications grounding busbar.

## 3. Rack and Equipment Grounding

- a. Contractor is responsible for properly grounding all network equipment, racks and cabinets and bonding them to the wall mounted busbars as described in the TIA [607-C](#) standard.
- b. All newly installed racks and cabinets shall have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.

Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar using a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.

Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built to that purpose.

Contractor shall take care to clean (wire brush, scotch brite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.

All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Contractor's expense.

Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy-chaining) of racks is expressly forbidden and will not be accepted.

Rack Bonding Conductors (RBC) may tap into an overhead or underfloor aisle ground or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.

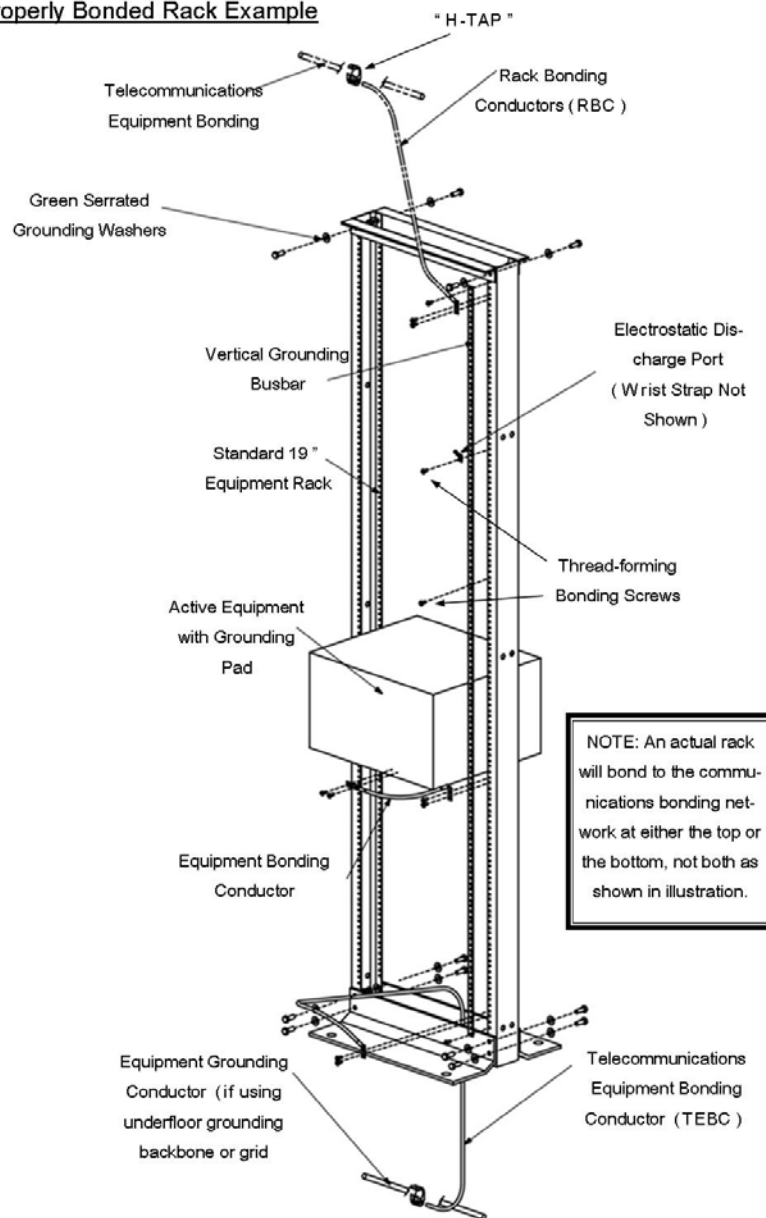
A minimum of every other rack or cabinet shall be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets these ESC ports and straps shall be provided on front and back to be accessible and able to reach any active equipment needing servicing.

Armored cables shall be properly bonded to the earthing system on both ends with a kit built to that purpose.

For examples of rack grounding refer to the illustrations below:

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

### Properly Bonded Rack Example



<END OF SECTION>

## IV. Network Labeling

### A. General Requirements

---

1. When labeling any Williamson County network system, Contractor shall adhere to the following requirements:
  - a. All cabling added to existing "legacy" installations shall follow the labeling convention in place at that location.
  - b. All labeling of installed cabling in new projects shall satisfy all requirements of Williamson County.
  - c. Contractor shall, wherever possible pre-print labels using Panduit Easy-Mark software and laser jet printer, or Wilco approved equivalent.
  - d. The Panduit PanTher (LS8E) hand-held thermal transfer printer or Wilco approved equivalent shall be used on site to print labels that were unanticipated, or that become damaged in application. Preferred Printer: Epson MP300
  - e. This labeling strategy shall, at a minimum, clearly identify all components of the system: racks, cables, panels and outlets, grounding, pathways and spaces like telecommunications rooms.

All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

Labeling will Identify the Floor and Port Number. Ex: 1<sup>st</sup> floor = 1-201, 2<sup>nd</sup> floor = 2-201, If there is multiple IDFs on a floor they will be separated as A,B. Example: 1<sup>st</sup> floor A1-201, B1-201, 2<sup>nd</sup> Floor A2-201, B2-201.

All label printing will be machine generated by either hand-held labeling systems or computer-generated using programs and materials built specifically for communications labeling.

Handwritten labels will not be accepted and must be remedied at Contractors expense.

Cabling system labels shall utilize materials designed to outlast the cabling elements to which they attach. Office quality labels will not be accepted.

Cable labels shall be self-laminating, appropriately sized to the outside diameter of the cable and placed within view at the termination point on each end.

Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

Machine-generated labels shall be installed behind the clear lens or cover on any device that provides such an option.

All labels will be permanently affixed to installed cables, patch panels, racks, cabinets, and enclosures.

Conduit shall be marked indicating the identification of the cable within.

Labels shall be legible and placed in a position that insures ease or visibility.

Label type must be as listed in Appendix C - Materials section at the end of this document.

<END OF SECTION>

## V. Testing and Acceptance

### A. General

---

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions.
2. All copper pairs or optical fibers of each installed cable shall be tested and verified prior to system acceptance.
3. Any defect in the cabling system performance or installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors or fibers in all cables installed.
4. All cables shall be tested in accordance with this document, the ANSI/TIA Standards, the PANDUIT® [Certification Plus](#) System Warranty guidelines and best industry practice.
5. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

### B. Copper Link Testing

---

1. All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA 1152 and ANSI/TIA 568-C.2 for the appropriate Category of cabling installed using a test unit meeting a minimum IEC IIIe level of accuracy.
2. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is the more stringent.
3. Contractor shall set references according to manufacturer's recommendation prior to each day's testing and reset references anytime tester is left unused for more than two hours.
4. For warranty purposes, Contractor shall perform the appropriate Permanent Link test. Channel Link testing is rendered void by the movement of patch cords and can be run but not used for final acceptance criteria.

### C. Fiber Testing

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1. All installed fiber shall be tested for link-loss in accordance with ANSI/TIA-C.0 and shall be within limits specified within ANSI/TIA-C.3, or as spelled out in the project documentation.
2. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in **both directions** at 850 nanometer (nm) **and** 1300 nm using an LED light source and power meter.
3. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

4. Backbone & WAN single-mode fiber cabling shall be power tested at the 1310 and 1550 wavelengths in both directions. OTDR traces shall be performed in both directions at 1310 and 1550 wavelengths. End face termination/connector captures shall be performed on each connector with a passing result.
5. Test set-up and performance shall be conducted in accordance with ANSI/568-C.0 standard, Method B.
6. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. Only basic link-loss testing with a power meter is required. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above.
7. The values for calculating loss shall be those defined in the ANSI/TIA 568-C.3 Standard. If the link loss requirements defined within the standard conflict with those referenced in the project documentation, Contractor shall immediately bring this to the attention of Information Technologies for resolution.

### **D. System Documentation**

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1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to Wilco for approval. Documentation shall include the items detailed in the sub-sections below.
2. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.
3. Contractor shall submit with drawings a diagram of each telecommunications room with indicating which cabling drops will terminate in which rooms (classrooms). This is both to give an idea of contractor cable plant design, as well as to facilitate future troubleshooting.
4. At the request of the Information Technologies Engineer, the telecommunications contractor shall provide copies of the original test results in tester native format, not spreadsheet.
5. Information Technologies may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by Information Technologies, including a 100% re-test. This re-test shall be at no additional cost to the Williamson County.

### **E. Test Results**

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1. Documentation shall be provided in electronic format within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year).

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

2. The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). Documentation shall also include test equipment name, manufacturer, model number, serial number, software version and last factory calibration date.
3. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation.
4. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
5. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form.
6. The media shall contain the electronic equivalent of the test results as defined by the specification along with the software necessary to view and evaluate the test reports.
7. When repairs and re-tests are performed, the problem found and effective action taken shall be noted, and both the failed and passed test data shall be documented.
8. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations.
9. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. Williamson County will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added.
10. These documents will be modified accordingly by the Telecommunications Contractor to denote as-built information as defined above and returned to the Williamson County.
11. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form.

<END OF DOCUMENT>



## **Appendix A – Wilco Contractor/Vendor Rules and Regulations**

### **Wilco Contractor/Vendor Rules and Regulations**

Williamson County maintains specific rules and regulations that apply to all contractors and vendors who perform work or provide services. It is the responsibility of the contractor or vendor to ensure that all rules and regulations are always adhered to. Any employee of the contractor or vendor who does not adhere to the rules and regulations will be asked to leave the property and will not be permitted to return. Poor conduct will not be tolerated.

**You or your company may not perform any work or services in the building or on the grounds until the following mandatory requirements are met:**

1. A certificate of liability insurance for your company must be filed with the Facilities department. The certificate must be current and must meet building insurance requirements for coverage and indemnification.
2. All subcontractors must be approved by Technology Services or Facilities.
3. Each worker, whether employed by your company or by a subcontractor, must possess an understanding of building safety procedures.
4. All permits must be displayed, and a copy must be on file with Facilities.

**The following general rules apply to all vendors, contractors and subcontractors:**

1. **ALL Facilities are Smoke Free.** No smoking in any area of the buildings, roof or loading docks.
2. All workers are expected to behave professionally. Please remember the importance of your appearance and professionalism in and around our buildings.
3. All contractors must wear proper attire while on the premises. Shirts or hats with profanity are not permitted on the property. All contractor employees must have identification with their company's name on it.
4. All combustible and flammable materials or liquids must be stored properly, and the Facilities Department must be notified of the presence of such materials.
5. Please check in at the Construction site or Facilities department for building access and/or prior to starting any work, unless otherwise specified.

**General Requirements:**

- 1) All construction and construction related activities will conform to all State, Local, Federal & OSHA laws
- 2) Contractor shall ensure that the construction site and adjoining areas including hallways and access ways are always kept clean. Areas not under construction but affected by or used during construction are to be protected from damage. Floors and carpets are to be covered with protective materials.
- 3) Contractor shall be responsible for the repair of all damages caused by them or their subcontractors.
- 4) Construction signs and/or barriers visible to tenants and guests of the building must be approved by Facilities prior to installation.
- 5) Physical or verbal abuse or harassment of any individual is prohibited.
- 6) Workers will be allowed in area where construction is taking place. All work which requires entering other tenant areas or common areas will be coordinated with Facilities.
- 7) Work being done outside of the hours of 8:00 am – 5:00 pm must be coordinated with Facilities or Technology Services departments.

#### **Cleaning**

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- 1) It is expected that all areas outside of the work area will be kept clean to include but not limited to:
  - a) Common areas
  - b) Elevator/Loading dock routes
  - c) Exterior areas
- 2) Work areas must always be kept clean. Each contractor is responsible for removing any trash or debris associated with their work activities. It is the contractor's responsibility to vacuum and dust common areas if work activities create excessive dust and trash
- 3) It is expected that walk off mats will be used at all areas of entry and exit of the space. The mats should be changed frequently to keep a tidy appearance and upon request of Facilities or Technology Services.
- 4) It is expected that if construction deliveries coming from the loading docks cause excessive dirt and damage to the existing finish of the common area floors as deemed by Facilities, the contractor will be expected to reimburse the facility for stripping and waxing or cleaning of the carpet. If this policy is not adhered to, the building will take appropriate action and charge back the contractor all costs associated with the activity.
- 5) If damage does not clean or is unable to be repaired the contractor will be responsible for the replacement of the goods.
- 6) Utility sinks are to be cleaned if used. No construction waste, paint thinner or other obstructing or hazardous materials are to be poured down the drain or left to clog the sinks
- 7) Carpets and flooring within the work area as well as the common areas must always be maintained in a clean and undamaged condition. Contractor shall be responsible for any damage and should report any preexisting conditions prior to the commencement of work.
- 8) Fire Exit doors and/or evacuation pathways must be open at all time and free of debris or clutter
- 9) There will be a mandatory post work inspection completed. This will consist of a representative from Facilities, along with a representative from the company completing the work. This will be to inspect the work completed, as well as the cleanliness of the area at the finish of the project. The associated post inspection form must be completed and signed by both representatives. Any requests made from the facilities department during this time must be met prior to receiving payment for work. If contractor does not comply with post work inspection, they will be back charged for any costs associated to with the issues.

### Construction

- 1) All Air Handling Returns must be sealed during construction. Contractors must notify Facilities prior to using any products that could generate dust or odors that may migrate into the buildings HVAC system or other tenant spaces. Off hour restrictions may be required.
- 2) All construction related trash must be properly disposed of in a construction dumpster by contractor. Facilities will approve location.
- 3) A representative of the Facilities department will attend all weekly job meetings.
- 4) The owner reserves the right of first refusal on all demo'd materials
- 5) All Wilco buildings are smoke free
- 6) Any unused materials such as conduit, wiring, building materials must be disposed of by the contractor
- 7) Prevailing wage rates must be posted at the worksite in accordance with M.G.L. ch.149 sec.27. It is the responsibility of the contractor to maintain all state and local postings
- 8) Hot Works- will be coordinated and permitted through the Facilities Department. Prior to any welding, soldering or metal cutting, contractors must present the Facilities Department with a fire plan and proof of fire watch and permit.
  - All Fire alarm wiring must be installed in conduit clearly labeled every 10'

### Roof Access

- 1) Roof access must be coordinated with the Facilities Department
- 2) There is no smoking on the roof

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

- 3) Clean up all debris including loose screws
- 4) Any damage to the roof will be the responsibility of the Contractor to repair

### **Shut Down coordination**

- 1) All shut down's must be coordinated with the Facilities Department. If the building systems are shut down for any reason, the contractor must first coordinate through Facilities such activities allowing time to notify all appropriate parties. At any time, the contractor accidentally causes a building system to fail, the contractor will be responsible for all costs associated with that failure.
- 2) All shutdowns must be back online by the end of the day. Shutdowns are NOT permitted overnight.
- 3) Facilities or Technology Services must approve that services are back online to their satisfaction BEFORE the contractor leaves the property.

### **Noise coordination**

- 1) All noise will be contained. Please keep all doors closed to help to contain sound as well as dust. No radio music will be allowed
- 2) County occupied space will be handled with the utmost respect.
- 3) Complaints of excess noise will be handled immediately. Management reserves the right to stop all work if the work causes complaints from other tenants. Any charges, fees and/or other costs associated with scheduled or non-scheduled work stoppage is the responsibility of the contractor doing the work.
- 4) All floor and wall penetrations must be fire stopped.

### **Core Drilling**

- 1) Core Drilling or any other work causing noise disruption must be coordinated with the Facilities Department. Absolutely no work will be permitted that in any way disrupts daily activities during class times or normal working hours unless prior authorization from Facilities is granted

### **Elevator Use**

- 1) The elevators will be used according to their proper designation and weight capacity. Freight Elevator will be used for all construction related materials and or utility carts
- 2) Priority use must be given to staff use. Please do not enter an elevator with construction equipment with staff.
- 3) Floor and wall protection must always be used

### **Loading dock**

- 1) Use must be coordinated with Facilities.
- 2) Deliveries must be coordinated with Facilities.
- 3) Loading docks will be kept clean and free of construction materials. Storage is not allowed on or around the loading dock
- 4) Floor protection must be used when entering the common areas from the loading dock
- 5) No Smoking on or around the loading dock area

### **Security**

- 1) A contact lists must be provided to the Facilities department of all Trades, to include emergency contact information
- 2) The list will be given to the Project Manager
- 3) Absolutely no smoking in project area or within any building on site.
- 4) No alcohol is allowed in any project areas.
- 5) Entry to other non-project related spaces or unauthorized areas are strictly prohibited.

### **Parking**

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- 1) Vehicles will be allowed access on site for unloading and loading purposes only identification. Any Vehicle parked in unauthorized areas will be towed at the owners' expense.
- 2) Overnight parking is not permitted
- 3) Parking of Trailers must have prior authorization from the Facilities department

### Insurance:

The Contractor shall purchase and maintain in a company or companies licensed to do business in the state in which the contract services are to be performed, insurance as set forth below which will protect the Contractor, Owner, and the Agent, and their respective employees, agents, successors and assigns, from claims which may arise out of or resulting from Contractor's operations under the Agreement, whether such operations be performed by the Contractor, its subcontractors, or by anyone directly or indirectly employed by any of them for whose acts they may be liable. The Contractor must bring the insurance certificate to the Facilities Department prior to any work commencing.

We require Certificate of Liability Insurance from each vendor we contract with. The following information should be included:

- a. General Liability- minimum coverage \$1,000,000.
- b. Automobile Liability- minimum coverage \$1,000,000.
- c. Workers Comp& Employee Liability
- d. Description of Operations must be filled out. Please include "It is hereby agreed that S.T.C.C. is additionally insured and will be held harmless for all damages you create"
- e. Certificate Holder

### **Life Safety Procedures**

- 1) In the event of a medical emergency, fire or life-threatening emergency, workers should call 911
- 2) Facilities must be notified of any injuries that occur on the property.

### **Life Safety Systems**

- 1) If there is a possibility that the life safety equipment has been compromised, Facilities Department must be notified immediately.
  - a) Facilities Department (512) 943-1666
- 2) No propping open fire doors.
- 3) Contractors must maintain the proper equipment to manage water from a broken sprinkler pipe

<END OF APPENDIX>

## **Appendix B – Wilco Cabling Policies and Procedures**

### **Williamson County (Wilco) POLICY & PROCEDURE CONCERNING ALL ELECTRICAL, TELECOMMUNICATIONS AND NETWORKING INSTALLATIONS AND/OR MODIFICATIONS**

#### **I. Policy**

Permits are required for all Electrical, Telecommunication and Network wiring modifications within Wilco buildings PRIOR to commencing work. By requiring prior authorization and pre and post implementation inspections, Wilco will better maintain the integrity and safety of the telecommunications system, alarms, cameras, elevator, fire alarms and electrical wiring. The goal of instituting this policy is to maintain strict control over the wiring and facilities to significantly reduce the probability of system issues, prevent damage to the facilities and maintain compliance with building and fire codes.

**It is therefore, the policy of Wilco that existing telecommunications wiring, including electrical, voice, data, and video, as well as telecommunications facilities located in various buildings may not be altered in any way except by written permission from the Facilities Project Manager or Technology Services Systems Engineer.**

#### **II. Procedure for Wiring (Telecommunications and Computer)**

1. Existing telecommunications and/or computer wiring, and cables may not be altered by anyone except an IT contractor, vendor or Wilco Electrician and must include permission from the Facilities Project Manager or Technology Services Systems Engineer.
2. Wilco System Engineer or Facilities Project Manager shall review and approve the telecommunications and computer wiring and for new and existing buildings.
3. Electrical Inspector shall inspect all telecommunications wiring in new and renovated buildings and projects to ensure proper installation.
4. Any unauthorized wiring found in telecommunication, electrical spaces or within buildings & grounds will be removed immediately at the cost of the department.
5. Any unauthorized wiring which interfaces with telecommunications, wiring or health and safety will be reported to Facilities Department for review. Working with Technology Services, if the wiring is found to be either a safety hazard; or not in conformance with applicable codes; or detrimental to the functioning of the telecommunications system; it shall be removed by the vendor authorized representative, at the expense of the vendor/contractor's or department that installed or authorized it.
6. All telecommunication will be marked identifying their terminal ends and owner.

#### **III. Telecommunications Manholes and Closets**

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

1. Any manholes or closets containing telecommunications conduit or electrical wiring shall be under the exclusive control of the Facilities Department.
2. No equipment or storage may be placed in these areas without the Facilities department knowledge and consent. All confined spaces regulations will be complied with for manhole applications including those persons entering the manholes.

### **IV. Electrical Wiring**

1. All electrical wiring will be installed and marked according to National, State and City codes. Only approved licensed and insured vendors/contractors will be approved for such work.
2. Abandoned or discontinued electrical wiring will be properly removed and circuitry identified of such discontinuance.
3. Wilco will review and approve plans for additional wiring before the vendors/contractors performs work.
4. Any unauthorized wiring will be removed at vendor/contractor/departments expense.

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## **Summary of Policy and Procedure**

- A. Permits for all wiring will be required. NO EXCEPTIONS
- B. Telecom or electrical wiring will be run in conduit, independently of all other conduit unless the conduit is specifically designated for that particular wiring. Wiring is never to be hung from or connected to HVAC piping or ducts or fire suppression equipment and piping.
- C. All telecommunication and electrical closets are designated areas for Telecom and network equipment. Closets will be organized and free of clutter. Wiring closets are not to be used for storage and will be readily accessible at all times.
- D. All telecom and electrical wiring will be marked with project name and location name and demarcation points. Ends will be clearly marked with destination location.
- E. All work will be completed with the approval of the Facilities Project Manager or Technology Services Systems Engineer.
- F. All holes drilled through walls, ceilings and floors etc. will be fire stopped and labeled. Temporary use or construction means, and methods still must be approved by Facilities and Technology Services
- G. All contractors must sign in at the Construction office daily. Appropriate permits must be posted at the work area. Contractors must submit all hot works permits to Facilities at least 72 hours prior to work. Hot works permits are approved by the Facilities Department. Work

## WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

may not be done without approval. Contract must arrange with the Facilities Department to be able to take the fire alarm offline with prior to any work being performed

H. Hours for drilling or any other work that will create noise/vibrations during the academic year will only be allowed between 11 p.m. to 7 a.m. unless exceptions are made by the Facilities Project Manager. Any work creating noise done outside those hours will be shut down by the Facilities department.

I. Intervals of labeling of conduits and wiring will be left to the discretion of the Technology services Systems Engineer or designee and wiring code, however a minimum of every 8-10' is required. Labels should be clearly placed and the beginning and end of each run.

K. No employees of Wilco will run, pull, manipulate or extend power, terminated Ethernet or fiber (electrical and computer, phone etc.) except for the Wilco Electrician or Technology Services Systems Engineer for Telecom.

L. Any work on or to power, Ethernet or fiber in any of 's buildings or grounds must be done by a Facilities Approved Vendor. **Technology Services REQUIRES Notification by all vendors working on any of wiring or cabling, new or existing. Notification should include identifying the means and methods of routes.** It is expected that all wires and cables will be run according to State and Federal codes and laws without exception. Any work done that does not meet these requirements will be the responsibility of the contractor.

Requests should be submitted to the Facilities department at least 2 weeks prior to any work being done. In an emergency, the Facilities Project Manager or Technology Services Systems Engineer should be contacted before any work is done.

M. Technology Services (Infrastructure) will coordinate vendor work with the Facilities Department. All bid documents (RFP, RFI etc.) will include these Technology Services policy, procedure, requirements and expectations.

N. All Contractors must provide necessary insurance and certificates to include but limited to, Terms and Conditions, Certificate of Liability Insurance, W9, etc.

<END OF APPENDIX>

# WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

## Appendix C – Materials List

Manufacturer	Part Number	Description
		<b>COPPER DISTRIBUTION</b>
Panduit	PUP6004xx-UY	Blue Category 6 UTP cable.
Panduit	CPPKL6ATGxxWBL	Mini-Com 24/48-port category 6-RJ45 patch panel in black, (1/2 RU).
Panduit	CJ688TGxx	Category 6, RJ45, 8-position, 8-wire universal module. Color PN: Blue-BU, Yellow-YL, White-WH, Black-BL, Red-RD
Panduit	UTP28SP*xx	Category 6 Performance, 28 AWG UTP patch cord with TX6™ Modular Plugs on each end. Get Length and color from Wilco ITS.
Panduit	CFPL*IWY	Mini-Com Classic series single gang vertical faceplate.
Panduit	FPUD6X88MTG	TX6A™ Category 6A UTP Field Term Angled RJ45 Plug.
Panduit	HLS-15R0	Tak-Ty ® Hook & Loop Cable Ties, 15' Continuous Rolls
		<b>FIBER DISTRIBUTION SYSTEMS</b>
Panduit	FLCS2/9SOCU9BU	OptiCam Fusion Splice-On Connectors. Fiber LC-UPC Splice-On Connector for 250/900um Fiber, 9um Singlemode
Panduit	FLCS2/9SOCA9AG	OptiCam Fusion Splice-On Connectors. Fiber LC-APC Splice-On Connector for 250/900um Fiber, 9um Singlemode
Panduit	FSPP9**Y	Fiber OS2 singlemode plenum rated indoor interlocking aluminum armored cable. For intrabuilding use between telecom rooms in the same building.
Panduit	FSNP9**Y	Fiber OS2 singlemode plenum rated indoor/outdoor stranded cable. For use for between building fiber backbone.
Panduit	FCE2U	Opticom® QuickNet™ Rack Mount Fiber Enclosures, holds up to eight QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions : 3.48"H x 17.60"W x 16.30"D (88.4mm x 447.0mm x 414.0mm).
Panduit	FCE4U	Opticom® QuickNet™ Rack Mount Fiber Enclosures, holds up to twelve QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions : 6.98"H x 17.60"W x 16.30"D (177.0mm x 447.0mm x 414.0mm)
Panduit	FAP*WBUDLCZ	LC FAP loaded with 6/12 LC duplex singlemode fiber optic adapters (Blue) with zirconia ceramic split sleeves.
Panduit	NKFP91BN1NNM001	LC to Pigtail – OS1/OS2 Singlemode Simplex Pigtails – 900µm Buffered Fiber LC to pigtail singlemode simplex pigtail, 900µm buffered fiber (one LC connector on one end and open on the other end) – 9/125µm.
Panduit	FAPB	Blank fiber adapter panel – reserves space for future use.
Panduit	FOSMF	Fiber optic splice module holds and protects up to 24 fusion splices. Self-stacking modules with integral cable management and fiber slacking/spooling features. Black plastic base and clear plastic hinged cover. For use with Panduit Opticom ® FCE*U, FRME*U, and FMT series enclosures. Dimensions : 0.30"H x 14.03"W x 5.28"D (7.6mm x 356.4mm x 134.1mm).
Panduit	FOSMH2U	Fiber optic splice module handler, 2 RU. Holds up to eight FOSM splice modules. For use with FCE2U fiber cassette enclosure. Dimensions: 2.91"H x 0.72"W x 2.61"D (74.0mm x 18.3mm x 66.4mm).
Panduit	FOSMH4U	Fiber optic splice module holder, 4 RU. Holds up to twelve FOSM splice modules. For use with FCE4U fiber cassette enclosure. Dimensions: 5.50"H x10.42"W x 5.41"D (139.7mm x 264.7mm x 137.4mm)
		<b>RACKS, ZONE ENCLOSURES AND CABLE MANAGERS</b>
Panduit	PZAEWM3	PanZone Active Wall Mount Enclosures
Panduit	R2P	19" EIA 2-post rack, aluminum. Dimensions: 84.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).
Panduit	PR2VWF	Waterfall Trough for 2/4 Post Rack. FOR TOP-OF-RACK INTERBAY ROUTING.



# WILLIAMSON COUNTY CABLING SPECIFICATIONS AND POLICY

Panduit	<b>R4P</b>	4 post EIA rack with #12-24 threaded rails. Dimensions : 84.0"H x 20.3"W x 23.0"D (2134mm x 515mm x 584mm). 45 RU.
Panduit	<b>PR2VD0*</b>	6"/8" Patchrunner® 2 Vertical Cable Manager Dimensions: 83.88"H x 6"W x 20.0"D
Panduit	<b>CMLT19</b>	4 RU lower trough with 1.3" bend radius mounts to the bottom of a standard 19" EIA rack. Dimensions: 8.0"H x 19.0"W x 4.5"D (203mm x 483mm x 114mm). FOR BOTTOM-OF-RACK INTERBAY PATHWAY. LARGER OPTION THAN CMUT19 IF NEEDED.
		<b>CABLE PATHWAYS</b>
Panduit	<b>J-Pro J-Hook system</b>	Panduit J-Pro System. Plenum rated composite J-hooks with hardware available for various hardware applications. See <a href="http://www.panduit.com">www.panduit.com</a> for variations.
Panduit	<b>CBXQ2WH-A</b>	Single gang one-piece outlet box with adhesive backing. Box accepts Pan-Way® Screw-On Faceplates or any NEMA standard single gang faceplate. For use with Pan-Way® LD profile raceway. 5.09"L x 3.34"W x 1.75"H (129.4mm x 85.0mm x 44.4mm). Breakouts for 1/2", 3/4", or 1" diameter conduit.
Panduit	<b>WG12BL10</b>	Wyr-Grid 12" wide x 10' long pathway section used to carry cables horizontally throughout the system. Snap-on sidewalls attach for job specific height requirements. Uses splice connector WGSPL1218BL to connect straight sections and intersection splice WGINTSPLBL to connect pathways at an intersection. For fittings and accessories see <a href="http://www.panduit.com">www.panduit.com</a> .
Panduit	<b>WGSW*BL</b>	2"/4"/6" Snap-on Sidewalls
Panduit	<b>CFPL*IWY</b>	2/4 Port Mini-Com Classic series single gang vertical faceplate.
Panduit	<b>WG18BL10</b>	Wyr-Grid 18" wide x 10' long pathway section used to carry cables horizontally throughout the system. Snap-on sidewalls attach for job specific height requirements. Uses splice connector WGSPL1218BL to connect straight sections and intersection splice WGINTSPLBL to connect pathways at an intersection. For fittings and accessories see <a href="http://www.panduit.com">www.panduit.com</a> .
		<b>BONDING AND GROUNDING</b>
Panduit	<b>ACG24K</b>	#6 AWG (16mm <sup>2</sup> ) jumper for armored cable diameter up to 0.84" (21.3mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
Panduit	<b>LCC series</b>	Panduit two-hole compressing lugs for code conductors in BICSI hole spacing.
Panduit	<b>HTCT series</b>	Panduit HTAPs. Must be selected according AWG size of run and tap conductors.
Panduit	<b>CLRCVR series</b>	Panduit clear covers for HTAPs. Must be selected according to HTAP being covered.
Panduit	<b>RGS134-1Y</b>	Grounding strip (vertical busbar) for newly installed racks or cabinets with screw rails. 78.65" (2m) length; .67" (17mm) width; .05" (1.27mm) thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
Panduit	<b>RGCBNJ660P22</b>	Jumper kit for bonding individual racks or cabinets into grounding backbone. #6 AWG (16mm <sup>2</sup> ) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread forming screws and a copper compression HTAP* for connecting to a #6 to #2 awg sized bonding backbone.
Panduit	<b>GJ672UH</b>	Rack jumper (and cabinet) kits for smaller TR (5 bays or less) to bond individual rack or cabinet directly back to wall mounted busbar. One 72" length #6 AWG green wire with yellow horizontal stripe. Jumper is pre-terminated on one end

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		with LCC6-14JAWH-L and the other end with LCC6-14JAW-L. This rack grounding jumper is 72" long. For other lengths replace the "72" in the part number. Available lengths are 72, 96, 120, 144, 168, 192, 216, 240, 264 and 288 inches.
Panduit	<b>RGESD2-1</b>	Two-hole ESD port with 5/8" hole spacing; provided with an ESD protection sticker, .16 oz. (5cc) of antioxidant, and two each #12-24 x 1/2" and M6 x 12mm thread-forming screws. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH WRIST STRAP RGEDSDWS.
Panduit	<b>RGEDSDWS</b>	Adjustable fabric ESD wrist strap with 6' coil cord, banana plug, 1 megaohm resistor and 4mm snap. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH ESD PORT RGEDSD2-1.
Panduit	<b>RGTBSG-C</b>	Green thread-forming bonding screws for use to mount equipment that does not have a built-in grounding pad (terminal).
Panduit	<b>RGEJ1024PHY</b>	24" long pre-terminated equipment grounding jumper #10 AWG (6mm <sup>2</sup> ) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).
Panduit	<b>RGEJ1036PFY</b>	36" long pre-terminated equipment grounding jumper #10 AWG (6mm <sup>2</sup> ) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).
Panduit	<b>GB2B0306TPI-1</b>	Wall mounted telecommunications busbar suitable for small telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 12" in size.
Panduit	<b>GB2B0514TPI-1</b>	Wall mounted telecommunications busbar suitable for med telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 24" in size.
Panduit	<b>GB4B0624TPI-1</b>	Wall mounted telecommunications busbar suitable for main grounding busbar in medium sized facility. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 4" x 20" in size.
Panduit	<b>LTYK</b>	Wall mounted busbar label kit. Label kit includes printed tag and one flame retardant cable tie.
		<b>NETWORK LABELING SOFTWARE – FOR INK JET/LASER PRINTER</b>
Panduit	<b>PROG-EM2GO</b>	Easy-Mark Labeling Software for PC supplied on USB Flash Drive. For preprinting communications labels on laser/inkjet printer.
Panduit	<b>S100X150YAJ</b>	Self-laminating cable labels for Category 6 cable for use with Easy-Mark software and laser/ink jet printer.
Panduit	<b>C261X035Y1J</b>	Patch Panel labels for use with Easy-Mark software and laser/ink jet printer.
Panduit	<b>C195X040Y1J</b>	Faceplate labels for single gang stainless or sloped plastic - use with Easy-Mark software and laser/ink jet printer.
Panduit	<b>C288X040Y1J</b>	Faceplate labels for double gang stainless - use with Easy-Mark software and laser/ink jet printer.
Panduit	<b>S100X650YAJ</b>	Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with Easy-Mark software and ink jet printer.
Panduit	<b>S100X160YAJ and NWSLC-3Y</b>	Label and turn-tell sleeve for labeling fiber jumpers. For use with Easy-Mark software and ink jet printer.
Panduit	<b>C200X100FJJ</b>	1" high, white, vinyl tape labels for labeling grounding busbars, racks, cabinets and pathways. For use with laser/ink jet printer.
		<b>NETWORK LABELING – HANDHELD LABELER</b>
Panduit	<b>LS8EQ-KIT-ACS</b>	Panduit PanTher hand-held label printing system in kit. Includes LS8EQ printer with QWERTY keypad, one cassette of S100X150VAC self-laminating labels, six AA alkaline batteries, LS8E-ACS, LS8-CASE, LS8-PCKIT, LS8-IB, LS8-WS, quick reference card and operator's manual. USE FOR LABELS THAT MUST BE PRINTED ON THE JOB SITE.

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Panduit	<b>S100X150VAC</b>	Self-laminating cable labels for Category 6 cable for use with PanTher LS8E hand-held printer.
Panduit	<b>C261X035Y1C</b>	Handheld printer labels for modular faceplate patch panels.
Panduit	<b>C195X040Y1C</b>	Faceplate labels for single gang stainless - use with PanTher handheld labeler.
Panduit	<b>C288X040Y1C</b>	Faceplate labels for double gang stainless - use with PanTher handheld labeler.
Panduit	<b>S100X650VAC</b>	Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with handheld labeler.
Panduit	<b>S100X160VAC and NWSLC-3Y</b>	Label and turn-tell sleeve for labeling fiber jumpers. For use with hand-held labeler.
Panduit	<b>T100X000VPC-BK</b>	1" high, continuous black on white, vinyl tape labels for labeling racks, cabinets and pathways with PanTher LS8E handheld labeler.
		<b>PHYSICAL SECURITY LOCKING DEVICES</b>
Panduit	<b>PSL-DCJB-C</b>	Package of 100 RJ45 jack blockout devices and one removal tool. Color red.
Panduit	<b>PSL-USBA-L</b>	Package of 50 USB Type 'A' blockout devices and one removal tool. Color red.
Panduit	<b>PSL-USBB</b>	Package of 50 USB Type 'B' blockout devices and one removal tool. Color red.
Panduit	<b>PSL-DCPLX-BL-C</b>	Package of 100 RJ45 plug lock-in devices compatible with flush mount jacks, and one installation/removal tool. Color black.
Panduit	<b>PSL-DCPLRX-BL-C</b>	Package of 100 RJ45 plug lock-in devices compatible with recessed jacks, and one installation/removal tool. Color black.
		<b>CABLE TIES – HOOK AND LOOP</b>
Panduit	<b>TTR-35RX0</b>	.75" wide, continuous roll Hook and Loop Cable Ties, black. 35 ft. roll. Carton qty 10 rolls.
Panduit	<b>HLSP1.5S-X12</b>	Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6" length.
Panduit	<b>HLSP3S-X12</b>	Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6" length.

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