



PUBLIC ANNOUNCEMENT AND GENERAL INFORMATION

**WILLIAMSON COUNTY PURCHASING DEPARTMENT
SOLICITATION**

Williamson County Expo Structured Cabling

BIDS MUST BE RECEIVED ON OR BEFORE:

Mar 15, 2016 3:00:00 PM CDT

BIDS WILL BE PUBLICLY OPENED:

Mar 15, 2016 3:00:00 PM CDT

Notice is hereby given that sealed Bids for the above-mentioned goods and/or services will be accepted by the Williamson County Purchasing Department. Williamson County uses BidSync to distribute and receive bids. Specifications for this IFB may be obtained by registering at www.bidsync.com.

Williamson County prefers and requests electronic submittal of this bid.

All electronic bids must be submitted via: www.bidsync.com

All interested Bidders are invited to submit a Bid in accordance with the Instructions and General Requirements, Bid Format, Bid Specifications, and Definitions, Terms and Conditions stated in this IFB.

Bidders are strongly encouraged to carefully read this entire IFB.

Electronic bids are requested, however paper bids will currently still be received, until further notice and may be mailed or delivered to the address listed below.

Please note that a complete package must be submitted choosing one of the above two methods.

Split packages submitted will be considered "unresponsive" and will not be accepted or evaluated.

- ✓ If mailed or delivered in person, Bids and Bid addenda are to be delivered in sealed envelope on or before the submittal deadline, as noted in the 'Public Announcement and General Information' listed above for this IFB, to:

Williamson County Purchasing Department
Attn: **IFB NAME AND NUMBER**
901 South Austin Avenue
Georgetown, Texas 78626

- ✓ Bidders should list the Bid Number, Bid Name, Name and Address of Bidder, and the Date of the Bid opening on the outside of the box or envelope and note "Sealed Bid Enclosed."
- ✓ Bidder should submit one (1) original; **AND** one (1) CD **OR** (1) USB copy of the Bid.
- ✓ **Williamson County will not accept any Bids received after the submittal deadline, and shall return such Bids unopened to the Bidder.**
- ✓ Williamson County will not accept any responsibility for Bids being delivered by third party carriers.
- ✓ Facsimile transmittals will NOT be accepted.
- ✓ Bids will be publicly opened and read aloud in the Williamson Purchasing Department at the time and date indicated above.
- ✓ All submitted questions with their answers will be posted and updated on www.bidsync.com.
- ✓ It is the Bidder's responsibility to review all documents in BidSync including any addenda that may have been added after the document packet was originally released and posted.
- ✓ Any addenda and/or other information relevant to the IFB will be posted on www.bidsync.com.
- ✓ The Williamson County Purchasing Department takes no responsibility to ensure any interested Respondent has obtained any outstanding addenda or additional information.
- ✓ Williamson County will NOT be responsible for unmarked or improperly marked envelopes.

Bid 1602-053

Williamson County Expo Structured Cabling

Bid Number **1602-053**
 Bid Title **Williamson County Expo Structured Cabling**
 Expected Expenditure **\$40,000.00** (This price is expected - not guaranteed)

Bid Start Date **In Held**
 Bid End Date **Mar 15, 2016 3:00:00 PM CDT**
 Question & Answer End Date **Mar 11, 2016 5:00:00 PM CST**

Bid Contact **Jewel Walker**
Purchasing Specialist III
512-943-1692
jewel.walker@wilco.org

Contract Duration **120 days**
 Contract Renewal **Not Applicable**
 Prices Good for **90 days**

Bid Comments **The telecommunications cabling system will be installed in a new construction environment. Williamson County has a Construction Manager (General Contractor) in place to manage the entire construction project. The cabling scope of work is being contracted directly by the county. There will still be some coordination necessary directly with the Construction Manager when on site work is being done. This will generally have to do with Safety issues.**
The current schedule has a cabling rough start date of April 20, 2016 and a finish date for trim-out of July 29, 2016. The current schedule may change, but these dates should generally be what to expect for start and end dates. Please make sure your company can be available to complete the work within this schedule. Substantial completion- 90 days, Final completion- 120 days.

BIDDER REQUIREMENTS CHECK LIST (proof of the following items must be submitted for your bid to be considered)

Contractor must have 5 years documented experience and provide list of key personnel
Contractor must have office within 50 mile radius of Williamson County
Contractor must employ at least one BISI Registered Communication Distribution Designer
Contractor shall not subcontract without written permission of Panduit and Williamson County
Contractor must have all necessary permits, licenses, and inspections
Contractor must be a current Panduit Certified Installer (PCI)
At least 30% of the technicians must have a current Panduit Certified Copper Technicians certificate
At least 30% of the technicians installing any Fiber Distribution Systems must have a current Panduit Certified Fiber Technicians certificate
Telecommunications contractor must provide a project manager (PM) as the single point of contact to:
 Initiate and coordinate with Williamson County Project Manager
 Provide day to day direction and supervision of Contractor personnel
 Ensure conformance with all contract & warranty provisions
 Participate in weekly meetings.
 Will remain PM for duration of project; may only change PM with written approval.
Contractor PM must be manufacturer certified in copper and fiber information transport systems.
Contractor must supply three reference accounts for similar installation was performed within the last year

BID CHECK LIST

The following documents MUST be completed and accepted if entering an electronic bid. If delivering a paper bid the documents must be completed and downloaded with the price sheet.

If entering an electronic bid in BIDS SYNC (PREFERRED), the following documents **MUST** be completed and attached to FIRST LINE ITEM:

Pricing – download bid form, complete and upload/attach to first line item

These items must be completed and accepted in Bidsync – not necessary to attach to line one:

Conflict of Interest Form

References

Bid Affidavit – if completed in Bidsync, not necessary for notary.

For paper bid, download and complete the attached PDF Bid Form

Bid and the Bid Affidavit (complete and notarize affidavit).

If delivering a paper bid instead of electronic; the above listed documents must be completed and added with the price sheet and delivered to:

Williamson County Purchasing, 901 South Austin Ave, Georgetown, TX 78626

CONTRACT ADMINISTRATION

Dale Butler (or successor), Project Manager, Williamson County Facilities 3101 SE Inner Loop, Georgetown, Texas 78626 shall serve as Williamson County's Contract Administrator with designated responsibility to ensure compliance with the requirements of the Contract and any ensuing Agreement, such as but not limited to, acceptance, inspection and delivery. The Contract Administrator will serve as liaison between the Williamson County Commissioners Court and the Successful Bidder.

The Successful Bidder agrees to maintain insurance in accordance with this IFB.

Successful Bidder will be required to submit Certificates of Insurance prior to being awarded the Contract. A copy of the issued policy should be submitted to the Purchasing Department within 60 days of the contract award date.

All certificates of insurance coverage as specified below must be provided to Williamson County at the following address:

Williamson County 901 South Austin Avenue Georgetown, Texas 78626

Failure to comply with these Insurance Requirements may result in the termination of the Contract and any ensuing Agreement between the Successful Bidder and County.

By signing its Bid, the Successful Bidder agrees to maintain at all times during any term of the Contract and any ensuing Agreement, at Successful Bidder's cost, insurance in accordance with this provision.

The following coverage limits shall be required at a minimum:

Worker's Compensation Statutory – Texas Law

Employer's Liability:

Bodily Injury by Accident \$500,000 Ea. Accident

Bodily Injury by Disease \$500,000 Ea. Employee

Bodily Injury by Disease \$500,000 Policy Limit

Comprehensive general liability including completed operations and contractual liability insurance for bodily injury, death, or property damages in the following amounts:

COVERAGE PER PERSON PER OCCURRENCE

Comprehensive

General Liability \$1,000,000 \$1,000,000

Aggregate policy limits: \$1,000,000

Comprehensive automobile and auto liability insurance (covering owned, hired, leased and non-owned vehicles):

COVERAGE PER PERSON PER OCCURRENCE

Bodily injury \$1,000,000 \$1,000,000

(including death)

Property damage \$1,000,000 \$1,000,000

Aggregate policy limits: No aggregate limit

E. Umbrella Coverage: \$1,000,000

Successful Bidder's property will not be covered by any insurance that may be carried by Williamson County. Successful Bidder assumes the risk of loss on its contents and property that are situated on/in/around Williamson County property. The Successful Bidder is strongly encouraged to obtain insurance on its property to the extent deemed necessary by the Successful Bidder.

The deductible for an insurance policy required hereunder shall not exceed \$100,000. Williamson County shall be named as an additional insured under any policy of insurance required hereunder.

Successful Bidder shall not commence any work until it has obtained all required insurance and such insurance has been approved by County. Successful Bidder shall not allow any subcontractor(s) to commence work to be performed in until all required insurance has been obtained by such subcontractor(s) and approved by County. Approval of the insurance by County shall not relieve or decrease the liability of

Successful Bidder or its subcontractor(s) hereunder.

The required insurance must be written by a company approved to do business in the State of Texas with a financial standing of at least an A- rating, as reflected in Best's insurance ratings or by a similar rating system recognized within the insurance industry at the time the policy is issued. Successful Bidder shall furnish County with a certification of coverage issued by the insurer. Successful Bidder shall not cause any insurance to be canceled nor permit any insurance to lapse. ALL INSURANCE CERTIFICATES SHALL INCLUDE A CLAUSE TO THE EFFECT THAT THE POLICY SHALL NOT BE CANCELED OR REDUCED, RESTRICTED OR LIMITED UNTIL TEN (10) CALENDAR DAYS AFTER COUNTY HAS RECEIVED WRITTEN NOTICE AS EVIDENCED BY RETURN RECEIPT OF REGISTERED OR CERTIFIED LETTER.

It is the intention of the County, and agreed to and hereby acknowledged by the Successful Bidder, that no provision of this Contract or any ensuing Agreement shall be construed to require the County to submit to mandatory arbitration or mediation in the settlement of any claim, cause of action or dispute, except as specifically required in direct connection with an insurance claim or threat of claim under an insurance policy required hereunder which absolutely requires arbitration or mediation of such claim, or as otherwise required by law or a court of law with jurisdiction over the provisions of this Contract or any ensuing Agreement.

WORKERS' COMPENSATION COVERAGE REQUIREMENTS

The Texas Labor Code, §406.096, requires workers' compensation insurance coverage for all persons providing services on a building or construction project for a governmental entity such as Williamson County. The rule requires Williamson County to timely obtain certificates of coverage and retain them for the duration of the project. The rule also sets out the language to be included in the Bid specifications and in contracts awarded by a governmental entity and the information required to be in the posted notice to employees. The rule is adopted under the Texas Labor Code, §402.061.

The information provided below is a result of this rule. By submitting your Bid to the County, you are acknowledging that this rule is a part of these Bid specifications, and that you will observe and abide by all of the requirements outlined in the rule. You are further agreeing that should your Bid be accepted by the Williamson County Commissioners Court, the necessary certificates of coverage showing workers' compensation coverage, will be provided to the following name and address prior to beginning work:

Williamson County Purchasing Department

901 S. Austin Ave.

Georgetown, TX 78626

Failure to comply with this request may result in termination of the Contract and any ensuing Agreement. If you have any questions related to this ruling and/or requirement, you are encouraged to contact either the Williamson County Purchasing Department at (512) 943-1546, or you may call the Texas Workers' Compensation Commission at (800) 372-7713.

A. The following words and terms, when used in this provision, shall have the following meanings. Terms not defined in this rule shall have the meaning defined in the Texas Labor Code, if so defined.

Certificate of coverage (certificate)—A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a workers' compensation coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees (including those subject to a coverage agreement) providing services on a project, for the duration of the project.

Building or construction—Has the meaning defined in the Texas Labor Code, §406.096(e)(1).

Contractor—A person bidding for or awarded a building or construction project by Williamson County.

Coverage--Workers' compensation insurance meeting the statutory requirements of the Texas Labor Code, §401.011(44).

Coverage agreement—A written agreement on form TWCC-81, form TWCC-82, form TWCC-83, or form TWCC-84, filed with the Texas Workers' Compensation Commission which establishes a relationship between the parties for purposes of the Texas Workers' Compensation Act, pursuant to the Texas Labor Code, Chapter 406, Subchapters F and G, as one of employer/employee and establishes who will be responsible for providing workers' compensation coverage for persons providing services on the project.

Duration of the project—Includes the time from the beginning of work on the project until the work on the project has been completed and accepted by Williamson County.

Persons providing services on the project ("subcontractor" in §406.096) - includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

Project—Includes the provision of all services related to a building or construction contract for Williamson

County.

B. The contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

C. The Contractor must provide a certificate of workers compensation coverage to Williamson County prior to being awarded the Contract.

D. If the coverage period shown on the contractor's current certificate of coverage ends during the duration of the project, the contractor must, prior to the end of the coverage period, file a new certificate of coverage with Williamson County showing that coverage has been extended.

E. The contractor shall obtain from each person providing services on a project, and provide to Williamson County:

(1) a certificate of coverage, prior to that person beginning work on the project, so Williamson County will have on file certificates of coverage showing coverage for all persons providing services on the project; and

(2) no later than seven days after receipt by the contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

F. The contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

G. The contractor shall notify Williamson County in writing by certified mail or personal delivery, within ten (10) days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

H. The contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

I. The contractor shall contractually require each person with whom it contracts to provide services on a project, to:

(1) provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011 (44) for all of its employees providing services on the project, for the duration of the project;

(2) provide to the contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;

(3) provide the contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

(4) obtain from each other person with whom it contracts, and provide to the contractor:

(a) a certificate of coverage, prior to the other person beginning work on the project; and

(b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

(5) retain all required certificates of coverage on file for the duration of the project and for one year thereafter;

(6) notify Williamson County in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

(7) contractually require each person with whom it contracts, to perform as required by paragraphs (1) -

(7), with the certificates of coverage to be provided to the person for whom they are providing services.

J. By signing this Contract or providing or causing to be provided a certificate of coverage, the contractor is representing to Williamson County that all employees of the contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

K. The contractor's failure to comply with any of these provisions is a breach of contract by the contractor which entitles Williamson County to declare the Contract void if the contractor does not remedy the breach within ten (10) days after receipt of notice of breach from Williamson County

Item 1602-053--01-01 - material and labor**Quantity** 1 each**Unit Price** **Delivery Location** Parks and Recreation

219 Perry Mayfield

Leander TX 78641

Qty 1**Description**

Bid all material and labor for the proposed low voltage data cabling system according to the attached:

Plans dated September 16, 2015 by Populous

Electrical Plans Addendum dated January 21, 2016 by Populous/HCE

Williamson County IT/Data specifications

Item 1602-053--01-02 - Alternate 2 on plan pg. E1-1**Quantity** 1 each**Unit Price** **Delivery Location** Parks and Recreation

219 Perry Mayfield

Leander TX 78641

Qty 1**Description**

Include pricing for Add Alternate # 2 on plan page E1-1. (data cabling for East Concession Room 204)

Williamson County Expo Center

Telecommunications/Data Cabling

Scope of Work

Bid all material and labor for the proposed low voltage data cabling system according to the attached:

- Plans dated September 16, 2015 by Populous
- Electrical Plans Addendum dated January 21, 2016 by Populous/HCE
- Williamson County IT/Data specifications

The install should include, but not necessarily be limited to the following:

1. Provide and install two 19" four post data cable termination racks at MDF/MDP Room 109 with approximately 48" of ladder rack fed from each rack to the nearest wall. The exact placement of the racks TBD.
2. Provide and install one 19"x15"D wall mount rack at IDF/Storage Room 135.
3. Provide and install one 19"x15"D wall mount rack at Data/Comm Room 218.
4. Install 1 – 3" 3-Cell MaxCell (or equivalent) Fabric Innerduct in schedule 40 conduit (installed by others) from MDF/MDP Room 109 to Ticket Office Room 142. This will provide the Cat 6 data cabling route to service the outlets at Ticket Office Room 142.
5. Install owner provided 24 strand fiber cable from MDF/MDP Room 109 to IDF/Storage Room 135. Continue the fiber cable install to the final termination point at Data/Comm Room 218.
6. Terminate six of the twenty-four strands of fiber at the MDF/MDP Room 109, IDF/Storage Room 135 and Data/Comm Room 218 data racks.
7. Provide and install two plenum rated Cat 6 data cables, jacks and wall plates at all data outlet locations shown on Electrical Plans.
8. Provide and install one plenum rated Cat6 data cable, jack and wall plate at all AP outlet locations shown on plans.
9. Terminate Cat 6 cables at all data outlet locations and at the data rack in closest proximity to the outlet.
10. Provide and install patch panels with sufficient capacity at each data rack location according to the number of data cable terminations at each.
11. Include pricing for Add Alternate # 2 on plan page E1-1. (data cabling for East Concession Room 204)

12. The final product should be a fully functioning telecommunications/data cabling system per the attached plans and specifications.



Cabling Specification

Department of Information Technologies

11-6-15

WILLIAMSON COUNTY CABLING SPECIFICATION

Bill Bingham
Telecom Manager

Table of Contents

I. GENERAL	4
A. Purpose	4
B. Scope of Work - Typical	4
C. Applicable Regulatory References	5
D. WILCO Substitution Policy	8
E. Contractor Qualifications	8
F. Warranty	11
II. Installation and Maintenance Guidelines	13
A. Maintenance of Patch Fields	13
B. Cable Pulling and Termination	13
III. Cabling Systems and Associated Infrastructure	16
A. Cabling Subsystem I – Horizontal Cabling System	16
C. Cabling Subsystem II – Intrabuilding Fiber Backbone	21
D. Cabling Sub-system III – Interbuilding Fiber Backbone	22
E. Fiber Connectivity	23
F. Cable Pathways	25
G. 19" Racks and Rack-mount Cable Managers	27
H. Cable Accessories	30
I. Communications Grounding Network	31
IV. Network Labeling	34
A. General Requirements	34
V. Testing and Acceptance	36
A. General	36
B. Copper Link Testing	36
C. Fiber Testing	36
D. System Documentation	37
E. Test Results	37
Appendix A – WILCO Contractor/Vendor Rules and Regulations	39
Appendix B – WILCO Cabling Policies and Procedures	44

WILLIAMSON COUNTY CABLING SPECIFICATION

Appendix C – Typicals	47
Appendix D – Materials List	52

WILLIAMSON COUNTY CABLING SPECIFICATION

I. GENERAL

A. Purpose

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 the "Department of Information Technologies". Bidding low-voltage installers shall be referred to as "Contractor".
3. This specification defines quality standards and practices common to all Williamson County enterprise network cabling upgrades.
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 particular 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 Information Technologies.
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 Information Technologies.

B. Scope of Work - Typical

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 WILCO.
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

WILLIAMSON COUNTY CABLING SPECIFICATION

- 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 telecommunications infrastructure projects are listed in "Appendix D" at the end of this document.

C. Applicable Regulatory References

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

WILLIAMSON COUNTY CABLING SPECIFICATION

- i. 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-B (September 2011) 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

WILLIAMSON COUNTY CABLING SPECIFICATION

- 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 Centres - 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 Fibre 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

WILLIAMSON COUNTY CABLING SPECIFICATION

- 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

1. This is a performance-based specification developed from the experience of the Department of Information Technologies in providing exceptional solutions for all of 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.
 - b. 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 WILCO.
 - c. 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 Williamson County 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

WILLIAMSON COUNTY CABLING SPECIFICATION

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. 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.
- d. 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 a Panduit PCI certified installation company.
- e. Contractor shall have all necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations
- f. Contactor shall be a current Panduit Certified Installer (PCI) or accepted substitute manufacturer (See Substitution Policy). A copy of the corporate manufacturer certification must be included with all quotes.
- g. 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.
- h. 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
- i. 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.
- j. Contractor Project manager must be manufacturer certified in the copper and fiber information transport systems to be installed.

WILLIAMSON COUNTY CABLING SPECIFICATION

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 WILCO determines the Communication Contractor is not fulfilling their responsibilities as defined within this document.
- b. Contractor's appearance and work ethics shall be of a professional manner, dress shall be commensurate with work being performed.
- c. Dress displaying lewd or controversial innuendos will strictly be prohibited.
- d. Conduct on Williamson County property will be professional in nature.
- e. 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 Information Technologies, such person shall be removed from work on the Wilco project.
- f. 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 facilities 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 WILCO facilities are 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.
- e. 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.

WILLIAMSON COUNTY CABLING SPECIFICATION

- f. Contractor shall abide by the regulations set by local Williamson County's Security Policy pertaining to access and conduct while on WILCO property.
- g. Contractor shall all obey all posted speed limits and parking regulations at the Williamson County facilities where the work is being performed.

F. Warranty

1. General

- a. Contractor shall provide a 25 year PanGen TM System Warranty (or Wilco approved equal) on all copper and fiber permanent cabling links.
- b. It is understood the PanGen TM System 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.
- c. The PanGen TM System Warranty may be invoked only if the cabling channel links are comprised of continuous Panduit/General Cable components, including patch cords, equipment cords and fiber jumpers.
- d. 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 Certified Installer (PCI) or approved equivalent manufacturer in good standing and shall include a copy of the company installation certification with the bid.
- b. 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.
- c. 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.
- d. 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.
- e. All intra-building new fiber optic installations shall utilize an appropriate cable constructions as specified herein.
- f. All UTP cable pulled and terminated shall be Category 6 cable and connectivity whether new or legacy systems.

WILLIAMSON COUNTY CABLING SPECIFICATION

- g. 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.
- h. 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 segregation of different cable types,
- i. 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.
- j. Contractor is responsible for understanding and submitting to Panduit all documents required prior to project start to apply for the PanGen™ System 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.
- k. 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.
- l. 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.
- m. 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.
- n. 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>

WILLIAMSON COUNTY CABLING SPECIFICATION

II. Installation and Maintenance Guidelines

A. Maintenance of Patch Fields

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.
 - b. 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.
 - c. All patch cords used shall be of same copper Category or fiber OM/OS designation as the media used in the permanent cabling links.
 - d. Patching in all cases shall be done using factory terminated cords manufactured for that purpose. Hand terminated patch cords will not be accepted.
 - e. 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.
 - f. 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.
 - g. 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.
 - h. 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

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

WILLIAMSON COUNTY CABLING SPECIFICATION

used.

- c. Do not deform the jacket of the cable. The jacket shall be continuous, free from pinholes, splits, blisters, burn holes or other imperfections.
- d. Install proper cable supports, spaced less than 5 feet apart, and within manufacturer's requirements for fill ratio and load ratings.
- e. Leave a pull string to the end of each conduit run. Replace pull string if it was used for a cable pull.
- f. Note service loops may not touch the drop-ceiling assembly. Any portion of the communications cabling making contact with ceiling structures must be remedied at the Contractor expense.
- g. 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.
- h. Dress the cables neatly with hook and loop cable ties in telecommunications rooms. Plastic ties are approved in pathways where cable bundles will not be reentered. Contractor responsible for using plenum ties and appliances in air-return (plenum) spaces as required by the local AHJ (Authority Having Jurisdiction).
- i. 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.
- b. Within all new installations within Williamson County facilities, contractor shall use copper pinout T568B.
- c. All four pair Category 6 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.
- d. Copper links that are 90 meters in permanent link, shall not exceed 6 meters (total) of patch cords when using 28 awg "small diameter" patch cords.
- e. Use low to moderate force when pulling cable. Maximum tensile load may not exceed 25' lbs. maximum pulling force per 4 pair cable.
- f. 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.
- g. Keep Category 6 cables as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as required in cited TIA Standards.
- h. 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.
- i. Service loops in the work area shall be stored behind the equipment outlet (faceplate).
- j. Service loops in the telecommunications room may be wall mounted or contained in pathways or racking

WILLIAMSON COUNTY CABLING SPECIFICATION

systems if done in a neat, workmanlike fashion.

- k. Service loops shall be stored in such fashion as to not violate bend radius, slack touching the drop ceiling is not allowed and must be remedied at Contractor expense.
- l. Maintain the twists of the pairs all the way to the point of termination, or no more than 0.5" (one half inch) untwisted.
- m. All UTP patching shall be accomplished using Category 6 rated modular patch panels as indicated elsewhere in this document.
- n. 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.
- b. Within all new fiber installations within Williamson County, contractor shall use Panduit cam-style "Opti-cam" LC connectors. See product section and Appendix D for details.
- c. 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.
- d. Fiber terminations shall be done according to recommendations of TIA, manufacturer's requirements and accepted industry best practices.
- e. Allunjacketed 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.
- f. Contractor shall perform test setup and testing according to guidelines in the "Testing and Acceptance" section of this document.

<END OF SECTION>

WILLIAMSON COUNTY CABLING SPECIFICATION

III. Cabling Systems and Associated Infrastructure

A. Cabling Subsystem I – Horizontal Cabling System

1. Slack (Service Loops) in Horizontal UTP Cable

- a. Horizontal cable in WILCO facilities are routed through conduit, but electrical boxes are not used for low-voltage communications cable.
- b. Contractor shall use low-voltage mounting brackets ("box-eliminators") for mounting low-voltage communications faceplates.
- c. Contractor shall provide a minimum 12" slack or service loop at the equipment outlet (work area) on each terminated copper horizontal permanent link. Work area slack shall be contained within the wall behind the faceplate if this may be done easily without violating cable bend radius.
- a. Where there is not sufficient space behind the faceplate, Contractor may pull work area slack into the ceiling space and properly store service loop with appropriately rated hook and loop cable ties. Cable slack shall in no instances touch the ceiling grid or associated drop ceiling components or fixtures.
- b. Contractor shall provide a minimum of 10 feet slack or service loop in the horizontal telecommunications room on each terminated copper horizontal permanent link, to be stored on the wall backboard using appropriate mounting fixtures built for that purpose (i.e. D-rings).
- c. Contractor should consult project-specific documentation or the Williamson County project liaison for other mounting methods where wall mount is not an option.

2. Metal Conduit

- a. Cable in horizontal runs in offices shall be routed and contained in 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 in regards to color of existing raceway and faceplates.
- b. Flush mount faceplates in new projects shall be Panduit NetKey ® faceplates (or approved equivalent) with label fields in either electric ivory or international white as called for in the project documentation.
- c. NetKey ® Faceplates shall be available in one, two, four and/or six-port vertical single gang configurations. Faceplates shall further have the following characteristics:
 - 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.

WILLIAMSON COUNTY CABLING SPECIFICATION

- Dedicated sloped versions shall be available for improved bend radius control and decreased requirements in wall depth.
 - Each faceplate shall accept NetKey ® modules that can be individually inserted and removed as required.
- d. See Appendix C for faceplate typicals.
- e. See Appendix D for faceplate part numbers.

4. Equipment Outlets – Surface Boxes

- a. Wireless access points and IP cameras mounted on walls and ceilings utilize single Category 6 horizontal runs (drops) terminated in NetKey 2 hole surface mount boxes (or approved equivalent) having the following properties.
- b. 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 NetKey ® Modules
 - Include mounting screws and adhesive tape
 - Be compatible with Panduit® LD3, LD5, and LD10 Raceway.

5. Copper Jacks

- a. Modular jacks shall be Panduit Category 6 NetKey ® Jack Modules (or approved equivalent) featuring 110-termination technology 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 standard.
 - Termination shall be accomplished by use of a 110 termination.
 - 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 intermateability standard IEC 60603-7 for backward compatibility.
 - Category 6 modules shall have UL and CSA approval. The modules shall have ETL verified Category 6 performance and ISO Class E performance (as defined in ISO/IEC 11801) in both the basic and channel links.
 - 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 NETKEY ® outlets and patch panels.












WILLIAMSON COUNTY CABLING SPECIFICATION

- b. Consult project documentation for jack color coding in use for that installation.
- c. See Appendix D at the end of this document for part numbers.

6. Category 6 Unshielded Twisted Pair Cable

- a. WILCO Category 6 UTP cable shall be plenum PanGen 6 manufactured by General Cable.
- b. Standard blue version is part number 7131800. For other colors use table below:

General Cable Category 6 Cable

Jacket Color	GS 6 Pull-Pac® II	
	CMR (Non-Plenum)	CMP (Plenum)
 Blue	7133800	
 White	7133801	7131801
 Yellow	7133802	7131802
 Gray	7133803	7131803
 Red	7133804	7131804
 Orange	7133805	7131805
 Green	7133806	7131806
 Black	7133807	7131807
 Pink	7133808	7131808
 Purple	7133809	7131809

- c. For cable colors on actual project, consult the project documentation.
- d. See Appendix D 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 NetKey® type with frames of either metal or molded polymer.
- b. If made of molded polymer construction, the patch panels shall have the following features:
 - Punchdown patch panels shall be a molded design made of polymer material and mount to standard racks and cabinets.
 - Punchdown modules shall meet Category 6/Class E performance levels and terminate unshielded twisted 4-pair, 22 – 26 AWG, 100 ohm cable.
 - Punchdown tool properly terminates each conductor for optimum performance. Universal T568A and T568B color-coded wiring schemes included.
 - Patch panels shall be available in standard density 24 and 48-port configurations.
 - Patch panels include pre-numbered labels with writable surface on back.

WILLIAMSON COUNTY CABLING SPECIFICATION

- Additional numbering engraved in the front and back of the panel.
- c. If made of metal frame construction, the patch panels shall have the following features:
 - Category 6/Class E punchdown patch panels shall terminate unshielded twisted 4-pair, 22 – 26 AWG, 100 ohm cable and mount to standard EIA 19" or 23" racks.
 - Punchdown tool shall properly terminate each conductor for optimum performance. Universal T568A and T568B.
- d. For instructions for which patch panel to use consult project-specific documentation.
- e. For detailed part numbers see "Appendix D" at the end of this document.

8. Small Diameter Category 6 Copper Patch Cords

- a. Copper patching of Category 6 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.
 - Category 6/Class E channel and component performance.
 - Exceeds all ANSI/TIA-568-C.2 Category 6 and ISO 11801 Class E Edition 2.1 electrical performance requirements for all frequencies from 1 to 250 MHz.
 - 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.
- b. Due to miniature size of patch cords, utilize increased attenuation de-rating value of 1.9. These supports 96 meter channels that include 90 meter permanent links, and 6 meters of patch cord. A channel using 10 meters total of patch cord would support a 93 meter channels.
- c. For in telecom patch fields, WILCO projects use color coded small diameter patch cords to indicate

WILLIAMSON COUNTY CABLING SPECIFICATION

various circuits. These colors and circuits they represent are as follows:

Blue = Administrative
Yellow = Academic
Green = Wireless
Orange/Red = Public Safety
Purple = Crossover
Grey = Printer
Black = Utility
White = VoIP/Wallphone

- d. Consult project documentation for how color coding is to be used on that job.
- e. For more detail on use of patch cord color coding in the telecommunications rooms, see Appendix C.
- f. See Appendix D for part numbers.

9. Surface Mount Raceway – Wall Mount

- a. See Appendix D at the end of this document for part numbers.

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.
- 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 Pan-Net •Connectivity, also accepts all common manufacturers' connectivity with use of a NEMA standard 70mm faceplate or module frame.

WILLIAMSON COUNTY CABLING SPECIFICATION

- d. Consult Appendix D 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. Power/communications poles shall be Pan-Way® Pan-Pole™ Aluminum Outlet Poles for Power and Communication (or WILCO approved equivalent), and must have the following properties:
- Dual channel aluminum pole is equipped with pre-terminated electrical outlets and provides channel separation for the installation of communication cabling and modules.
 - UL and CSA rated 600 V.
 - Available in 11 or 13 foot lengths and supplied with a non-metallic cover.
 - Electrical outlets are pre-wired.
 - Pre-installed components include: Blank non-metallic cover, two 20 A factory wired rectangular outlets with wiring fed through power channel to base of power entry box. power entry with 1/2" and 3/4" conduit breakouts, Removable plate for power wiring connections, ground screw pre-mounted behind removable plate.
 - Supplied mounting hardware includes: Entry end bend radius fitting, ceiling T-bar bracket, ceiling tile trim plate, end cap, End cap floor grip pad.
- c. See Appendix D for part numbers for 11' and 13' power/communications poles.

C. Cabling Subsystem II – Intrabuilding Fiber Backbone

- a. Intrabuilding singlemode Fiber Trunks are for Use within Buildings.
- b. On additions to existing Williamson County fiber cableplant , 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 singlemode 24 strand Opti-Core® Fiber Optic Indoor Interlocking Armored Cable Armored plenum-rated tight-buffered singlemode cable 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
 - Available in 6, 12, 24, 36, 48, 72, 96 and 144-fiber counts
 - Multimode (OM4, OM3, OM2, and OM1) and singlemode (OS1/OS2) fiber available optimized) fiber available
 - Sheath markings provide positive identification, quality traceability, and length verification

WILLIAMSON COUNTY CABLING SPECIFICATION

- 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
 - Opti-Core ® 10Gig ™ Fiber Optic Cable is designed to support network transmission speeds up to 10 Gb/s for link lengths up to 300 meters for OM3 and up to 550 meters for OM4 with an 850nm source per IEEE 802.3ae 10 GbE standard; backward compatible for use with all 50/125µm system requirements
- d. Contractor shall terminate tight-buffered cable constructions with Panduit Opti-cam LC fiber connectors.
- e. See Appendix D for part numbers.

D. Cabling Sub-system III – Interbuilding Fiber Backbone

1. Singlemode Fiber Trunks for Use Between Buildings

- a. On additions to existing Williamson County fiber cableplant. Contractor shall match existing fiber and connector types.
- b. In new Williamson County projects, backbone fiber running between buildings (cabling subsystem III) shall be Panduit 48 strand Opti-Core® Gel-Free Fiber Optic Indoor/Outdoor All-Dielectric Cable, or College approved equivalent.
- c. Loose tube outside plant cable shall be terminated in the entrance facility using Panduit Opticam connectors with appropriate fan-out kits.
- d. 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
- a. Length: 1 meter (39.37")
- b. Refer to Appendix D for part numbers.
- c. 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 riser (OFNR) or 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

WILLIAMSON COUNTY CABLING SPECIFICATION

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
- Multimode (OM4, OM3, OM2, and OM1) and singlemode (OS1/OS2) fiber available
- Sheath markings provide positive identification, quality traceability, and length verification
- 250µm buffer coating protects fibers during handling and allows for ease of stripping
- Opti-Core ® 10Gig TM Fiber Optic Cable is designed to support network transmission speeds up to 10 Gb/s for link lengths up to 300 meters for OM3 and up to 550 meters for OM4 with an 850nm source per IEEE 802.3ae 10 GbE standard; backward compatible for use with all 50/125µm system requirements
- Contractor shall terminate loose-tube cable constructions between buildings with LC pigtails as indicated elsewhere in this document.

d. See Appendix D part numbers.

E. Fiber Connectivity

1. LC Fiber Connectors

a. All LC terminations shall be done with Panduit fusion splice pigtails having the following properties:

- TIA/EIA-604 FOCIS-10 compatible connectors.
- Exceed TIA/EIA-568-B.3 requirements.
- Connector backbone and boot colors follow TIA/EIA-568-C.3 suggested color identification scheme.
- Insertion loss: 0.3dB average (multimode and singlemode).
- Return loss: >26dB (10Gig TMmultimode), >20dB (multimode), >50dB (singlemode).
- Quick installation; provide field termination in less than half the time of field polish connectors.
- Patented re-termination capability provides yield rates approaching 100%.
- Factory pre-polished fiber endface eliminates time-consuming field polishing to reduce installation costs, labor, scrap and the number of tools required.
- Cable retention boot assemblies consistently provide higher than industry standard cable retention.
- Non-optical disconnect maintains data transmission under tensile loads for jacketed cable.

b. See Appendix D for part numbers on cam-style LC 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.

WILLIAMSON COUNTY CABLING SPECIFICATION

- 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 break-outs 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.
- e. See Appendix D for part numbers.

3. Loose-tube cable and Fusion Splicing with LC Pigtails

- a. Outdoor rated loose-tube fiber shall be terminated at the demarcation with fan-out kits and Panduit OptiCom cam-style connectors. The fan out kit shall meet the following requirements:
 - 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.
 - Length: 1 meter (39.37").

4. Fiber Adapter Panels

- a. FCE fiber enclosures shall be populated with fiber adapter panels containing either 6 LC singlemode duplex fiber adapters, or 12 LC singlemode duplex fiber adapters depending on the density needs of the telecom room.
- b. Consult project documentation to determine whether 6 or 12 LC singlemode duplex adapters are to be used on a given job.
- c. Contractor is responsible to blank out any enclosure spaces where adapter panels are not used.
- d. 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

WILLIAMSON COUNTY CABLING SPECIFICATION

- LC fiber adapter panels are Sr/Jr. to conserve enclosure space.
 - Accept FOCIS-10 compatible senior LC connectors at either end and FOCIS-10 junior LC connectors at the inside end for behind the wall applications.
 - Both ends accept FOCIS-10 compatible senior LC connectors.
 - Junior end also accepts FOCIS-10 compatible junior (fixed ferrule/springless) LC 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 singlemode applications.
 - Every adapter is laser marked with Q.C. number to assure 100% traceability.
 - LC adapters are also available in QuickNet ~ Fiber Optic Cassettes.
- e. Consult Appendix D for fiber adapter panels and blank adapter panels.

5. Fiber Patch Cords

- a. Fiber patch fields within Williamson County facilities shall utilize riser rated singlemode "push/pull" fiber jumpers (fiber patch cords) that have the following properties:
- Push-Pull LC Duplex Fiber Optic Patch Cords shall feature the push-pull strain relief boot and duplex clip, to allow users easy accessibility in tight areas when deploying very high density LC patch fields.
 - Jumpers shall be available in OM3, OM4 and single-mode and be available in in riser (OFNR), plenum (OFNP), and low smoke zero halogen (LSZH) rated jacket materials.
- b. See "Appendix D" at the end of this document for singlemode push/pull LC jumper part numbers.

F. Cable Pathways

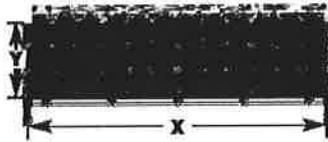
1. Overhead Metallic Pathway

- 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.

WILLIAMSON COUNTY CABLING SPECIFICATION

- 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 particular type of system and per TIA 607-B including most recent revisions, TSB and addenda.
- 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



12.2	2	24.3	269	172	269	24.2	2	48.3	534	342	534
	4	48.7	538	344	538		4	96.7	1069	684	1069
	6	73.0	807	516	807		6	145.0	1603	1026	1603
18.2	2	36.3	401	257	401	30.2	2	60.3	666	427	666
	4	72.7	804	514	804		4	120.7	1334	854	1334
	6	109.0	1205	771	1205		6	181.0	2000	1280	2000

"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.

- e. All cable trays and grounding conductors should be clearly marked in accordance with manufacturer's instructions, applicable codes, standards and regulations.
- f. Contractor shall take care to segregate and protect armored fiber from copper cabling in metallic pathway.
- g. 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.
- h. See Appendix D for part numbers.

2. J-Hooks

- a. Bundles of 120 Category 6 cables or less may be required to be routed above ceilings using J-hooks. Check project documentation for clarification.
- b. J-hook systems used by Williamson County shall be Panduit "J-Pro" series, or Williamson County approved equivalent.
- c. Contractor installing J-hook systems shall space them no more than 5 feet apart as per TIA 569-C standard.
- d. Contractor is responsible for proper sizing of J-hook systems based upon cable count and manufacturers recommendations for fill, with new J-hooks to have not more than 30% fill per manufacturer's fill charts

WILLIAMSON COUNTY CABLING SPECIFICATION

based upon projected worst case future bundle size.

- e. 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 pathways that will not have sufficient capacity should be replaced in the design with the proper sized basket tray for future cable additions and flexibility.
- f. 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.
 - 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.
- g. See Appendix D for part numbers.

G. 19" Racks and Rack-mount Cable Managers

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 particular job.

2. Two-post Communications Racks

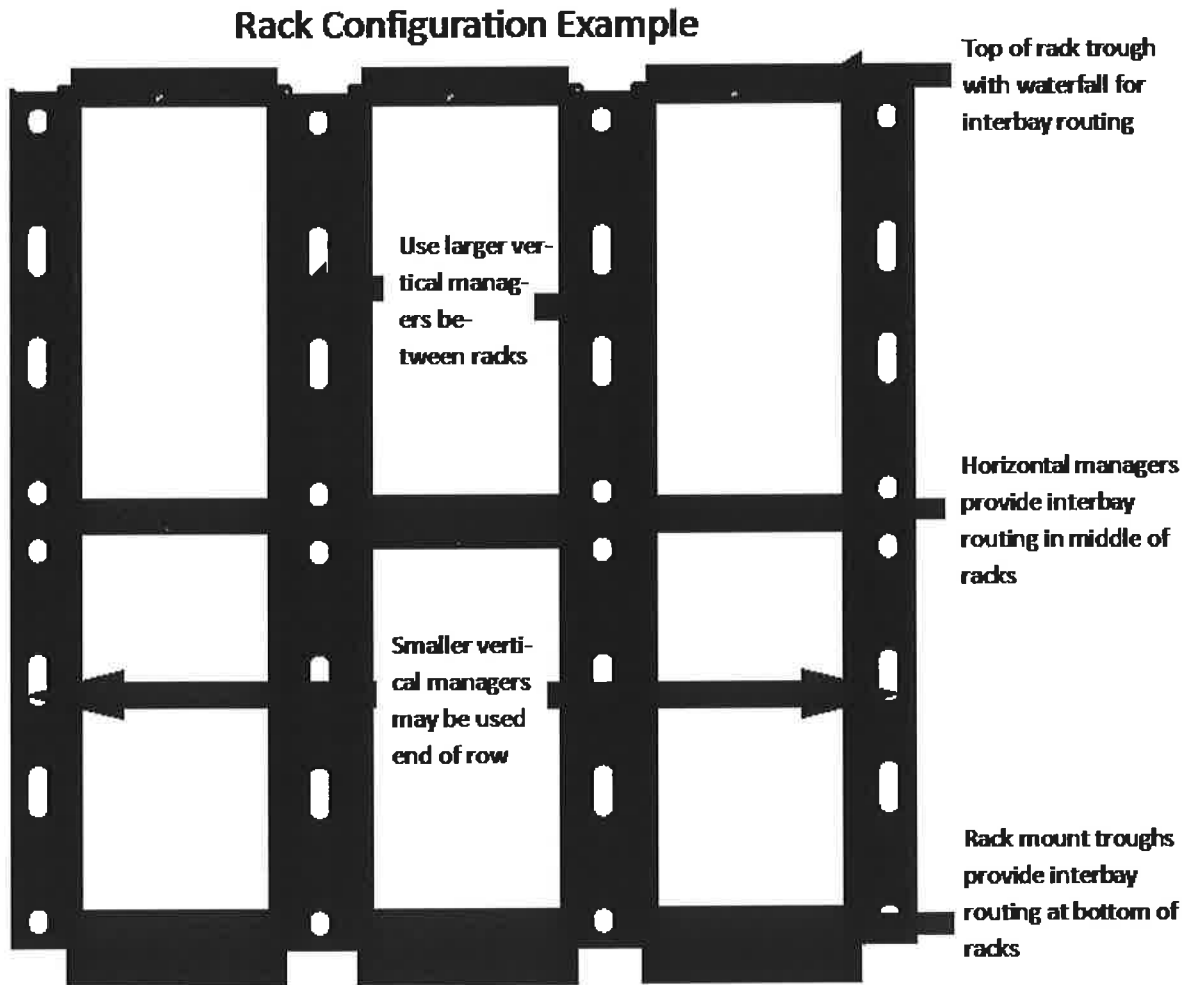
- a. 2-post racks will be Panduit black-powdered aluminum (or WILCO approved equivalent) and have the following properties:
 - 19" EIA rack, aluminum.
 - Dimensions: 96.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).
 - Rack units numbering up from bottom to allow quick and easy location of rack mount 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

WILLIAMSON COUNTY CABLING SPECIFICATION

per TIA 607-B Bonding and Grounding Standard.

- b. 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.



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

WILLIAMSON COUNTY CABLING SPECIFICATION

- c. For bottom-of-rack interbay routing where cable quantities exceed capacity of CMUT19 troughs, Contractor shall substitute 4RU trough CMLT19.
- d. 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.
- e. See Appendix D 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
 - PatchRunner™ and NetRunner™ Vertical Cable Managers mount directly to the 4 post rack at any of the four corners to provide a flexible end-to-end cable management solution
 - Paint piercing washers included
- b. See Appendix D for 4 post racks part numbers.

4. Rack-mounted Cable Management – Vertical Managers

- a. Vertical cable managers shall be NetRunner™ Vertical Cable Management System in sizes 4.9" wide, 6.7" wide, or WILCO Williamson County approved equivalent.
- b. Contractor will use double sided (front and back) vertical managers on 2-post racks.
- c. All vertical cable managers shall have dual hinged doors.
- d. 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.

WILLIAMSON COUNTY CABLING SPECIFICATION

- e. 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.
- f. Vertical cable managers shall have the following features:
 - Large finger openings accommodate up to 24 Category 6 cables
 - 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
- g. Part numbers are listed in Appendix D.

5. Rack-mounted Cable Management – Horizontal Managers

- a. Contractor shall use double-sided PatchLink™ Horizontal Cable Managers (or WILCO approved equal) in sizes 1 RU and 2 RU having the following features:
 - Lightweight plastic construction provides durability and easy installation.
 - Patented dual hinged cover allows cable access without removing cover.
 - Rounded edges on fingers protect cables from snags and damage to cable.
 - Flexible fingers allows easy installation and removal of cables.
 - Increased finger spacing provides larger area for high performance Category 6 cables.
 - Pass-through holes allow front to rear cabling.
 - Mount to standard 19" EIA racks and cabinets.
 - Covers, #12-24 and M6 mounting screws included.
- b. Part numbers are listed in Appendix D

H. Cable Accessories

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.
- b. Contractor is responsible for using plenum hook and loop ties in air-return spaces.
- c. See "Appendix D" for part numbers.

WILLIAMSON COUNTY CABLING SPECIFICATION

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.
- b. Areas where such devices are required will be called out in the project documentation.
- c. See Appendix D 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.

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 D 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-B 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.
- c. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of 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.
- d. 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.
- e. Contractor shall take care to clean (wire brush, scotchbrite 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.
- f. 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.