Office of Information Technology

Specification Standards for Communication Systems

The following information is a guideline relating to the low voltage communication systems installation for the University of Texas at Arlington. This Specification Standards for Communication Systems is comprised of industry standards, University of Texas at Arlington standards and associated supporting documents. This document describes cabling system components, installation requirements and services associated with the facility's low voltage systems. The work and services specified herein include the coordination with other trades, installation of the cable plant, submittal of testing reports, and submittal of as-built documentation. It is expected that all bidding Communication, Electrical and Service Contractors will carefully read and understand this specification document, the referenced documents and will survey all related spaces involved in the University of Texas at Arlington projects.

NOTE: The primary purpose of this document is to provide the minimum low voltage communications infrastructure standard requirements for University of Texas at Arlington facilities and is to be utilized as a designer's reference guide to be applied to project specific conditions. It is recommended that this document be reviewed on an annual basis. Technology and part number updates shall be incorporated into the revisions. Please contact accessibility@uta.edu for large-print accommodation.

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Section 27 00 00 – Communications

Part 1 General

A. Purpose of this Document

1. The intention of the University of Texas at Arlington by implementing this document is to insure the consistent performance, quality of product and installation of low voltage communications systems throughout all The University of Texas at Arlington facilities and spaces. These facilities and spaces include:

   a. Campus environments

   b. Facilities onsite and offsite

2. This Specification applies to both new construction and renovations of the University of Texas at Arlington facilities.

3. While deviations from this document may be appropriate in some situations, they should be exceptional and, in all cases, require prior approval from the University of Texas at Arlington OIT Director or Manager of Infrastructure. For the remainder of this document, the UTA OIT Director and Manager of Infrastructure will be referred to as the "OIT Representative". This role is currently filled by:

   Director: Brad Samek (samek@uta.edu, 817-272-3633)

   Manager: Keith Tharp (keith.tharp@uta.edu, 817-272-3636)

4. For the remainder of this document the University of Texas at Arlington will be referred to as the "University".

B. Performance, Quality and General Design

1. Design guidelines for communication systems and supportive technologies defined in this document include but are not limited to:

   a. Voice and data communications infrastructure

   b. Communications facility

   c. Supporting hardware

2. IP Based System Performance and Quality Assurance

   a. To ensure the IP based system Performance within these Facilities, the University will follow the recommendations set forth by the foundational ANSI/TIA-4966 standard and BICSI TDMM documents.

   b. All Ethernet based systems shall conform to this standard. If analog and proprietary systems can be adapted to the twisted pair cabling infrastructure defined in this document, they should be implemented as such.

c. To ensure the Standard of Quality and Performance of IP based system products, a copper solution based on Belden cabling and Panduit termination hardware will be implemented for all University facilities. The cabling infrastructure shall be warranted by the 15-year Panduit Certification Plus[SM] System Warranty.

d. To ensure the Standard of Quality and Performance of IP based system products, a fiber optic solution utilizing Corning Optical Communications will be implemented for all University facilities.

e. To maintain consistency with industry best practices for education facilities, Category 6 performance is required for all horizontal cabling infrastructure, as outlined in the ANSI/TIA-4966 standard.

3. The design and installation of the cabling infrastructure shall comply with TIA and BICSI standards recommendations and adhere to all local codes and regulations.

4. To ensure the Standard of quality and Performance of products, materials and components have been predefined for the communications cabling infrastructure within this document. No substitutions shall be accepted.

C. Standards, Codes and References

1. The following standards and code documents will be recognized as references for acceptable installation of communications cabling infrastructure. Active knowledge of these documents is strongly recommended for the installation contractor. If any of these documents are in conflict either with each other or this document, the most stringent will apply and be the responsibility of the installation contractor to follow.

a. ANSI/TIA-4966, 2014, Telecommunications Infrastructure Standard for Educational Facilities

b. ANSI/TIA-526-14-C-2015, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant

c. ANSI/TIA-526-7-A-2015, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant

d. ANSI/TIA 568-D-2018, Commercial Building Telecommunications Cabling Standard

e. ANSI/TIA-569-D-2015, Commercial Building Standard for Telecommunications Pathways and Spaces

f. ANSI/TIA 606-C-2017, Administration Standard for Telecommunications Infrastructure

g. ANSI/TIA-607-D-2019, Commercial Building Grounding and Bonding Requirements for Telecommunications

h. ANSI/TIA-758-B-2012, Customer-owned Outside Plant Telecommunications Infrastructure Standard

i. ANSI/ICEA S-83-596-2016, Standard for Indoor Optical Fiber Cable

j. ANSI/IEEE C2-2017, National Electrical Safety Code

k. ANSI/NFPA 70-2017, National Electrical Code

l. ANSI/NFPA 72-2019, National Fire Alarm and Signaling Code

m. ANSI/NFPA 75-2003; Standard for the Protection of Information Technology Equipment

n. ANSI/NFPA 101-2018, Life Safety Code

o. ANSI/UL 1479, Standard for fire tests of through-penetration fire stops

p. ASTM E 814, Standard test method for fire tests of penetration fire stops

q. BICSI TDMM, Telecommunications Distribution Methods Manual -13TH Edition

r. FCC 47 CFR Part 76, Multichannel Video and Cable Television Service

s. Telecordia GR-63, NEBS™ Requirements: Physical Protection

t. Telecordia GR-1089, Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment

Part 2 Qualifications

A. Installation Contractor Qualifications

1. The installation contractor must be, at a minimum, a qualified Certified Installer Plus (CIP) in good standing to offer the 15-year Panduit Certification Plus^{SM} System Warranty program, unless waived in writing by the OIT Representative.

2. The installation contractor will be referred from this point forth as the CIP.

3. The CIP shall also employ an active and current BICSI certified RCDD.

4. The CIP designer and installation teams must have experience with communications systems installation in the education industry.

5. The CIP must be a University approved contractor as defined by the OIT Representative.

B. CIP Installer Qualifications

1. The CIP shall employ BICSI certified installers for the University's projects.
   a. A minimum of one BICSI ITS technician must remain on-site for the duration of the project.

   b. The ratio of certified technicians shall be no less than (4) level 1 installers for every (1) level 2 installer.

   c. Installers must possess certifications for the systems they are testing including all fiber optic and copper workstation certification tests.

C. CIP Project Management

1. The CIP shall provide a BICSI certified RCDD available for any on-site management for the entire duration of the project.

2. The CIP shall include the appropriate staffing to attend project meetings and provide completion status reports as required throughout the duration of the construction and post construction phases.

3. The CIP staff will be available to attend meetings as required by the OIT Representative.

Part 3 Bid Requirements

A. General Requirements

1. All products and materials shall be new unless noted otherwise, and shall be clean and free of defects, damage and corrosion.

2. All products and materials shall be listed and labeled by U.L., E.T.L., or other certified 3rd party testing laboratory.

3. The CIP is responsible for obtaining, and payment of all permits, inspections, tests, etc., necessary to obtain certificate of occupancy.

4. The CIP agrees to furnish a Certificate of Insurance prior to start of work on this contract.

5. Where applicable the CIP shall, prior to bid, walk the project site

    a. Verify the full extent of the existing field conditions, including available spare circuits, space limitations for new equipment, etc.

    b. Failure to review the site conditions does not relieve the CIP of the obligations of the contract.

    c. The included design documents are diagrammatic and indicate approximate locations. It is the CIP's responsibility to coordinate final device/equipment locations with existing field conditions, new equipment, furniture, and ductwork, as defined by the architectural drawings.

6. The CIP shall notify the architect/engineer or designer immediately of any field conflicts, unsuitable materials, and dimensional inconsistencies, which affect the design intent and/or functionality of the system.

7. The CIP shall include provisions for premium-time work for any required shutdowns. Include premium time hourly rate in bid.

8. The CIP shall be responsible for complying with all local building standards, rules and regulations.

9. All work shall be performed in a neat and workman like manner. All conduit, junction boxes, hangers, support channels, etc. shall be installed straight and/or perpendicular to building construction. Special care shall be taken to align hanging devices in exposed "open" ceilings spaces.

10. Sub-subcontracting is not permitted. In cases where subcontracting is approved by the OIT Representative, subcontractors must adhere to all conditions and requirements as the contractor.

11. The CIP will be responsible for any damage caused, either to the physical structure or existing communications cabling infrastructure or systems. Any damage will be corrected as part of the included service to the University at no additional cost.

12. Refer to project plans and accompanying documents for:
    a. Dimensions of TR.
    b. Room names and numbers.
    c. Mounting heights of all electrical devices.
    d. Dimensions and final locations of furniture as related to electrical devices.
    e. Device back-box and faceplate colors.
13. It is the responsibility of the CIP to field verify all measurements and bring any issues to the attention of the OIT Representative.

B. Materials Approval Submittal

1. If materials deviate from this document, the CIP shall provide a complete cut sheet submittal package of all materials and components used for this project. Include (1) set of submittals in hard and electronic copy in DWG and PDF format for distribution, review and approval by the University's OIT Representative.
2. If materials defined by this document are implemented, no submission or approval is needed.

C. Installation Compliances

1. The CIP shall submit complete set of shop drawings showing all proposed fiber, copper cable routing and TR design prior to commencement of work.
2. Shop drawings must be approved prior to installation of cables to ensure best possible cable routes and do not affect any existing utilities or services.
3. The CIP shall verify the use of appropriate flame rated cables for the environment in which they shall be installed as per local jurisdictional codes and requirements.
4. The CIP is not to install cabling infrastructure in such a way that will block access to devices, access panels, or areas required for maintenance.
5. The CIP shall submit as-built changes to station drawings for any additions, moves, or changes that are not on current drawings.
6. The CIP must follow TR zones as outlined on provided drawings.
7. Any business or class disruptive installations such as coring must be performed on a schedule approved by the OIT Representative.

D. Project Close-Out Requirements

1. The CIP shall be required to completely test and certify that all (100%) terminated cable, meet the specified system performance requirement by performing and recording the testing of all installed cables.

2. The CIP shall be responsible for submitting a complete set of record drawings with as-built information and finalized versions of the shop drawings at the completion of the project.

    a. Drawings shall be submitted in electronic formats.

    b. Submittal shall include all drawings revised as per actual installation for the riser and station identification plans.

    c. In addition to the WAO ID's, the drawings shall include all cable pathways, installed sleeves and fire stop locations.

    d. The electronic format shall be submitted PDF, DWG or DXF.

E. Warranty Documentation

1. The CIP shall be required to submit all vendor documentation required for the 15-year Panduit Certification Plus^{SM} System Warranty.

2. The CIP shall provide a written, one-year construction guarantee for all work and materials upon project completion and acceptance.

End of Section

Section 27 05 00 – Common Work Results for Communications

Part 1 Abbreviations Used in this Document

AFF – Above Finished Floor

AWG – American Wire and Gauge

ANSI – American National Standards Institute

BEP – Building Entrance Protection

BICSI – Building Industry Consulting Service International

BICSI ITS – BICSI Information Transport Systems

BICSI TDMM – BICSI Telecommunications Distribution Methods Manual

BTU – British Thermal Unit, unit of heat

CAD – Computer Aided Design

CBB – Common Bonding Backbone, an unbroken continuous copper grounding conductor

CIP – Certified Installer Plus contractor who offers Panduit 15-year Certification Plus^{SM} System Warranty
Demarc – Point of demarcation, where provider hands off to customer network

DWG – Drawing, file format for CAD files

EC – Electrical Contractor

EAC – Electronic Access Control

EF – Entrance Facility

EIA – Electronic Industries Alliance

ER – Equipment Room, aka MDF – Main Distribution Frame

ETL – Electrical Testing Laboratories

FCC – Federal Communications Commission

GC – General Contractor or Building Landlord

HTAP – Half Tap, compression style connector used to bond two or more conductors

HVAC – Heating, Ventilation and Air Conditioning

IDC – Insulation Displacement Connector

ITS – Information Technology Systems

IP – Internet Protocol

LAN – Local Area Network

LC – Latching Connector, small form factor fiber optic connector

MC – Mechanical Contractor

N – Need or requirement

N+1 – Need plus one additional element for redundancy

NEBS – Network Equipment Building System

NEC – National Electrical Code

NEMA – National Electrical Manufacturers Association

NFPA – National Fire Protection Association

NIC – Not in Contract

OM3 – Optical Multimode type 3, 50 Micron Laser Optimized Multimode Fiber

OM4 – Optical Multimode type 4, 50 Micron Laser Optimized Multimode Fiber

OS2 – Optical Singlemode type 2, zero water peak to allow for additional wavelengths

PDF – Portable Document Format, file format for Adobe Acrobat

PDU – Power Distribution Unit

POTS – Plain Old Telephone Service, analog phone line

RCDD – Registered Communications Distribution Designer

RJ-45 – USOC registered Jack document 45, generic reference for 4 pair modular jacks and plugs

SCS – Structured Cabling System

SMB – Surface Mount Box, houses telecommunication jacks

TBB – Telecommunications Bonding Backbone

TC – Telecommunications Contractor

TGB – Telecommunications Grounding Busbar

TIA – Telecommunications Industry Association

TMGB – Telecommunications Main Grounding Busbar

TO – Telecommunications Outlet, one cable terminated with one jack

TR – Telecommunications Room aka IDF - Intermediate Distribution Frame

UL – Underwriters Laboratories

UTP – Unshielded Twisted Pair cable

UPS – Uninterruptible Power Supply

VA – Volt-Amps, measurement of electrical power

VoIP – Voice over IP

WA – Work Area, end users work area

WAO – Work Area Outlet, designated TOs in the same faceplate or surface mount box

End of Section

Section 27 05 05 – Selective Demolition for Communications

Part 1 Cable Removal

A. General

1. Where projects require complete cable removal, demolition will be part of Demolition and Structure Moving. Removal of cable will be the responsibility of the data (sub-)contractor unless otherwise specified by the OIT Representative.

2. Where projects do call out for specific removal of cabling infrastructure, definition of the requirements will be part of the project documentation.

B. Abandoned Cable

1. This section applies where partial remediation requires removal of selective cables and unused media.

2. The CIP shall provide a quotation for removal of all abandoned and unused data and voice cabling. This cost must be reflected as a separate line item cost.

3. Removal must include but is not limited to, all termination hardware, outlets, support systems and cable.

4. Removal shall include the repair to all abandoned penetrations, openings and wall finishes in a manner that is acceptable to the OIT Representative.

5. Reclamation and the value of copper cable shall be deducted from the labor quote for cable removal.

End of Section

Section 27 05 26 – Grounding and Bonding for Communications Systems

Part 1 Building Entrance Protection

A. General

1. The preferred manufacturer for building entrance protection is Vertiv.

B. Requirements

1. BEP for copper cabling shall be installed per NEC code requirements and manufacturers recommendations.

2. All metallic cable elements shall be protected by a BEP system within 50 feet of the building entrance.

3. All BEP terminal blocks shall be bonded and grounded to the Telecommunications Grounding System ad defined in Section 27 05 26, Grounding and Bonding for Communications Systems.

4. The BEP system shall consist of building entrance terminal blocks utilizing two (2) foot fused link between the outside cable plant splice and the protector module with IDC type input and output terminals, 100-pair capacity and female mounting base.

5. The BEP system shall be equipped with 5 pin 350-volt gas tube protector modules with PTC current limiter protection.

6. Provide sufficient protector modules to completely populate all building entrance terminals.

C. Bonding of Metallic Sheaths

1. Cabling with metallic protective elements such as a rodent preventive shield, sheath or strength member shall be bonded and grounded to the telecommunications grounding system.

2. Metallic sheaths shall be bonded using a piercing style bonding connector with an integrated lug to accept appropriately sized bonding conductor and installed per manufacturers recommendations.

Part 2 Telecommunications Grounding

A. General

1. Grounding shall conform to ANSI/TIA-607, NEC and local code requirements as a minimum.

2. All grounding shall comply with manufacturer's grounding requirements to achieve UL requirements.

B. Requirements

1. A Primary Bonding Busbar (PBB) shall be located at the electrical service entrance bonded to the building main grounding system.

2. A secondary bonding busbar (SBB) shall be in each telecommunications space.

3. An appropriately sized telecommunications bonding backbone (TBB) shall be bonded between the PBB and SBB.

4. The TBB shall be bonded to building steel and grounded/earthed to the electrical service ground per ANSI/TIA-607 guidelines. Each SBB shall be bonded to building steel and the electrical panel serving equipment in the telecommunications space.
See the following figure.

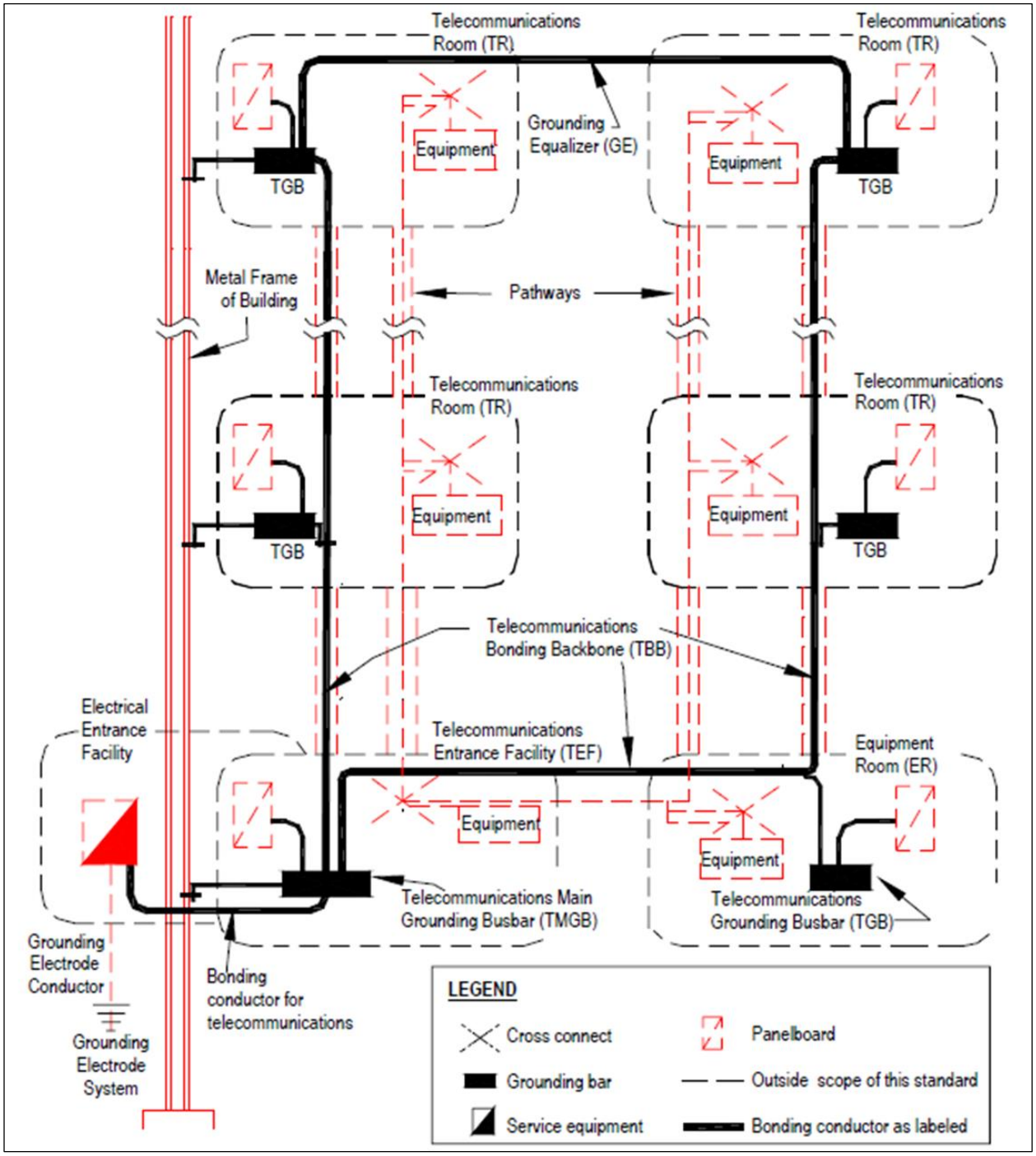

Figure 1: Four telecom rooms (IDFs), one entrance facility, and one electric room (MDF) are connected to each other and the designated ground source. The legend shows cross connects, panel boards, grounding bars, outside scopes, service equipment and bonding conductors.

5. The TBB shall be continuous without breaks. The gauge size is determined by the length of the bonding conductor. Refer to the following table for conductor sizing of all bonding conductors.

TBB/GE linear length m (ft)	TBB/GE size (AWG)
less than 4 (13)	6
4 – 6 (14 – 20)	4
6 – 8 (21 – 26)	3
8 – 10 (27 – 33)	2
10 – 13 (34 – 41)	1
13 – 16 (42 – 52)	1/0
16 – 20 (53 – 66)	2/0
20 – 26 (67 – 84)	3/0
26 – 32 (85 – 105)	4/0
32 – 38 (106 – 125)	250 kcmil
38 – 46 (126 – 150)	300 kcmil
46 – 53 (151 – 175)	350 kcmil
53 – 76 (176 – 250)	500 kcmil
76 – 91 (251 – 300)	600 kcmil
Greater than 91 (301)	750 kcmil

Figure 2: Table showing gauge sizes for each bonding conductor length. This ranges from 6 AWG for less than 4 meters (or 13 feet) to 750 kcmil for more than 91 meters (or 301 feet).

6. All telecommunications rooms shall have a SBB that will be bonded via a compression style Half Tap (HTAP) to the TBB. The SBB should provide a central ground attachment point for telecommunications systems, computers and other equipment located in the ER/TR.

7. Bond and ground all metallic elements in the ER/TR such as equipment racks, housings, messenger cables, raceways, and rack-mounted conduit, cabinets, racks, and frames to the SBB with a minimum size # 6 AWG or greater green insulated copper grounding conductor. Refer to Table 5.2.B for sizing of conductor.

8. The PBB and SBB installed in the ER and TR shall be 12 inches long and 4 inches wide by 1/4-inch-thick with pre-drilled EIA bolt hole sizing and spacing. This will be provided by the EC.

C. Bonding

1. Bonding shall be of low impedance to assure electrical continuity between bonded elements.

2. A minimum sized # 6 AWG copper conductor with compression style dual hole lugs (NEBS Level 3) will be used to bond the communications components to the grounding system. Any paint shall be removed at bonding surface and antioxidant shall be applied before bonding.

3. The electrical contractor must provide access to a bonding connection at the electrical service ground during new construction (NEC 250-71(b)). A PBB must be specified in the ER with an approved ground connector back to the electrical service ground point. Dual hole compression lugs are required at the ground bar side to insure NEBS Level 3 compliancy.

4. All metallic conduits terminating to cable trays, wire ways and racks shall be mechanically fastened.

5. When connected to a cable tray or rack, conduit must be connected with ground bushings, wire bonded to the tray or rack, and grounded to the main building grounding system or telecommunication room grounding bar using a minimum size #6 AWG copper ground conductor. Refer to Table above for sizing of conductor.

End of Section

Section 27 05 28 – Pathways for Communications Systems

Part 1 General

A. Requirements

1. The cable pathway shall be designed and implemented per ANSI/TIA-569 standard recommendations.

2. The CIP shall be responsible for properly supporting, protecting and managing all exposed and concealed communications cabling throughout the entire run as defined in this document.

3. At no time, shall cables be supported by any means other than a system specifically designed to support the cabling system type.

4. The cable support system shall not share support structure with other trades and be completely independent.

5. Other trades support structure such as ceiling grid wires, electrical conduits and sprinkler pipes shall not be used for communications cable support.

6. Acceptable support products are appropriately sized cable tray, J-Hooks, conduit or surface mount raceway.

7. During the installation process, temporary cable loops shall be supported by an appropriate support device such a J-Hooks as to not alter the performance of the cable.

8. Cable pathways shall be installed to enable all cables to be installed at least one foot from any fluorescent lighting unless contained in separate conduit, and two feet from other sources of electromagnetic interference such as electric motors and generators.

9. All above-ceiling cable must be installed in purpose-built support systems such as cable trays, J-Hooks or conduit so that the cable does not lie loosely on the top of the drop ceiling or interfere with other trade systems.

10. All cabling should be neatly installed without using any electrical conduits, plumbing, heating, or air conditioning structures for support.

11. All continuous metallic cable pathways shall be bonded and grounded to the telecommunications grounding system as defined in Section 27 05 26, Grounding and Bonding for Communications Systems.

Part 2 Outside Plant Systems

A. General

1. The cable pathway shall be designed and implemented per ANSI/TIA-758 standard recommendations.

2. Outside plant systems include areas where environmental conditions are not controlled such as outdoor and sub terrain tunnel environments.

3. Outside plant systems shall include but are not limited to; direct buried, buried duct and aerial pathways, vaults and handholds.

4. All unused ducts shall be plugged at both ends to prevent environment ingress.

5. All new construction requires that backbone fiber optic and copper cables be run to core locations as defined by the OIT Representative. Note that all new construction requires two independent, geo-diverse fiber optic cables to provide redundancy.

B. Buried Duct

1. A minimum size of 2” schedule 40 with two spare ducts shall be used.

2. If a larger size is required, spare ducts shall meet the same requirement.

3. The ducts shall have mule-tape or pull string provided with a minimum pull rating of 600 lbs.

4. When splicing the duct is required, a water-tight splice shall be securely installed per manufacturer’s recommendations to maximize strength and integrity of the pathway.

C. In-Ground Vaults and Hand Holds

1. The minimum size for hand holds shall be 30” x 48” x 20” deep with wire screened bottom.

2. The hand hold shall be rated to a minimum of 20,000 lb. with a two-piece bolt down lid.

3. The base shall be a minimum of 6” of medium wash rock.

4. Hand holds shall be no further than 400 ft apart and no more than 180 degree of bends are allowed between hand holds.

5. Where duct enters building above ground a 24” x 24” x 12” weather tight junction box shall be used for the transition and to provide a pull point.

6. Cable service loops shall be staged in the hand hold in a figure 8 method.

7. Service loops shall be a minimum of 100’.

D. Tunnels

1. Cable shall be supported every 4'.

2. Cable shall be labeled every 50'. If multiple cables are run, each cable requires its own set of cable labels.

Part 3 Indoor Conduit System

A. General

1. In new construction where concealed pathways cannot be added later, appropriately sized conduit pathways shall be installed during the construction phase.

2. When a project requires the use of a metallic conduit system; all conduit pathways, back boxes and drywall raceways shall be furnished and installed by the EC.

3. Coordination with the EC will be required to ensure usable protective conduit pathways.

4. Pull strings shall be installed in all conduits and replaced during installation.

5. The CIP shall make certain that the area fill percentage of the conduit does not exceed 40%. If capacity if reached, then another conduit shall be installed.

6. There shall be no more than 180-degree of bends in one continuous run of conduit between pull points.

7. The unterminated end of any conduit shall be reamed and fitted with a protective bushing.

B. Stub-Up

1. Conduit stub-ups shall be a minimum 1" trade size and terminate in a double gang (4"x4") back box at the WAO.

2. The back box shall be reduced to a single gang (2"x4") for single gang faceplate placement.

C. Horizontal Conduit Pathway

1. All voice/data horizontal cabling lengths shall not exceed 295-feet from outlet to patch panel. The EC shall coordinate with the CIP to verify that the conduit pathway is in the most direct route from the outlet to the termination equipment room.

2. Hard ceilings areas where cable access is restricted after construction should be avoided for cable pathways. However, where they cannot be avoided space shall have appropriately sized conduits to span the area.

3. The conduit pathway shall be sized to provide the same capacity as the interrupted cable tray.

4. If a completed pathway cable/conduit system results in any communications cable length to exceed 295- feet, the following corrective measures will be the responsibility of the EC and CIP.

a. The EC will be liable for all added costs (including premium time) associated with re-working of a conduit system to make the communication cabling system length compliant.

b. The CIP shall be liable for all added costs (including premium time) associated with re-working of all effected cabling, re-termination and re-testing to make the communication cabling system ANSI/TIA-568 compliant.

c. It is the CIP and EC's responsibilities to identify any locations where it is not physically possible to meet these requirements prior to installation and seek corrective guidance.

Part 4 Communications Cable Tray

A. General Requirements

1. Main cable tray runways shall follow corridors and main hallways.

2. The cable tray system shall be supported at a maximum of every 5'-0" intervals and/or at 2’-0” from each junction/intersection or as manufacturer recommends.

3. Protection against edges at horizontal intersections shall be in place to ensure the integrity of communications cable during installation.

4. Threaded rod supported tray

   a. Protective sleeves shall be placed over threaded rod for a minimum of 8 inches to protect cable and personnel during installation.

   b. In trapeze configurations, the supporting trapeze bracket shall be secured above and below with fender washers and hex nuts to properly restrict vertical movement of tray.

   c. Excess threaded rod below trapeze shall be removed flush with hex nut and be burr free.

5. Where wall mounted bracket applications are required, fasteners shall be secured to structural wall studs, cinderblock, concrete or surface mount plywood backboard. Anchors in gypsum board is not acceptable.

6. All cable tray shall be installed in accordance with manufacturers requirements to meet anticipated structural and capacity performance.

B. Wire Mesh Style Tray

1. Preferred manufacturer for wire mesh tray and associated products is Chatsworth Products, Inc.

2. The tray system shall be sized to accommodate the total area serve and filled to a capacity of 50% as recommended by the manufacturer. This calculation based on diameter of cable and free air space will result in a fully populated tray.

3. Cabling that exits the tray shall be supported via J-Hooks or conduit exclusively.

4. If design calls for cable tray in the TR, the tray shall be 2" deep.

5. 4" deep tray shall be used for pathways outside of the TR.

C. Ladder Style Runway Tray

1. The preferred manufacturer for ladder tray and associated products is Chatsworth Products, Inc.

2. This style of tray will typically be applied to telecommunications rooms.

3. Ladder tray requirements will be further detailed in Section 27 11 00 – Communications Equipment Room Fittings.

Part 5 Non-continuous Cable Supports

A. General

1. Non-continuous supports shall be selected to accommodate the immediate and anticipated quantity, weight and performance requirements of cables.

2. Installation shall be as close to the deck as possible and above other trade's structure.

3. If building structure for non-continuous supports does not exist, dedicated grid wire installed with powder-actuated devices shall be implemented.

B. J-Hooks

1. If ceiling space restricts cable tray installation, appropriately sized J-Hooks shall be used. See the following sizing matrix.

J-Hook Size	.75"	2.00"	4.00"
Number of Cat 6 Cables	10	46	180
Number of Cat 6A Cables	5	30	115

Figure 3: J-Hook Sizing Matrix showing the proper size for Cat 6 cables and Cat 6A cables.

2. The preferred manufacturer for J-hooks and associated products is B-Line.

3. J-Hook supports shall be located at intervals not to exceed 5’- 0”. Maximum cable sag of 1’ - 0” shall not be exceeded at the mid-span between J-hooks. See the following figure.

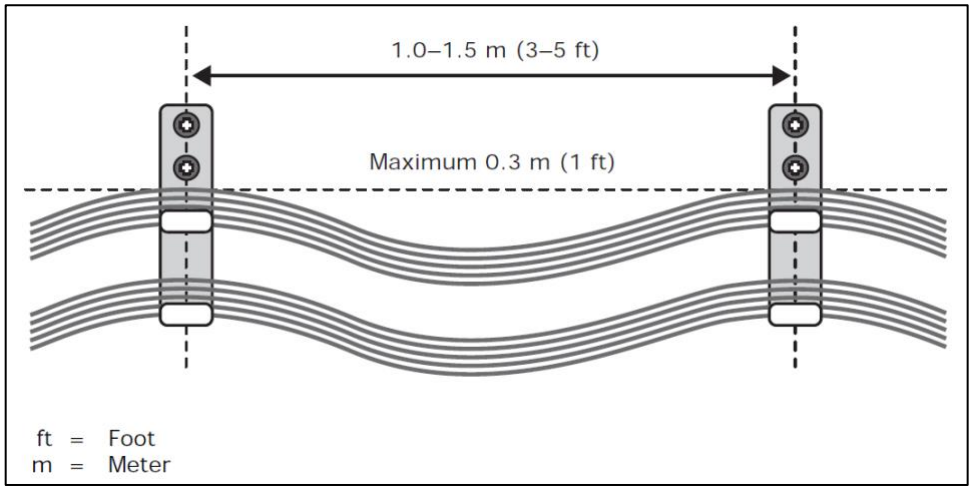

Figure 4: J-Hook support intervals showing that supports should be located at intervals between 3' to 5' and the maximum cable sag of 1'.

Part 6 Additional Raceway

A. General

1. Building construction with no false ceilings, cinder block walls or no access for cable pathway may require the use of surface mount raceway for distribution.

2. The preferred manufacturer for surface mounted raceway and associated products is Panduit.

3. Consult with the OIT Representative for all final requirements.

B. Latching Duct

1. In installation where surface mounted raceway and WAO are required, Panduit latching duct shall be used.

2. The race way shall be appropriately sized for the number of cables needed.

3. The raceway shall be mounted using #6 x ¾" long fasteners in conjunction with the provided double sided tape. Fasteners shall be spaced no greater than 16" apart.

4. Latching duct will be installed parallel and straight with the wall reference.

5. All appropriate manufacturer raceway fittings shall be used to create a complete system including drop ceiling fittings, elbows, tees and surface mount boxes.

C. Communication Poles

1. Power poles or communications poles may be used where there is no other option for vertical drops to feed cubicle furniture or other WAO.

2. If power and communication will occupy the same vertical pole, a power pole with two channels separated by a metallic barrier must be used.

3. Communication poles must be set plumb and secured to prevent movement.

4. If the surface mount WAO will be mounted to the pole, the WAO must be located on the communications side of the pole.

End of Section

Section 27 05 44 –
Sleeves and Seals for Communications Pathways and Cabling

Part 1 Wall Penetration and Firestopping

A. General Requirements

1. Wall penetrations shall be fitted with a UL approved smooth assembly sleeve.

2. All fire stop product must be rated and tested against ASTM E 814, Standard test method for fire tests of penetration fire stops, or ANSI/UL 1479, Standard for fire tests of through-penetration fire stops.

3. Sleeves shall meet or exceed the capacity of the existing cable pathway system as to not restrict installation of cabling infrastructure.

4. Sleeves shall be galvanized-steel sheet, round smooth tube, closed with welded longitudinal joint.

5. Sleeves shall be mechanically sound and secured to the barrier.

6. Sleeves shall be fitted with protective plastic bushings.

B. Pathway Sleeves for Non-Fire-Rated Construction Walls

1. Shall meet the general requirements for sleeves.

C. Pathway Sleeves for Fire-Rated Construction Walls

2. The preferred manufacturer for fire stop sleeves and associated products is Unique Fire Stop Products.

3. Cables penetrating through fire-rated floors or walls shall utilize fire-rated pathway sleeve devices capable of providing an F rating equal to the rating of the barrier in which the device is installed.

4. System shall comply with requirements per the AHJ for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

5. System shall comply with the latest version of the ANSI/TIA/EIA-569 standards document.

6. Contains integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated.

7. Contains a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type.

D. Wall Penetration Firestopping Installation

1. Cables passing through fire-rated floors or walls shall pass through a firestopping system, which contain an intumescent material.

2. The device (per code requirements) shall include both internal and external fire stopping characteristics.

3. Firestopping sleeve shall be installed in accordance with manufacturers requirements to meet this specification and AHJ requirements.

Part 2 Floor Penetration and Firestopping

A. General Requirements

1. Floor cores shall be fitted with a UL approved threaded rigid floor assembly sleeve.

2. All fire stop product must be rated and tested against ASTM E 814, Standard test method for fire tests of penetration fire stops, or ANSI/UL 1479, Standard for fire tests of through-penetration fire stops.

3. Floor penetrations shall comply with requirements per the AHJ for penetration firestopping installed in floor vertical applications, with and without penetrating items.

4. Floor penetrations shall comply with the latest version of the ANSI/TIA/EIA-569 standards document.

5. Sleeves shall be mechanically sound and secured to the floor.

6. Sleeves shall be fitted with protective plastic bushings.

7. The number of floor core penetrations should accommodate cable capacity plus one extra core.

B. Pathway Sleeves for Vertical Floor Applications

1. The preferred manufacturer for fire stop sleeves and associated products is Unique Fire Stop Products.

2. Cables penetrating through fire-rated floors or walls shall utilize fire-rated pathway sleeve devices capable of providing an F rating equal to the rating of the barrier in which the device is installed.

3. The sleeve shall be centered vertically to equalize the protrusion on both sides of floor.

4. The sleeve shall be packed with mineral wool batt insulation, compressed, tightly packed to fill the sleeve.

5. Packing material shall be recessed from top edge of the sleeve to accommodate firestop fill putty.

6. Firestop fill putty shall be a minimum of ½" thickness and flush with the top edge of the steel sleeve.

End of Section

Section 27 05 53 – Identification for Communications Systems

Part 1 Identification and Administration

A. General

1. All identifiers and labels shall conform to ANSI/TIA-606 recommendations.
2. All identifiers shall be a permanent, self-adhering label. No hand-written labels.
3. All communication related devices shall be labeled and documented on the as-built prints.
   a. Each element of the cabling infrastructure
   b. Sleeves
   c. Grounding and bonding elements
   d. Racks and cabinets

B. Work Area Outlet Numbering Sequence

1. WAO numbering shall be sequential in the room.
2. Numbering will begin directly left of room entry and follow in a clockwise direction. See the following diagram.

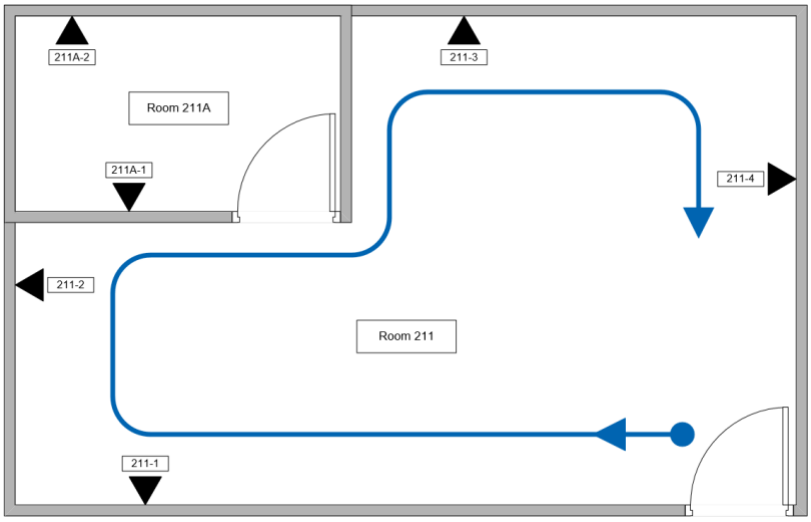

Figure 5: Numbering for work area outlets begins directly left of the room primary entry and follows in a clockwise direction.

C. Work Area Outlet Labeling

1. WAO faceplate labels and the patch panel labels must match identically.

2. WAO identification at the faceplate will include three levels of administration: room number, WAO number and jack number.

    a. If adding to an existing system and a different site schema is in use, the CIP must follow that designation.

3. Faceplates will be labeled with computer generated labels installed under the clear label window.

    a. The upper window will be populated with a label, designating “UTA net x2208”

    b. The lower window will be populated with the room number and WAO sequence number in Arial Bold 22-point font.

    c. The jacks in each faceplate location will be labeled with the room number, WAO sequence number and jack position in Arial 10-point font.

4. Jack labels

    a. Labels shall be adhered to the jacks before installation into the faceplate

    b. The label shall wrap around the edges of the jack extending to both sides of the jack.

    c. Once the jack is installed, the label will be secured in place between the faceplate and sides of the jack.

5. See the following typical faceplate identification.

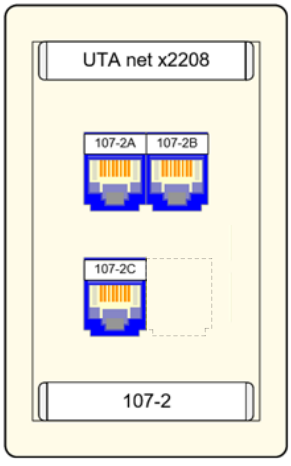

Figure 6: Example faceplate showing labels.

6. Ceiling located WAO shall have an additional identifier that will be represented at the jack and patch panel.

    a. The jacks in a ceiling location shall have a “C” as the first digit of the jack identifier.

    b. For example: 107-5CA

D. Horizontal Cable Labeling

1. All cables shall have a self-laminating label located on the cable jacket within 6" of each termination.

2. The identifier will be the same as the terminated jack as described above. See the following cable label.

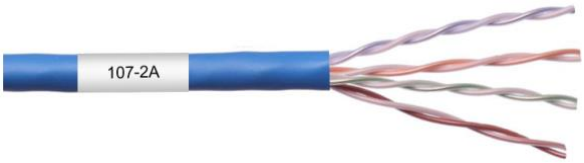

Figure 7: A self-laminating horizontal cable label

End of Section

Section 27 11 00 – Communications Equipment Room Fittings

Part 1 Telecommunications Rooms

A. General

1. Telecommunications rooms (TR) shall be designed and implemented per ANSI/TIA-569 standard recommendations.

2. The telecommunications room shall be dedicated for communication use only.

3. No part of the space shall be shared with building facilities or other trade's equipment such as electrical, mechanical or plumbing.

4. Storage of materials shall not be place in the active TR.

5. To accommodate hierarchal star wiring infrastructure, there shall be one Equipment Room (ER) with cabling media distributing to each TR per building.

6. There shall be a minimum of one TR per floor. Additional spaces may be required to maintain cabling distance requirements.

7. The TR shall only serve the floor in which it is located.

8. The ER may be dual purposed and serve as a TR serving the floor.

B. Location Guidelines

1. Centrally locate the TR in an area that will be least likely to be included in partial floor renovation such as the core of the building, next to elevators or stairwells, next to bathroom facilities, and mechanical or electrical rooms.

2. Avoid locations where possible flooding is a risk such as below ground level in flood plains.

3. The location should minimize the number of TRs that will serve the floor.

4. The location shall be able to serve areas of the floor without exceeding 90 meters (295') of total horizontal copper cable taking into consideration the 25 feet of additional service loops stored at the ends of the cable run.

5. In multi-story buildings, the TRs should be vertically stacked to create a cable riser system isolated from the rest of the building.

6. The TR shall be directly accessed from the hallway or corridor.

C. Sizing Telecommunications Spaces

1. General

   a. Final room size shall be determined by cabling density and special requirements set forth by the University.

   b. The University will coordinate with the architect and provide final room size and location requirements.

2. Room Sizing

   a. The telecommunications room shall be sized to meet the known requirements such as the function of the room, the number equipment and equipment racks needed and the number equipment outlets that it will serve.

   b. The minimum floor space shall be based on the number of equipment outlets served directly. See the following table.

Equipment Outlets Served	Minimum Floor Space m^2 (ft^2)	Typical Dimensions m (ft)
Up to 100	9 (100)	3x3 (10x10)
101 to 200	13.5 (150)	3x4.5 (10x15)
201 to 800	36 (400)	6x6 (20x2x0)
801 to 1600	72 (800)	6x12 (20x40)
1601 to 2400	108 (1200)	9x12 (30x40)

Figure 8: Recommended Telecom Room Sizing Matrix based on number of WAOs supported.

D. Layout

1. While layout of the space may vary, the design intent is the same.

2. All racks will be reserved for IT equipment use only.

3. 3’ of serviceable clearance must be maintained from the front and rear of the equipment to be placed in the equipment racks.

   a. The service clearance shall take into consideration deep mounted equipment such as UPS systems and chassis mount IT equipment.

4. The walls will be lined with flame retardant, unpainted plywood with a Grade A finish on the visible side (side abutting the wall will be Grade C or better). Plywood shall extend from 1’ AFF to 9’ AFF.

5. The overhead cable pathways shall be fitted to allow incoming cables to be supported to final destination.

6. See typical the following TR layout.

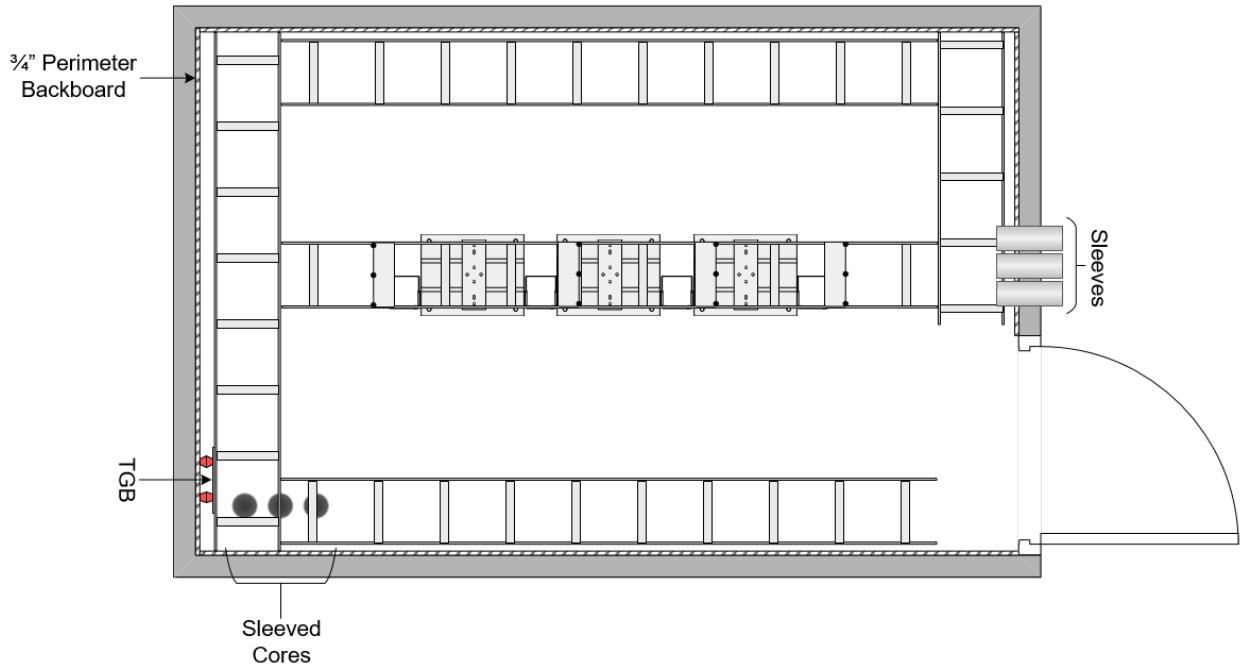

Figure 9: Typical example of telecommunications room floorplan showing equipment racks and overhead ladder pathways.

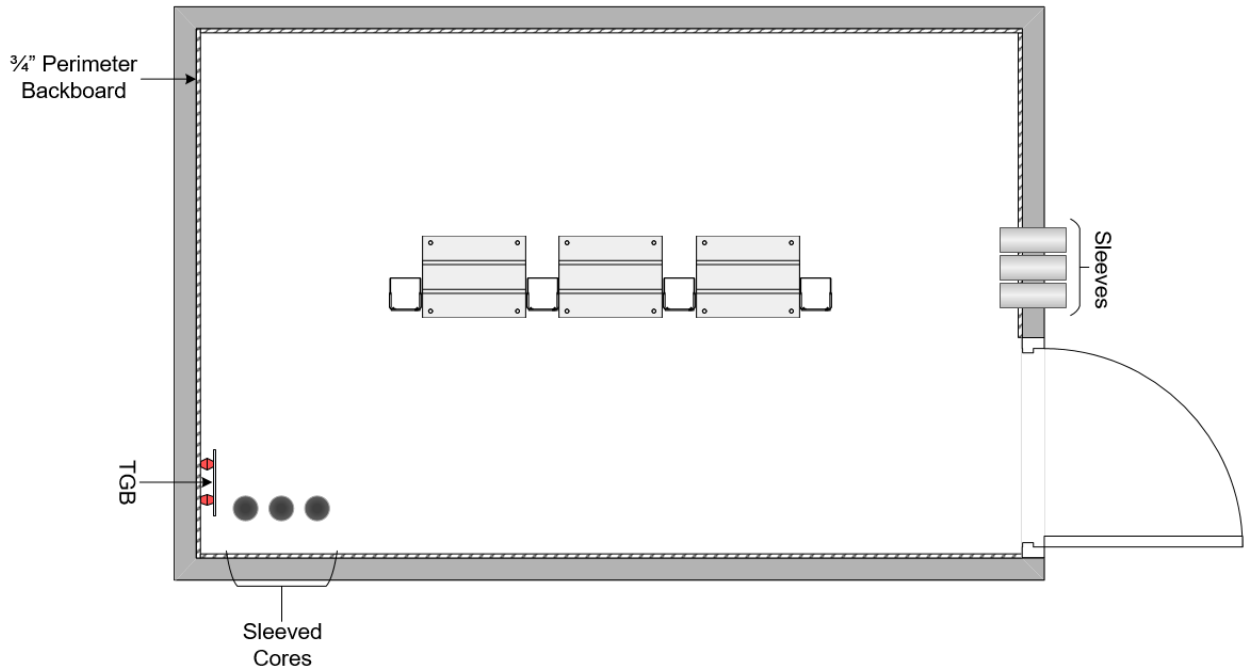

Figure 10: Typical example of telecommunications room floorplan showing equipment racks without overhead ladder tray.

E. Construction

1. Ceiling
    a. Minimum ceiling height shall be 10 ft AFF to accommodate frames and tray.
    b. Minimum unobstructed ceiling height is 8 ft AFF.
2. Perimeter walls shall extend from deck to deck.
3. Treatment
    a. Floors, walls and ceiling shall be treated in a manner to minimize dust.
    b. Finishes shall be light in color to enhance room lighting.
    c. Floors shall have anti-static properties.
4. Floor Loading
    a. Capacity shall be sufficient to bear both the distributed and concentrated load of the installed equipment.
    b. A structural engineer shall be consulted during the design phase to specify the floor loading limit.
    c. If equipment exceeds these limits the floor for the area shall be appropriately reinforced.
5. Seismic Considerations
    a. Seismic specifications for telecommunications infrastructure and related facilities shall accommodate applicable seismic requirements per the AHJ.
6. Lighting
    a. Lighting should be maintained at 500 lux in the horizontal plane and 200 lux in the vertical plane, measured at 3 ft AFF.
    b. Lighting should be able to be turned on/off via a wall switch located immediately inside the door.
    c. Lighting shall not be powered from the same electrical distribution panel as the communications equipment in the space.
    d. Lighting shall be provided via LED fixtures.
7. Entry Door
    a. The door shall be a minimum of 36 in wide and 80 in high with no doorsill.
    b. The door shall be hinged to open outward (code permitting). Otherwise, door will be located so as to not impede placement of equipment racks.

c. Doors shall be fitted with a locking mechanism and shall not restrict egress.

d. Electronic access control (EAC) locking system is preferred over a keyed lock and shall be a part of the base building access control system.

i. EAC shall be fitted with door status switch and motion request to exit and other AHJ required devices.

ii. The EAC shall not restrict egress from the room.

e. Door shall be secured with a door strike type locking mechanism, magnetic locks that rely on power to energize locking shall not be accepted.

F. Electrical Requirements

1. General

a. All electrical receptacles shall be labeled with distribution panel and circuit number.

2. Convenience Power Outlets

a. There should be, at a minimum, one duplex convenience outlet every 6 feet along the walls immediately to the left and right of the door for general-purpose use.

b. All convenience outlets will be 20A/120VAC utility grade.

3. The ER and TR network electronics rack power requirements.

a. Outlets will be located at the base of each network rack.

b. For existing ER and TRs each outlet will be a dedicated circuit rated at 20A.

c. For new or renovated ER and TR each outlet will be a dedicated circuit rated at 20A.

4. All equipment racks that will accommodate network distribution equipment will have UPS equipment installed (APC Smart-UPS X 1500 with NMC and where necessary, external battery packs). UPS capacity:

a. 30 minutes – if electrical service is not supported by backup generator

b. 7 minutes – if electrical service is supported by backup generator

5. Final design and layout approval on quantity, type, and location of outlets shall be provided by the OIT Representative.

G. Environmental Requirements

1. The temperature and humidity shall meet the requirements set forth and defined by ASHRAE Class B.
    a. Temperature range of 41-95 degree Fahrenheit dry bulb
    b. Maximum rate of temperature change is 36 degrees Fahrenheit
    c. Relative humidity 8-80%
    d. Maximum dew point of 82 degrees Fahrenheit
2. The University shall provide the HVAC contractor with any exceptional BTU information.
3. Environmental Monitoring
    a. UTA OIT will be responsible for deployment of temperature and humidity sensors unless otherwise specified by the OIT Representative.

H. Fire Protection

1. Fire protection shall be provided as per applicable code.
2. If wet pipe sprinklers or two stage preaction sprinkler system are installed the following shall apply:
    a. The heads shall be provided with wire cages to prevent unintentional activation.

I. Water Infiltration

1. TRs shall not be located below water level or flood plain unless preventative measures against water infiltration are implemented.
2. The TR shall be free of water or drain pipes, excluding what is required to support equipment in the room.
3. Piping containing liquids of any kind shall not pass over the top of the TR. This includes septic, drain, water, mechanical chilled loops, etc.
4. A floor drain with back flow preventer shall be provided within the room if risk of water ingress exists.
5. Where moisture is present or humidity exceeds limits within this document, a dehumidification system shall be implemented.

J. Buildout

1. Plywood Lined Walls

   a. Plywood backboard shall be installed by the carpenter trade.

   b. Walls shall be fitted with 3/4” A-C grade fire-retardant (treated) plywood with the UL classified fire retardant label facing out on A side of plywood.

   c. Plywood shall extend from 1’ AFF to 9’ AFF and shall be provided on all perimeter walls.

2. Cores and Conduits

   a. A minimum of 3 four-inch conduits/cores shall feed each communications room.

   b. The number of conduits will be based on N+1. Example: if 3 conduits will be occupied with cables for initial build out then 4 conduits shall be installed.

   c. All vertical conduits/coring should be kept six inches (6") or less from walls whenever construction permits.

   d. All floor cores should be in single row.

   e. All floor cores should align to create a straight vertical path between vertically stacked TRs.

   f. All floor and wall penetrations must be sleeved and fire stopped as described within this document and which meets local applicable codes.

3. Telecommunication Racks

   a. The preferred manufacturer for free standing relay racks and associated products is Chatsworth Products.

   b. The ER/TR room will have at least two floor mount equipment rack.

   c. If a 4-post rack is required by the design, it will be first in the alignment from adjacent wall. Additional 2-post racks will follow in the row. The final design layout for the placement of racks, rack hardware, and wall fields within the space shall be approved by the OIT Representative.

   d. Racks shall be anchored to the floor and adjusted for plumb vertical alignment.

   e. Vertical cable managers shall be installed between the racks and at both ends of the row.

   f. A clear space of 3 ft shall be reserved in the front and rear of the rack from nearest obstruction.

   g. 2 post racks shall be 7’ floor mount racks 19” mounting rails with EIA hole spacing for equipment.

h. Provide (2) rackmount PDUs per active electronics rack. Specific manufacturer and part number will be specified on a case-by-case basis.

i. All telecommunication racks shall be bonded and grounded to the telecommunications grounding system as defined in section 27 05 26, Grounding and Bonding for Communications Systems.

4. Network Distribution Equipment

   a. Network Distribution equipment in the TR (routers, switches, etc.) will be owner provided, owner installed unless otherwise specified

   b. Wireless access points will typically be owner provided

5. Ladder Style Cable Tray

   a. The CIP shall furnish and install a complete cable tray system in the ER/TR rooms.

   b. A ladder style cable tray shall create a pathway from room cable entry to freestanding racks and to wall board.

   c. The tray shall be secured to the top of the rack for additional stability.

   d. All exposed cable shall be routed to overhead tray.

   e. A wall mount vertical tray shall be installed from backbone riser cable entry to the horizontal tray.

   f. The cable ladder tray system shall be supported at a maximum of every 5'-0" and/or at 2’-0” from each junction/intersection.

   g. All exposed cables in open ceiling environments shall be neatly bundled using Velcro spaced at a maximum of 24-inch intervals and secured to the cable tray rungs. Plastic cable ties are not acceptable.

   h. The tray shall be fitted with a radius drop bracket at each cable elevation transition such as over each vertical manager and horizontal to downward vertical tray junction.

   i. Ladder sections shall be bonded across junctions to maintain grounding of the support system as shown in the following diagram.

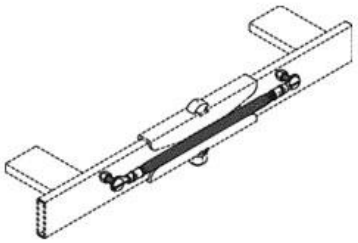

Figure 11: Ladder style cable tray showing how ladder sections should be bonded across junctions.

6. Grounding and Bonding

    a. All metallic substrates shall be bonded to the telecommunications grounding system as defined in section 27 05 26 Grounding and Bonding for Communications Systems.

End of Section

Section 27 13 00 – Communications Backbone Cabling

Part 1 Backbone Cabling Infrastructure

A. General

1. All cable shall be inspected for damage before installation. If any damage is present it shall not be installed.
2. Backbone cable shall be continuous from source to destination and shall not be spliced.
3. Cable shall be secured to prevent movement, kinking or stress on termination points.
4. All cable shall be installed in predetermined pathway support hardware and follow right angles throughout run.
5. If cables show signs of damage such as kinks, deformation of the cable jacket or nicks during or after installation it shall be replaced by the CIP at no charge to the University.
6. All communications cabling shall be listed and marked with the required jacket flame rating for the areas of installation. If many areas are spanned by the cable, the most stringent flame rating shall be met.
7. All cabling infrastructure shall be field tested, post installation, to requirements set forth by the ANSI/TIA-568 standards.

B. Multipair Copper UTP Cabling (Telephone Feeder Cable)

1. The preferred manufacturer of the backbone copper cabling is Belden.
2. The backbone UTP cable will be a 25-pair UTP category 3 cable at a minimum. Consult with the OIT Representative for final pair count.
    a. OSP and tunnel cabling shall be flooded with water blocking compound to prevent moisture ingress.
    b. Indoor UTP cable shall meet the required jacket flame rating for the areas of installation.
3. Cable and termination hardware must comply with TIA/EIA-568.

C. Fiber Optic Cable

1. The preferred manufacturer of fiber optic cabling and backbone termination hardware is Corning Optical Communications.
2. Indoor fiber optic cable shall be tight-buffer construction with an interlocking armored jacket.
3. OSP fiber optic cable shall be loose-buffer construction, dry water blocked with an interlocking armored jacket.
4. If OSP fiber optic cable continues beyond the building entrance facility, the cable jacket will be plenum rated.

5. At a minimum, a 48-strand, singlemode, OS2 fiber shall be installed, strand count based on application. In those instances that multimode fiber is also required, 12-strand OM4 multimode fiber shall be installed.

6. Fiber optic strand count and mode will be defined by the OIT Representative for the individual project or application.

7. See project documents for final fiber optic transmission performance and strand count.

8. Jacket color shall be aqua for multimode and yellow for singlemode applications.

9. Fiber cable shall have a minimum service loop of 25 feet at each end of the cable.

    a. The service loop size shall not exceed the manufacturers minimum bend radius for active fiber.

    b. The service loop will be located as designated by the OIT Representative.

10. Metallic armor shall be bonded and grounded to the telecommunications grounding system as defined in section 27 05 26, Grounding and Bonding for Communications Systems.

11. Consult with the University and the OIT Representative for all final requirements.

Part 2 Termination Hardware

A. General

1. All conductors or strands shall be terminated. No cables shall have unterminated elements.

2. Consult with the University and the OIT Representative for all final requirements.

B. Multipair Copper UTP

1. Do not untwist conductors more than 1/2 inch (12 mm) at the termination to maintain cable performance.

2. UTP backbone cable connecting the ER to each TR shall be terminated using wall mount 66 style blocks.

   a. 4 pair category 6 UTP tie cables shall extend the backbone to patch panel ports in the rack.

C. Fiber Optic System

1. All fiber optic cables shall be terminated with “SC” “LC” connectors on both ends.

2. Rackmount fiber optic enclosures and cable must be labeled in accordance with the University’s labeling conventions.

3. Rackmount fiber optic enclosures shall be in the topmost position of the rack.

4. Minimum size of the rackmount enclosure is 3U.

5. Fiber cable in the enclosure shall be dressed and supported as recommended by the manufacturer.

6. Consult with the University and the OIT Representative for all final requirements.

End of Section

Section 27 15 00 – Communications Horizontal Cabling

Part 1 Horizontal Cabling Infrastructure

A. General

1. The horizontal cable must be listed and marked verifying that it meets the jacket flame rating necessary for the installation environment.

2. All horizontal cabling shall follow predetermined communication pathways and be supported throughout cable run.

3. All cabling infrastructure shall be field tested, post installation, to requirements set forth by the ANSI/TIA-568 standards.

B. Horizontal UTP Voice and Data Cabling

1. To ensure the IP based system Performance within these Facilities, the University will follow the recommendations set forth by the foundational ANSI/TIA-4966 standard and BICSI TDMM documents.

2. The preferred manufacturer for UTP horizontal cabling is Belden.

3. To maintain consistent with industry best practices for education facilities, the following performance guidelines outlined in the ANSI/TIA-4966 standard shall apply:

    a. Category 6 unshielded twisted pair cable shall be the minimum performance specification for horizontal copper media where systems are compatible or adaptable to UTP cabling infrastructure.

    b. Category 6A unshielded twisted pair cable shall be the minimum performance specification for horizontal copper media for wireless access point locations.

    c. All copper termination apparatus and patch cords shall match the performance of the horizontal cabling.

    d. OM4 fiber shall be the minimum performance specification for fiber optic media for all inter and intrabuilding backbone and tie cable applications.

    e. OS2 fiber shall be implemented where distances exceed backbone application speeds or to meet future performance requirements.

4. Flame rating of cable shall be color coded for identification.

    a. Plenum cable shall be Yellow

    b. Non-plenum cable shall be Blue. Use of non-plenum cable requires approval from the OIT Representative.

    c. Consult with the OIT Representative for discrepancies in existing installations.

5. All Ethernet based systems shall conform to this standard. If analog and proprietary systems can be adapted to the twisted pair cabling infrastructure defined in this document, they should be implemented as such.

6. Cables shall be neatly bundled using Velcro in groups no larger than 48 cables.

7. Service loops shall be required at both ends of the cable and supported by an appropriately installed J-hook.

    a. 10 feet located above the WAO

    b. 10 feet at the TR location, location to be determined by OIT Representative.

    c. Service loops shall be secured to J-hook with a hook and loop tie.

8. If there is a use for power injection on a data cable, the hardware for such will be mounted on the wall of the TR at a location to be specified by the OIT Representative.

C. Horizontal Fiber Optic Cable

1. The preferred manufacturer of horizontal fiber optic cabling and TR termination hardware is Corning Optical Communications.

2. Indoor fiber optic cable shall be tight-buffer construction with an interlocking armored jacket.

3. 12-strand or less, singlemode, OS2 fiber or OM4 multimode fiber shall be installed as determined by the OIT Representative.

4. See project documents for final fiber optic transmission performance and strand count.

5. Jacket color shall be aqua for multimode and yellow for singlemode applications.

6. Service loops shall be required at both ends of the cable and supported appropriately.

7. Metallic armor shall be bonded and grounded to the telecommunications grounding system as defined in section 27 05 26, Grounding and Bonding for Communications Systems.

8. Consult with the OIT Representative for all final requirements.

Part 2 Termination Hardware

A. UTP

1. General

   a. The preferred manufacturer for termination hardware and associated products shall be Panduit.

   b. The CIP shall provide all identification and labeling in accordance with the University's labeling schema.

   c. All RJ-45 modular style jacks will terminate with the T568B wiring scheme at both the workstation and TR.

   d. Jack category of performance shall match the horizontal cable to insure the highest end to end performance.

2. TR

   a. Backbone

      i. Siemon is the preferred manufacturer for all copper backbone direct termination hardware.

      ii. All high pair-count copper cabling shall terminate on wall mount 66 blocks.

      iii. 4 pair category 6 cable shall terminate on the cross connect side of the 66 block and extend the connections to the rack mount patch panels in the main cross connect for WAO activation. See the following diagram.

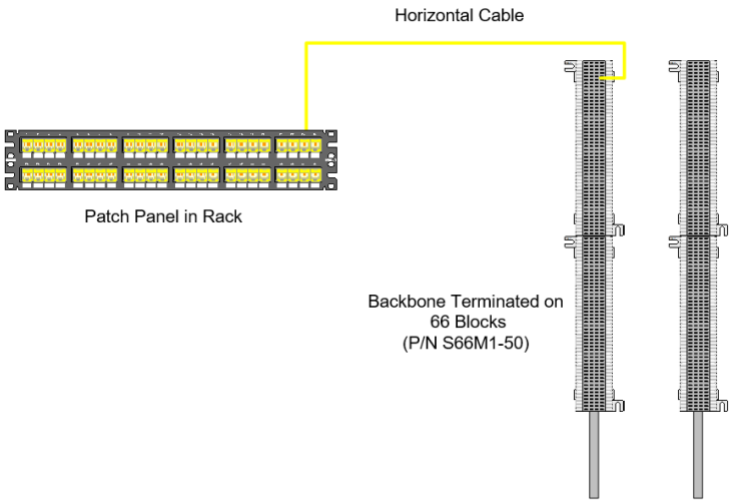

Figure 12: Diagram of copper backbone direct termination hardware showing showing the location of patch panels, backbone terminals, and horizontal cables.

b. WAO horizontal cable

i. All horizontal cabling in the TR shall terminate onto modular RJ-45 jacks and be mounted in modular patch panels.

ii. Horizontal cable managers shall be placed between each patch panel with an additional horizontal manager above and below the stack of patch panels.

3. Work area outlets

a. One cable drop shall be installed in each work area faceplate unless otherwise designated.

b. Faceplates and surface mount boxes shall be of a minimum size necessary to accommodate the number of cable drops installed at the work area outlet.

c. All WAO shall match the standard color scheme (Off White) unless otherwise specified by the OIT Representative

d. Minimum Wiring requirement:

i. Office – 1 data wire per office occupant

ii. Conference Room – 1 data wire

iii. Huddle Rooms – no data wiring is required

iv. Bull pen/Cubicles – no wiring is required

v. Classrooms – 3 wires in support of A/V

vi. Lounges – no wiring is required

vii. Copiers/Faxes – 1 data wire per copier/fax

viii. Common Area Phones – 1 data wire per phone

4. Ceiling WAO

a. Ceiling WAO will terminate above the ceiling to provide service for wireless access points, projectors and surveillance cameras.

b. A 15-foot service loop shall be left in the horizontal run and supported by a J-hook at the WAO location. The J-hook shall follow all University guidelines for mounting.

c. One cable drop (one wire) shall be installed in the surface mount WAO for surveillance camera locations.

d. Minimum Wiring Requirement for Wireless Access Points (WAP):

i. General: One 1 data wire per location, with a 50’ service loop when possible

ii. Conference Room: 1 WAP drop per 25 occupants (or fraction thereof)

iii. Classroom: 1 WAP drop per 25 occupants (or fraction thereof)

iv. Bull pen/Cubicles – 1 WAP to support each 25 people (round up) and no more than 30’ apart

v. Offices – WAPs should not be located inside offices, but should have one within 30’

vi. Hallways/Lounges – The entire space must be within 30’ of a WAP

5. Wall mount telephones

   a. Utilize a single port 8-pin, 8- conductor RJ-45 category 6 blue jack mounted at 54” AFF.

B. Fiber Optic

1. The preferred manufacturer of fiber optic horizontal termination hardware at the WAO is Panduit.

2. The preferred manufacturer of fiber optic horizontal termination hardware at the TR is Corning Optical Communications.

3. All fiber optic cables shall be terminated with “LC” connectors on both ends, utilizing fusion splice termination with factory polished connectors.

4. Rackmount fiber optic enclosures and cable must be labeled in accordance with the University’s labeling conventions.

5. Rackmount fiber optic enclosures shall be in the top most position of the rack.

6. Minimum size of the rackmount enclosure is 3U.

7. Fiber cable in the enclosure shall be dressed and supported as recommended by the manufacturer.

8. Consult with the OIT Representative for all final requirements.

C. Copper Patch Cords

1. The preferred manufacturer of Cat 6 patch cords is Panduit.

2. 4-pair patch cords shall be utilized for all network connections including VoIP telephones. Patch cords shall be by the same manufacturer and performance Category as cable and connectivity to ensure the highest end-to-end performance.

3. All patch cords utilized will have a blue jacket unless otherwise specified by the OIT Representative.

4. No field terminated patch cords will be accepted.

5. TR/ER Data Cords on new construction will be provided by the CIP and will be Panduit 1' blue-jacketed Cat 6 cables unless otherwise specified by the OIT Representative.

6. Workstation Data Cords on new construction will be provided by the CIP and will be Panduit blue-jacketed Cat 6 cables in the appropriate lengths and quantity to support the wiring infrastructure unless otherwise specified by the OIT Representative.

Part 3 Testing

A. General

1. All twisted pair cable must be tested by the installer to the latest industry standards (ANSI/TIA-568) to be compliant with performance specifications.

2. All fiber optic cable must be tested to the latest industry standards (ANSI/TIA-568 and TIA-526-14-B).

3. All test results must be included in the “As-Built” documentation and provided to the OIT Representative in an electronic format (PDF).

B. UTP Copper Horizontal Cable Testing

1. Certification of the UTP horizontal wiring system shall be performed and documented by the CIP.

2. The test to be run must be the most current standard parameters ANSI/TIA-568 for 100 ohm UTP, 4-pair cable.

3. Test parameters shall include: wire map, length, attenuation, near-end-cross-talk (NEXT), power sum near end cross talk (PSNEXT), far-end-cross-talk (FEXT), power sum ELFEXT (PSELFEXT), ACR, resistance, propagation delay, delay skew and headroom.

4. Test result printout shall show each cable tested shall be displayed on a single sheet of the report. The first page of the report shall be a report summary of all test results indicating the following: cable ID, time/date of test, longest pair length and pass/fail.

C. Fiber Optic Backbone Cable Testing

1. Optical power loss shall be tested and recorded on all fiber strands per ANSI/TIA-568

2. If Multimode fiber is used, the strands shall be tested bi-directionally for 850nm and 1300nm wavelengths.

3. Single mode fiber strands shall be tested bi-directionally for 1310nm and 1550nm wavelengths.

4. All multimode fiber testing methods shall comply with TIA-526-14-B.

5. Losses for OM4 fiber

    a. Maximum power loss budget for OM4 fiber runs is 3.75dB/km @ 850 MHz and 1.5db/km @ 1300 MHz.

    b. Maximum insertion loss for LC connectors is 0.75dB per mated pair.

6. Losses for SM fiber

    a. Maximum power loss budget: 1db/km @ 1310nm and 1550nm.

    b. Maximum insertion loss for LC connectors is 0.75 dB per mated pair.

D. Approved Test Equipment

1. Level IIIe test equipment or better is required. The CIP shall provide documentation of latest software upgrades and factory calibrations. The CIP is required to get written authorization to use test equipment that is not listed as approved.

E. Test Result Submittals

1. The CIP shall submit via electronic media all UTP and fiber cable test results/summary report in .txt or .doc format.

End of Section

Appendix A

Part 1 Approved Materials

Part Number	Description
Belden	
3613	Enhanced Category 6, Plenum Cable, 1000' spool
Chatsworth	
10250-712	Universal Cable Runway, 10' length, 12" width (black)
10595-712	Channel Rack-To-Runway Mounting Plate, 3" (black)
11374-703	Single-Sided Wide Vertical Cabling Section (black)
11583-519	Flush Mounted Wall Bracket (clear), 4RU
55053-703	Standard Rack, 7' x 19" (black)
Corning	
CCH-04U	4RU Rack Mount Enclosure, holds 12 CCH connector panels (bulkheads)
WCH-12P	Wall Mount Enclosure, holds 12 CCH connector panels (bulkheads)
CCH-CP06-E4	CCH Connector Panel, Multi-Mode (OM3/4) (50 micron) (aqua housing) 3 LC duplex adapters (6ea), ceramic insert, composite housing
CCH-CP12-E4	CCH Connector Panel, Multi-Mode (OM3/4) (50 micron) (aqua housing) 6 LC duplex adapters (12ea), ceramic insert, composite housing
CCH-CP24-E4	CCH Connector Panel, Multi-Mode (OM3/4) (50 micron) (aqua housing) 12 LC duplex adapters (24ea), ceramic insert, composite housing
040402R5820003F	LC-LC 2.0MM PLENUM OFNP 3FT PATCH CORD
040402R5820006F	LC-LC 2.0MM PLENUM OFNP 6FT PATCH CORD
040402R5820009F	LC-LC 2.0MM PLENUM OFNP 9FT PATCH CORD
040402R5820012F	LC-LC 2.0MM PLENUM OFNP 12FT PATCH CORD
040402R5820015F	LC-LC 2.0MM PLENUM OFNP 15FT PATCH CORD
040402R5820018F	LC-LC 2.0MM PLENUM OFNP 18FT PATCH CORD
040402R5820021F	LC-LC 2.0MM PLENUM OFNP 21FT PATCH CORD
047202R5820003F	LC-SC 2.0MM PLENUM OFNP 3FT PATCH CORD
047202R5820006F	LC-SC 2.0MM PLENUM OFNP 6FT PATCH CORD
047202R5820009F	LC-SC 2.0MM PLENUM OFNP 9FT PATCH CORD
047202R5820012F	LC-SC 2.0MM PLENUM OFNP 12FT PATCH CORD
047202R5820015F	LC-SC 2.0MM PLENUM OFNP 15FT PATCH CORD
047202R5820018F	LC-SC 2.0MM PLENUM OFNP 18FT PATCH CORD
047202R5820021F	LC-SC 2.0MM PLENUM OFNP 21FT PATCH CORD
727202R5820003F	SC-SC 3FT PATCH CORD
727202R5820006F	SC-SC 6FT PATCH CORD
727202R5820009F	SC-SC 9FT PATCH CORD
727202R5820012F	SC-SC 12FT PATCH CORD
727202R5820015F	SC-SC 15FT PATCH CORD
727202R5820018F	SC-SC 18FT PATCH CORD

Part Number	Description
727202R5820021F	SC-SC 21FT PATCH CORD
050502T5820003F	LC-LC 3FT PATCH CORD
050502T5820006F	LC-LC 6FT PATCH CORD
050502T5820009F	LC-LC 9FT PATCH CORD
050502T5820012F	LC-LC 12FT PATCH CORD
050502T5820015F	LC-LC 15FT PATCH CORD
050502T5820018F	LC-LC 18FT PATCH CORD
050502T5820021F	LC-LC 21FT PATCH CORD
055702T5820003F	LC-SC 3FT PATCH CORD
055702T5820006F	LC-SC 6FT PATCH CORD
055702T5820009F	LC-SC 9FT PATCH CORD
055702T5820012F	LC-SC 12FT PATCH CORD
055702T5820015F	LC-SC 15FT PATCH CORD
055702T5820018F	LC-SC 18FT PATCH CORD
055702T5820021F	LC-SC 21FT PATCH CORD
575702T5820003F	SC-SC 3FT PATCH CORD
575702T5820006F	SC-SC 6FT PATCH CORD
575702T5820009F	SC-SC 9FT PATCH CORD
575702T5820012F	SC-SC 12FT PATCH CORD
575702T5820015F	SC-SC 15FT PATCH CORD
575702T5820018F	SC-SC 18FT PATCH CORD
575702T5820021F	SC-SC 21FT PATCH CORD
Erico	
MPLS	Single Gang Wall Mount Bracket
MPLS2	Double Gang Wall Mount Bracket
CAT32HPBCB	J-Hook with beam clamp
CAT32HP4Z34	J-Hook with spring clamp
CAT425	Adjustable Cable Support for horizontal surface (Caddy Bag)
CAT425WM	Adjustable Cable Support for vertical surface (Caddy Bag) ***(sold as a bag of 10)
CAT600R	Strut Mount Support
CAT600WM	Wall Mount Support
Panduit	
CJ688TPBU	TX Style Cat 6 Modular Jack (blue)
CPP24WBLY	Mini-Com Modular Patch Panel, 24 port (black) with CFFP4 style snap-in faceplates
CPP48WBLY	Mini-Com Modular Patch Panel, 48 port (black) with CFFP4 style snap-in faceplates
WMPV22E	NetRunner Vertical Cable Management, front/back, 22 RU (black)
WMPVHC45E	NetRunner Vertical Cable Management - High Capacity, front/back, 45 RU (black)
WMPV45E	NetRunner Vertical Cable Management, front/back, 45 RU (black)
WMPVCBE	NetRunner Center Mount Bracket Kit

Part Number	Description
UTPSP1BUY	Cat 6 24 AWG UTP Copper Patch Cable, 1 ft, Blue
HLS-15R0	Velcro, 15' roll (black)
GB2B0306TPI-1	Telecommunications Grounding Busbar, 1/4" X 2" X 12"
Siemon	
M2-5T-128LR-TP	66-50 style Punch Down block, pre-wired to RJ-45, T568A pin-out (white)
M1-50	66-Punch Down Block (white)
S-89B	66-Block Wall Mount Bracket (white)
Specified Tech Inc	
SSB24	Fire Stop Pillow, 2"x4"x9"
Assorted Copper Patch Cables	
	Cat 6 Patch Cable with non-booted ends (assorted colors) 3'
	Cat 6 Patch Cable with non-booted ends (assorted colors) 5'
	Cat 6 Patch Cable with non-booted ends (assorted colors) 7'
	Cat 6 Patch Cable with non-booted ends (assorted colors) 10'
	Cat 6 Patch Cable with non-booted ends (assorted colors) 14'
	Cat 6 Patch Cable with non-booted ends (assorted colors) 25'
	Cat 6 Patch Cable with non-booted ends (assorted colors) 40'
	Cat 6 Patch Cable with non-booted ends (assorted colors) 100'
MDF/IDF UPS - APC	
SMX1500RM2UCNC	Smart-UPS X 1500 Rack mount, 2 RU – Network manageable (NMC module)
SMX48RMBP2U	External battery Pack, Rack/Tower 2 RU

End of Document