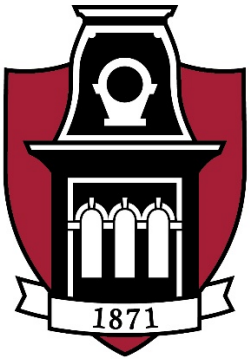

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Communications Infrastructure Specification

This document defines the communications installation guidelines for the University of Arkansas.

Revision Information
Revision Number: Rev 2.2
Issue Date: 02/16/2018

The following information is a guideline relating to the communication systems installation for the University of Arkansas referred herein as the “University”. This Communications Infrastructure Specification is comprised of industry standards, University standards and associated typical drawings. This document describes cabling systems components, installation requirements and services associated with the University’s communication 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 follow the project specific document, which would be informed by this document.

NOTE: The primary purpose of this document is to provide the minimum communications infrastructure standard requirements for all University 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 component references shall be incorporated into the revisions along with any changes in administration and installation of said technologies.

Table of Contents

Part 1 - Purpose of this Document

A. The intention of the University by implementing this document is to insure the consistent performance, quality of product and installation of the structured cabling system throughout each facility.

B. To insure the performance for educational facilities, the University will follow the recommendation set forth by the ANSI/TIA-4966 Telecommunications Infrastructure Standard for Educational Facilities and its referenced documents.

C. To insure the Standard of Quality and Performance of products, a single manufacturer of structured cabling products will be used for all University facilities. The cabling infrastructure shall be warrantied by the manufacturer under a performance warranty and guarantee.

D. This specification applies to the broadest of University facilities, both new construction and renovations. **While deviations from this document may be appropriate in some situations, they should be exceptional. Contact the IT Services Network Enterprise Systems Team (NEST) for clear guidance to a resolution.**

Part 2 - Roles and Responsibilities

2.1 IT Services

A. Supports and maintains the University of Arkansas data networks, including all wired and wireless access on a 24/7/365 basis.

B. Provides network designs for a project when CAD drawings have been released. The design will include specifications and installation instructions for architects, engineers, and contractors for all low-voltage cabling and its uses. Input will be required by building client to determine particulars of use cases that will inform ultimate design schematics.

C. Manage project from technical perspective to ensure successful implementation of network services after construction activities have completed.

D. Procures, configures and installs and network-related electronics, equipment, and other accessories including copper and fiber patch cables, uninterruptible power supplies, remote-site Internet connections, power distribution units, point-to-point link antennas, optical transceivers, network switches, routers, security appliances, access points and all associated support contracts.

2.2 Contractor/Architect

A. Determine project programming by reviewing client (occupant) expectations for space. This is information that the network team can't, or shouldn't dictate on behalf of the client. It may be the responsibility of the architect to capture space use case data.

B. Provides services to facilitate successful network services installation and performance.

C. Adheres to and installs infrastructure based on provided network design program unless otherwise negotiated.

D. Procures and installs infrastructure copper and fiber cables and associated connector components, patch panels, LIUs, race ways, 2- or 4-post racks or lockable wall-mounted enclosures, rack grounding components, access point brackets (provided), ladder or basket trays, surface-mount raceway, wall-plates and point-to-point antenna mounting poles and guy-wires.

Part 3 - Recognized Reference Documents and Abbreviations

3.1 Standards and Codes

The following Standards and code documents will be recognized as references for acceptable installation of the structured cabling system. Active knowledge of these documents is strongly recommended for the communications installer. All listed codes will be the latest adopted versions by the state of Arkansas. This document shall not supersede the Facilities Management A&E Guide in areas not related to telecommunications systems.

A. NEC-2008, National Electric Code
B. BICSI TDMM, Telecommunications Distribution Methods Manual
C. ANSI/ICEA S-83-596, Fiber Optic Premises Distribution Cable
D. ANSI/TIA-4966, Telecommunications Infrastructure Standard for Education Facilities
E. ANSI/TIA 568-C, Commercial Building Telecommunications Cabling Standard
F. ANSI/TIA 606-A, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
G. TIA-526-14-B: Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
H. ANSI-J-STD-607-B, Commercial Building Grounding and Bonding Requirements for Telecommunications
I. ANSI/TIA-758 A 2004, Customer-owned Outside Plant Telecommunications Cabling Standard
J. ANSI/TIA-569-C, Commercial Building Standard for Telecommunications Pathways and Spaces
K. ANSI/IEEE, National Electrical Safety Code
L. ANSI/NFPA, National Electric Code
M. ANSI/NFPA, Standard for the Protection of Information Technology Equipment
N. NFPA/NESC, National Electrical Safety Code
O. NFPA 101, Life Safety Code
P. Telcordia GR-63, NEBS™ Requirements: Physical Protection
Q. Telcordia GR-1089, Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment
R. BICSI TDMM, Telecommunications Distribution Methods Manual

3.2 Abbreviations

A. AFF – Above Finished Floor
B. BEP – Building Entrance Protection
C. BICSI – Building Industry Consulting Service International
D. CBB – Common Bonding Backbone, an unbroken continuous copper grounding conductor
E. Demarc – Point of demarcation, where provider hands off to customer network
F. EC – Electrical Contractor
G. EF – Entrance Facility
H. ER – Equipment Room, aka MDF – Main Distribution Frame
I. GC – General Contractor or Building Landlord
J. HTAP – Half Tap, compression style connector used to bond two or more conductors
K. ITS – Information Technology Systems
L. LIU – Lightguide Interconnect Units

M. MC – Mechanical Contractor
N. N – Need or requirement
O. N+1 – Need plus one additional element for redundancy
P. NEST – Network Enterprise Systems Team
Q. NIC – Not in Contract
R. NET-POP – Network Point of Presence or Provider Demarcation Point
S. OM4 – Optical Multi-mode type 4, 50 Micron Laser Optimized Multimode Fiber
T. OS2 – Optical Single-mode type 2, zero water peak to allow for additional wavelengths
U. POTS – Plain Old Telephone Service, analog phone line
V. RCDD – Registered Communications Distribution Designer
W. SCS – Structured Cabling System
X. SMB – Surface Mount Box, houses telecommunication jacks
Y. TBB – Telecommunications Bonding Backbone
Z. TC – Telecommunications Contractor
AA. TGB – Telecommunications Grounding Busbar
BB. TI – Telecommunications Installer
CC. TMGB – Telecommunications Main Grounding Busbar
DD. TO – Telecommunications Outlet, one cable terminated with one jack
EE. TR – Telecommunications Room aka IDF - Intermediate Distribution Frame
FF. UTP – Unshielded Twisted Pair cable
GG. UPS – Uninterruptible Power Supply
HH. WA – Work Area
II. WO – Work-area Outlet, designated TOs in the same faceplate or surface mount box

Part 4 - Performance and General Design

4.1 Cable Media Performance

A. To maintain consistency with the ANSI/TIA-4966 the following shall apply:
   1. Category 6A UTP will be the media of choice for horizontal copper cabling applications.
   2. OM4 Laser Optimized Multi-Mode fiber and OS2 Single-Mode fiber will be the media of choice for backbone fiber optic cabling applications.

B. SCS General Design Considerations
   1. The distance and system performance requirement will determine type of media to be used as defined in the project requirements.
   2. All SCS distribution will adhere to a hierarchical star wiring topology as recommended by TIA standards. Topology shown in Fig 3.3.1.B.2 below.

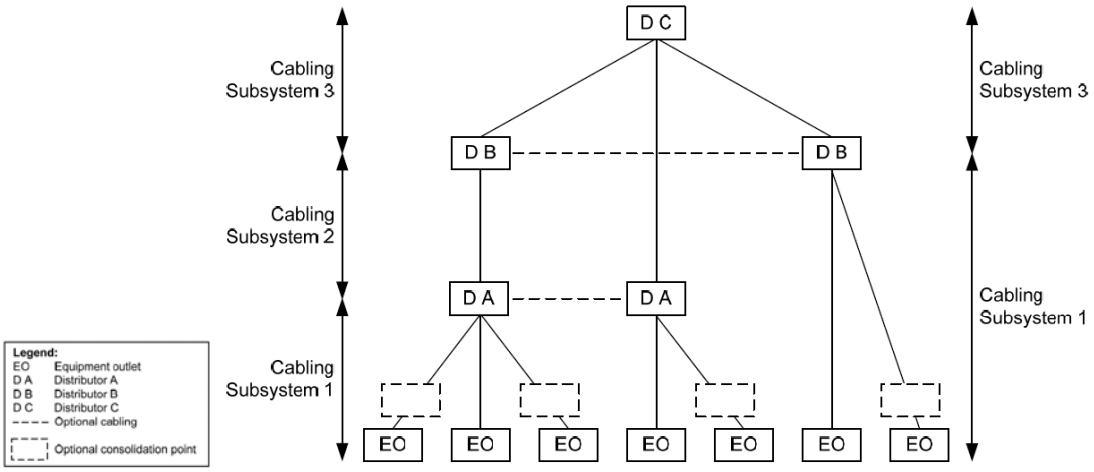

Cabling Subsystem 3
Cabling Subsystem 2
Cabling Subsystem 1
D C
D B
D B
D A
D A
EO
EO
EO
EO
EO
EO
EO
Cabling Subsystem 3
Cabling Subsystem 1
Legend:
EO Equipment outlet
D A Distributor A
D B Distributor B
D C Distributor C
Optional cabling
Optional consolidation point

Fig 3.1.B.2

3. There shall be no more than 2 distribution points between the TO and ER.

Part 5 - Telecommunications Contractor Requirements

5.1 Contractor Qualifications

A. The TC must be certified in the manufacturer solution provided and in good standing with that manufacturer for warranty purposes.

B. The TC must be able to offer and support the required manufacturer's system warranty.

C. The TC shall also employ a BICSI certified RCDD and installers with BICSI ITS certification credentials.

Part 6 - Telecommunications Grounding and Bonding

6.1 Building Entrance Protection

A. BEP for copper cabling shall be installed according to NEC code.

B. The BEP shall consist of a building entrance terminal utilizing a two (2) foot fuse 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, equipped with 240-volt solid state protector modules. Provide sufficient protector modules to completely populate all building entrance terminals.

6.2 Grounding

A. Grounding shall conform to ANSI-J-STD-607-C, NEC code and manufacturer's grounding requirements as minimum. A PBB shall be located at the service entrance. A SBB shall be located in each telecommunications space. The SBB will be grounded/earthed to the PBB.

B. The PBB shall be bonded to building steel and grounded/earthed to the electrical service ground according to ANSI-J-STD-607-C guidelines. Each SBB shall be bonded to building steel and the electrical panel serving equipment in the telecommunications space. See Figure 5.2.B below.

Figure 5.2.B

C. The Telecommunications Bonding Backbone (TBB) shall be continuous without breaks. Refer to Table 5.5.2.C for conductor sizing of the TBB.

Sizing of the TBB	
TBB Length in Linear meters (feet)	TBB Size AWG
Less than 4 (13)	6 (13mm²)
4-6 (14-20)	4 (21mm²)
6-8 (21-26)	3 (26mm²)
8-10 (27-33)	2 (33mm²)
10-13 (34-41)	1 (42mm²)
13-16 (42-52)	1/0 (53mm²)
16-20 (53-66)	2/0 (67mm²)
20-26 (67-84)	3/0 (85mm²)
26-32 (85-105)	4/0 (107mm^2)
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

Table 5.2.C

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

E. 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.C for sizing of conductor.

F. The TMGB and TGB installed in the ER and TR shall be 12 inches long and 4 inches wide by ¼" thick with pre drilled EIA bolt hole sizing and spacing.

6.3 Bonding

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

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

C. The electrical contractor must provide access to a bonding connection at the electrical service ground during new construction (NEC 250-71(b)). A Primary Bonding Busbar (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.

D. All conduits terminating to cable trays, wire ways and racks shall be mechanically fastened. When connected to a cable tray or rack it 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 5.2.C for sizing of conductor.

Part 7 - Telecommunication Pathways

7.1 Cable Pathways

A. All SCS support systems shall be independent of other trades and contain only Class 2 communications cabling. Pathways shall have at least 18" of clearance from any RFI/EMI sources including any electric motors, transformers or lighting fixtures. All support systems shall be installed according to manufacturer's recommendations.

B. Cable Tray in Hallways and Main Runs– cable tray is the preferred pathway method and shall be a minimum of 12" x 4" basket style tray but sized to serve the cabling requirements of the area served. It shall provide a continuous main pathway located above corridors and permanent fire exit routes. If supported by threaded rod in a trapeze configuration, the threaded rod shall be covered with a protective sleeve where it may come in contact with the SCS. The cable tray shall be supported a minimum of every 5'.

C. Cable Tray in Telecommunication Spaces – cable tray is the preferred pathway method and shall be a minimum of 12" ladder type tray, providing a continuous pathway from space entry to the telecommunications rack. It shall attach and provide rigidity to the top of the free standing relay racks. If supported by threaded rod in a trapeze configuration, the threaded rod shall be covered with a protective sleeve where it may come in contact with the SCS. The cable tray shall be supported a minimum of every 5'.

D. J-Hooks – drop offs from the tray to the telecommunications outlet shall use J-hooks and shall be spaced no further than 5' apart and have a cable securing mechanism. J-hooks can be attached to walls, metal building framework or independent hanger systems. They shall not use existing ceiling grid wire or other trades support systems.

7.2 Metallic conduit

A. Although not preferred for main runs due to size restriction, conduit may be used where access to tray is restricted for SCS installation.

B. Conduit can be an extension of the cable tray but shall maintain the cable capacity of the tray.

C. Metallic conduit may be used at work area outlets where hollow wall exists or planned. The minimum size for this conduit shall be 1" trade size or larger based upon number of cable drops. The conduit shall terminate in a double gang electrical box with a reducer to accommodate a single gang telecommunications faceplate.

Part 8 - Telecommunication Spaces

8.1 General Requirements

A. New construction telecommunications spaces will be single use, contain no other equipment and will be keyed to the University standard.

B. Renovated telecommunications spaces include a variety of rooms and locations that are used to interact with telecommunications equipment and are a location for the placement, termination and interconnection of cabling and telecommunications equipment. These rooms may be a combination of spaces including:

1. Telecommunications room
2. Equipment room
3. Entrance room or space
4. Access provider space
5. Service provider space

C. A minimum of one wall shall be covered with 19 mm (3/4 in) plywood. The backboard shall be 1.2 m (4 ft.) x 2.4 m (8 ft.) sheets, mounted vertically with the bottom of the plywood mounted 150 mm (6 in.) AFF. Plywood shall be fire treated A/C grade with the A side facing toward the room. A defined pathway shall be in place

D. Floors, walls and ceiling shall not be left unfinished to prevent dust buildup.

E. Minimum clear height in the space shall be 2.4m (8ft) without obstructions. The height between the finished floor and the lowest point of ceiling should be a minimum of 3 m (10 ft.).

F. The space should be located in an accessible area such as access from a common hallway or corridor.

G. Pathways leading into the space shall be accessible for cable installation from a common hallway or corridor.

H. All metallic elements in the space shall be bonded to the telecommunications grounding system. This includes but not limited to cable tray, relay racks and cabinets. See Telecommunications Grounding for more detail.

8.2 Lighting

A. Lighting should be maintained at 500 lux measured at 1 m (3 ft.) AFF in the front and rear of telecommunications racks.

B. The lighting shall be controlled by switch located immediately inside the door.

C. Emergency lighting and signs shall be properly placed per AHJ such that an absence of primary lighting will not hamper emergency exit.

8.3 Telecommunications Room

A. Free standing two-post relay racks are the preferred method for mounting communications hardware and equipment. The rack shall be a 7' tall x 19" wide vertical mounting rails with an EIA hole pattern. The vertical mounting rails shall be at least 6" deep for rigidity.

B. Racks shall be numbered sequentially, facing the front of the rack from left to right. See Appendix A, Typical Rack drawings for clarification.

C. Where room restrictions warrant a wall mounted rack or cabinet, it shall be mounted on a 19 mm (3/4 in.) plywood backboard. The backboard shall be 1.2 m (4 ft.) x 2.4 m (8 ft.) sheets, mounted vertically with the bottom of the plywood mounted 150 mm (6 in.) AFF. Plywood shall be fire treated A/C grade with the A side facing toward the room. The wall mounted rack shall be swingable for rear accessibility to cable terminations.

D. Rack cable managers

1. Cable managers include rack mounted vertical and horizontal pathways for both the static horizontal cable and patch cord management.
2. All cable managers shall provide cable pathway in the front and rear of the rack.
3. All cable managers shall be sized for the full capacity of their purpose, vertical for patch cord slack management and horizontal for routing cords away from ports.
4. Where angled patch panels are used horizontal cable managers will not be necessary.
5. Flat patch panels will require horizontal cable managers above and below patch panels for adequate cable management. See Appendix A, Sample Rack Elevation for reference.

8.4 Construction and Buildout

A. Door shall be minimally 0.9 m (36 in.) wide and 2 m (80 in.) high, with no doorsill, hinged to open outward (code permitting).

B. Floor loading must be a minimum of 100 lb. per square feet

C. All conduits/coring should be kept 150 mm (6 in.) or less from walls whenever construction permits.

1. All cores should be in single row.
2. All cores should be kept in same proximity in stacked TRs.

D. No communications room can have any wet pipes within the room's interior space, routing horizontally on the floor directly above the room, or within the floor slab. This does not include fire suppression required for the space.

E. Doors should lock from outside access, exiting from rooms must always be permissible.

F. Access control for doors shall be furnished and shall be a part of the base building access control system.

G. Backbone riser cable access into communication rooms shall be via four-inch (4 in.) conduit or sleeved cores. A minimum of 3 four-inch conduits/cores shall feed each communications room. The amount 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.

H. There should be, at a minimum, one duplex convenience electrical outlet every 6 feet along the walls immediately to the left and right of the door for general-purpose use. All convenience outlets will be non-UPS power (utility).

I. All floor and wall penetrations must be fire stopped as described within this document and shall meet applicable code.

8.5 Sizing Telecommunications Spaces

A. Sizing of telecommunications spaces are minimum known requirements for cabling infrastructure and equipment. Final room size will be impacted by cabling density and special requirements set forth by the University. The ITS NEST will coordinate with Architect and provide final room size and location requirements.

B. Equipment Room (ER)

1. The ER shall be a minimum size of 14 m^2 (150 ft^2) and no wall shall be less than 3 m (10 ft) long. The space surrounding the ER shall be designated for future growth of the ER, up to twice the existing space. This can be storage space that can be later commissioned for this purpose.

C. Telecommunications Room (TR) will be determined by the number of telecommunication outlets served. See table 7.5.D below.

Equipment Outlets Served	Minimum Floor space m^2 (ft^2)
Up to 200	14 (150)
201 to 800	37 (400)
801 to 1600	74 (800)
1601 to 2400	111 (1200)

Table 7.5.D

8.6 Environmental Control

A. HVAC should be designed to maintain a room temperature of 68 to 72 degrees with the full complement of equipment in the room.

B. HVAC systems should not be mounted about the network rack or enclosure.

8.7 Electrical

A. ER Equipment rack will be required to have the following.

1. One 120 volts 20 amp NEMA 5-20R dedicated double duplex receptacle mounted to the top of the rack. Circuit shall be on emergency generator power/UPS.
2. One 208 volts 30 amp NEMA L14-30P dedicated receptacle mounted to the bottom of the rack. Circuit shall be on emergency generator power only and provide feed for local 6 kVA UPS.

B. TR Equipment rack will be required to have the following.

1. One 120 volts 20 amp NEMA 5-20R dedicated double duplex receptacle mounted to the top of the rack. Circuit shall be on emergency generator power/UPS.
2. One 208 volts 30 amp NEMA L14-30P dedicated receptacle mounted to the bottom of the rack. Circuit shall be on emergency generator power only and provide feed for local 6 kVA UPS.

C. Final design and layout approval on number, type, and location of outlets shall be provided by ITS NEST.

D. 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. All convenience outlets will be non-UPS power (utility).

E. All electrical receptacles within the communication equipment room shall be labeled with source panel and circuit number.

8.8 Local UPS Power

A. ER local UPS shall be rack mounted, specified and installed by ITS NEST to maintain 20 minutes.

B. TR local UPS shall be rack mounted, specified and installed by ITS NEST to maintain 10 minutes.

8.9 Tag Plan

A. The 21” W x 15”H plan shall be a labeled “As-Built” plotted floor plan showing the TO locations throughout the area served by the TR/ER.

B. The tag plan shall be secured to the wall in each TR and ER as designated in Appendix A.

C. A clear plexiglass sheet 22” W x 19” H shall be secured to the plywood lined wall. Fastener locations shall be on the top and bottom only.

D. The tag plan shall slide behind the plexiglass from the left or right.

E. This plan shall be updated to reflect any move, add or change to the area served by the TR/ER.

F. See Appendix A, TAG Plan drawing for clarification.

Part 9 - Wall Penetrations Firestopping

9.1 General

A. All wall penetrations shall be fitted with the firestopping system as defined herein and be installed to meet the fire rating of wall.

B. All smoke and firewall penetration devices shall be of University standard and performance.

C. Cable tray systems shall not penetrate smoke or fire walls.

D. The capacity (quantity and size) of the firestopping system must at a minimum equal the capacity of the cable tray system.

E. If J-Hooks are used, the firestopping system capacity shall meet that of the J-Hooks.

F. Furnish and install all fire rated wiring devices and associated hardware as shown in Appendix A and as hereinafter specified.

9.2 Installation

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

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

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

D. All wall penetrations for cable shall be mechanically sound and maintain fire rating of wall. They shall be sleeved with a UL Certified system and be fully compliant with NFPA 101 Life Safety Code. The sleeved pathway shall not restrict cable capacity but shall meet the capacity of the cable tray or J-hook system.

Part 10 - Exceptions in Installation

10.1 Best Practices in Confined Spaces

A. Where existing obstructions or confined spaces restrict or impede the practices described in this document it is the responsibility of the installer to bring these conflicts, in writing, to the attention of the ITS NEST for clear guidance to a resolution.

B. The ITS NEST shall evaluate the situation and make recommendations based upon:

1. Performance of the system
2. Capacity restrictions
3. Future growth
4. Ease of serviceability

C. The corrective steps may include using metallic conduit for RFI/EMI avoidance, creating alternate paths or adjusting the size of the communications rack.

D. The ITS NEST will respond, in writing, recommendations on how to proceed.

E. These exceptions to the standards and best practices of the University shall be clearly noted in the as built documentation upon completion.

Part 11 - Horizontal Cabling Requirements

11.1 Work Area Voice and Data Connectivity Requirements

A. Jacks shall be of the same manufacturer as the horizontal cable to insure the highest end to end performance.

B. Data jacks shall be Cat 6A.

C. Four port single gang faceplates shall be used for all workstation outlets with the exception of wall mount telephones.

D. All jacks and faceplates shall be consistent throughout the facility.

E. Wall mount telephones shall utilize stainless steel plate with a single 8-pin, 8- conductor RJ-45 Cat 6 jack.

F. All jacks will be RJ-45 modular style at both workstation and communication room termination points utilizing the T568B wiring scheme.

11.2 Horizontal Voice/Data Transmission Media

A. Cable shall be Category 6A.

B. Cable shall be marked as either CMP or CMR rated as required by the space.

Part 12 - Termination Hardware

12.1 Jacks

A. All station cabling shall terminate into modular RJ-45 jacks and be housed in modular patch panels with deep cable strain relief bar. TC shall provide all identification and labeling as specified. Labeling must be in accordance with the University's labeling conventions.

12.2 Patch Panels

A. All patch panels shall be angled modular rack-mounted panels and have adequate horizontal cable support installed on the back side of the panel.

12.3 Patch Cords

A. 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.

12.4 Modular Furniture

A. Modular furniture shall not have outlets attached to the furniture.

B. Long work area cords shall extend from the wall outlet to each work area.

12.5 Access Points

A. Solid ceiling or industrial ceiling environments

1. A double-gang electrical box shall be used at access point locations.
2. A two port surface mount box (SMB) shall be used at access point locations.
3. The SMB shall be mounted on or within a few inches of the double-gang electrical box.

B. False ceiling environments
   1. A double-gang electrical box shall be used at access point locations.
   2. A two port surface mount box (SMB) shall be used at access point locations.
      a. The access point and SMB should be reasonably accessible by staff for maintenance and support for the lifetime of the facility.
   3. The box shall “float” above the ceiling for patching to the access point.

C. Outdoor Areas
   1. A double-gang electrical box shall be used at access point location on the inside of the facility.
   2. A two port surface mount box (SMB) shall be used at access point location.
   3. Flexible conduit should be used to protect the data cable from the penetration on the building to the environmentally hardened access point.

Part 13 - Patch Cables and Cross-Connect

13.1 Data

A. TR/ER Data Cords
   1. Patch cables shall be 4-pair cords, factory manufactured, tested and UL listed. Manufacturer and model number of patch cords must match the cable vendor system rating. The University shall identify port locations and quantities. The patch cords must provide the manufactures end-to-end solution and shall comply with the certification requirements.

B. Workstation
   1. Data workstation cords shall be 4-pair, factory manufactured, tested and UL listed. Manufacturer and model number of patch cords must match the cable vendor system rating. The University shall identify port locations and quantities. The patch cords must provide the manufactures end-to-end solution and shall comply with the certification requirements.

13.2 Voice

A. TR/ER cross-connect
   1. Voice cross-connect jumpers at the ER/TR will be performed by others

B. Workstation
   1. Voice Line Cords at the workstations furnished and installed by the University.

Part 14 - Identification and Administration

14.1 Labeling and Identification

A. All identifiers and labels shall conform to ANSI/TIA-606-B recommendations.

B. Work station identification at the faceplate will include "TR- Rack-Patch Panel-Port".
   1. Example: 202-1-2-1; TR 202-Rack 1-Patch Panel 2-Port 1.

C. All terminations shall be clearly identified at both ends with a permanent, self-adhering label.

D. All work area tags must match the patch panel tags identically. Include individual port labels at all faceplates at each individual port.

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

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

G. See Appendix A, Faceplate Detail drawing for labeling and configuration.

14.2 Administration

A. A tag plan shall be affixed to the wall in each TR and ER as designated in the Appendix A. The plan shall be a labeled “As-Built” floor plan showing outlet locations throughout the area served by the TR/ER.

Part 15 - Testing

15.1 Twisted Pair

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

15.2 Fiber Optic

A. All fiber optic cable must be tested to the latest industry standards (ANSI/TIA-568-D.3 and TIA-526-14-B).

15.3 Results

A. All test results must be included in the “As-Built” documentation.

15.4 UTP Copper Horizontal Cable Testing

A. Certification of the UTP horizontal wiring system shall be performed and documented by the TC.

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

C. 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.

D. 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.

15.5 Fiber Optic Backbone Cable Testing

A. Optical power loss shall be tested and recorded on all fiber strands per ANSI/TIA-568-D.3
B. Multimode fiber strand tested bi-directionally for 850nm and 1300nm wavelengths.
C. Single mode fiber strand tested bi-directionally for 1310nm and 1550nm wavelengths.
D. All multimode fiber testing methods shall comply with TIA-526-14-B.
E. Losses for OM3 fiber
    1. Maximum power loss budget for OM3 fiber is 3.75dB/km @ 850 nm and 1.5db/km @ 1300 nm.
    2. Maximum insertion loss for LC connectors is 0.75dB per mated pair.
F. Losses for SM fiber
    1. Maximum power loss budget: 1db/km @ 1310 nm and 1550 nm.
    2. Maximum insertion loss for LC connectors is 0.75 dB per mated pair.

15.6 Approved Test Equipment

A. Level IIIe test equipment is required. A standard of quality would include a Fluke DTX-1800 series or approved test equipment. The TC shall provide proof of latest software upgrades and factory calibrations. The TC is required to get written authorization to use test equipment that is not listed as approved.

15.7 Test Result Submittals

A. The TC shall submit (1) hard copy of all UTP and fiber cable test results/summary report and CD-ROM of test data in .txt or .doc format.

B. Manufacturer format is acceptable if the manufacturer's viewing software is included to review the test results.

Part 16 - Support and Warranty

16.1 General requirements

A. Comply with additional requirements in contract general requirements and extended warranties required in other specification sections. Refer to all other sections of this document for specific additional warranty requirements that exceed or are in addition to those of this section.

16.2 SCS Manufacturers Extended Warranty

A. SCS will be covered by a two-part certification program provided by a single manufacturer and that manufacturer's certified vendor. Manufacturer shall administer a follow on program through the Vendor to provide support and service to the purchaser. The first part is an assurance program, which provides that the certified system will support the applications for which it is designed, during the 20-year warranty of the certified system.

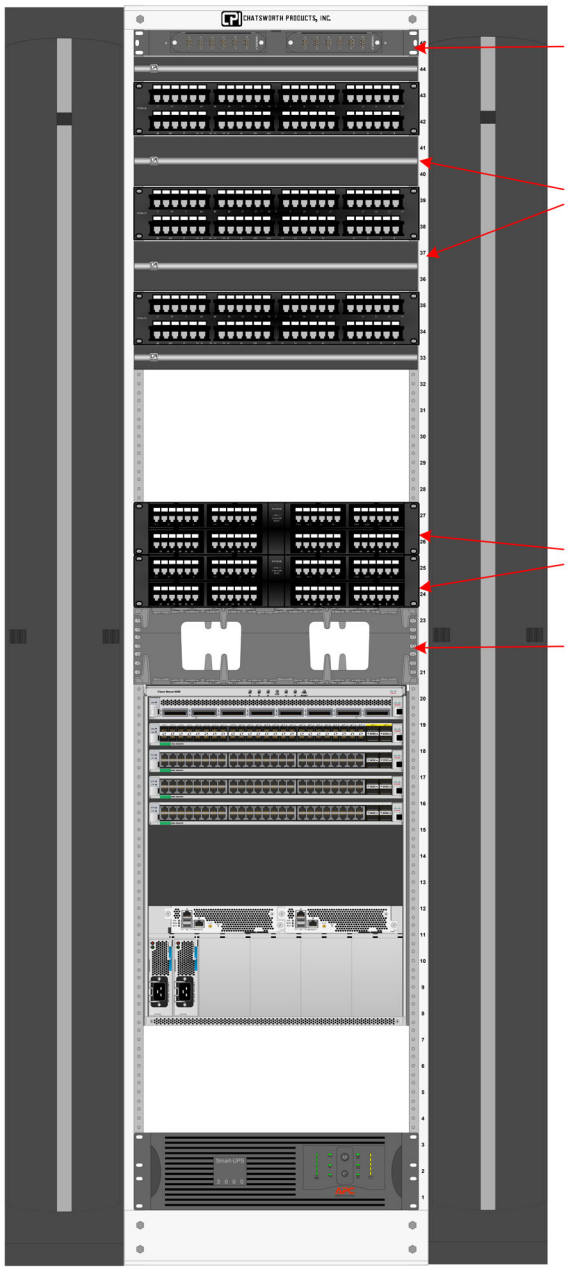
B. The second portion of the certification is a 20-year warranty provided by the manufacturer and the vendor on all products within the system (cords, telecommunications outlet/connectors, cables, cross-connects, patch panels, etc.).

C. In the event that the certified system ceases to support the certified application(s), whether at the time of cutover, during normal use or when upgrading, the manufacturer and vendor shall commit to promptly implement corrective action.

D. Documentation proving the cabling system's compliance to the End-to-End Link Performance recommendations, as listed in ANSITIA/EIA-568 shall be provided by the Vendor prior to the structured cabling system being installed.

E. The cabling system must conform to the current issue of industry standard ANSI/TIA/EIA-568. All performance requirements of this document must be followed. As well, workmanship and installation methods used shall be equal to or better than that found in the BICSI (Building Industry Consulting Service International) ITSIM manual.

F. Manufacturer shall maintain ISO Quality Control registration for the facilities that manufacturer the product used in this SCS.



Fiber Optic Patch Panel at top

Horizontal cable managers above and below flat panels. Should be sized to match patch panel rack units served.

No horizontal cable managers needed for angled panels

Large horizontal cable manager for routing horizontally across rack

8" Vertical Cable Manager with Cover

Note: Cat 6A Angled and Flat Patch Panels shown in same rack for reference only. Typical design will require one or the other.

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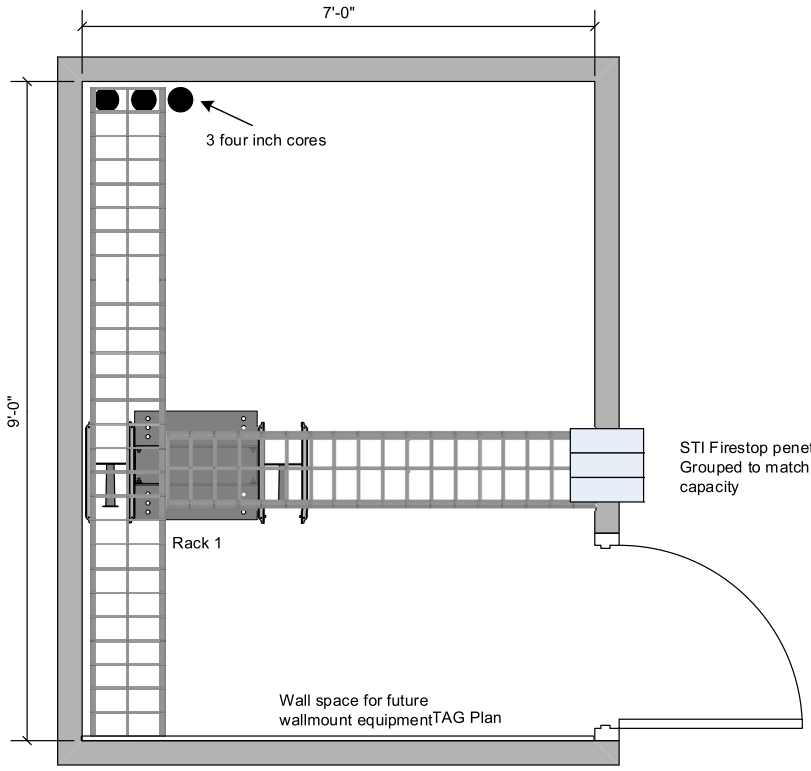
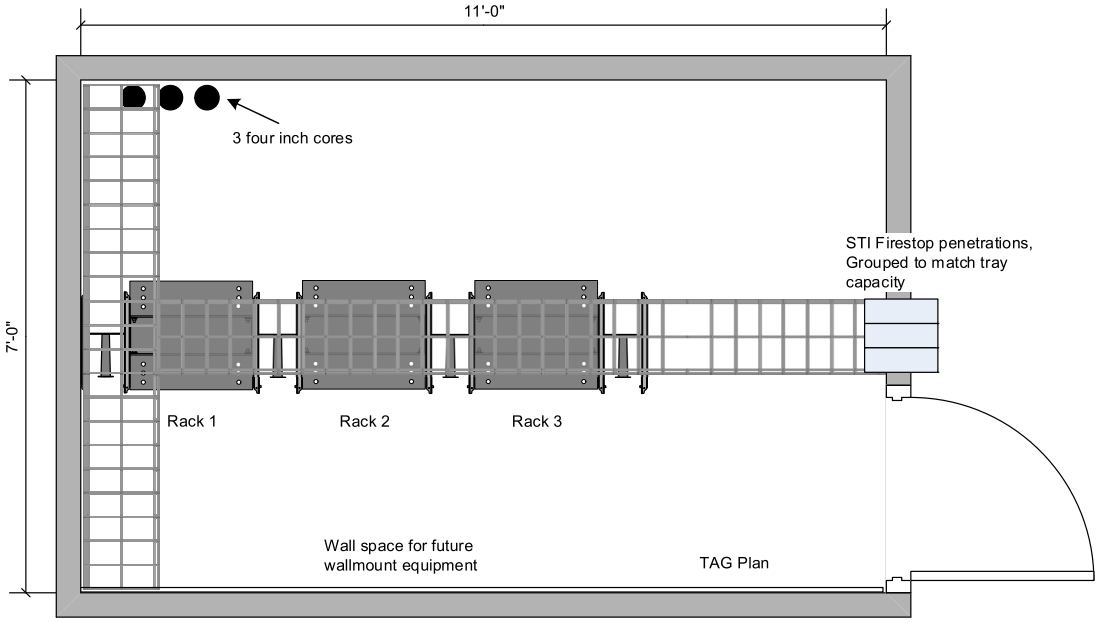
PRELIMINARY
NOT FOR CONSTRUCTION

DATE	FILENAME	REVIEWED BY	DESCRIPTION	Sample Rack Elevation	ANIXTER
06/14/2017	RACK ELEVATION.VSD				2301 Patriot Blvd Glenview, IL 60026
REV	PAGE	DRAWN BY			
A	1 OF 1	DW			



Typical TR Layout, cable entry points will dictate cable tray pathway
1 wall lined with ¾" AC grade fire retardant plywood

DATE	FILENAME	REVIEWED BY		
06/21/2017	TR LAYOUTSINGLERAC		DESCRIPTION Typical Single Rack TR	ANIXTER
REV	PAGE	DRAWN BY		2301 Patriot Blvd
A	1 OF 1	DW		Glenview, IL 60026



Typical TR Layout, cable entry points will dictate cable tray pathway
1 wall lined with ¾" AC grade fire retardant plywood

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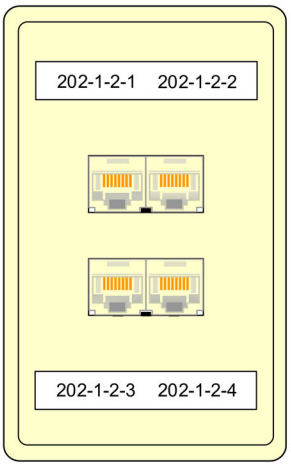
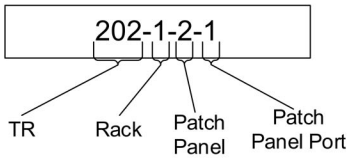
DATE	FILENAME	REVIEWED BY	DESCRIPTION	ANIXTER
06/21/2017	TR LAYOUTMULTIRACK		Typical Multi-Rack TR	2301 Patriot Blvd Glenview, IL 60026
REV	PAGE	DRAWN BY		
A	1 OF 1	DW		

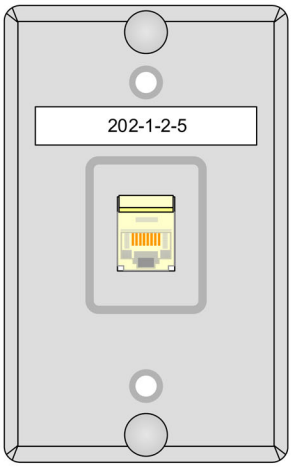
Work Area Faceplate



Label Scheme



Wall Phone Faceplate



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PRELIMINARY
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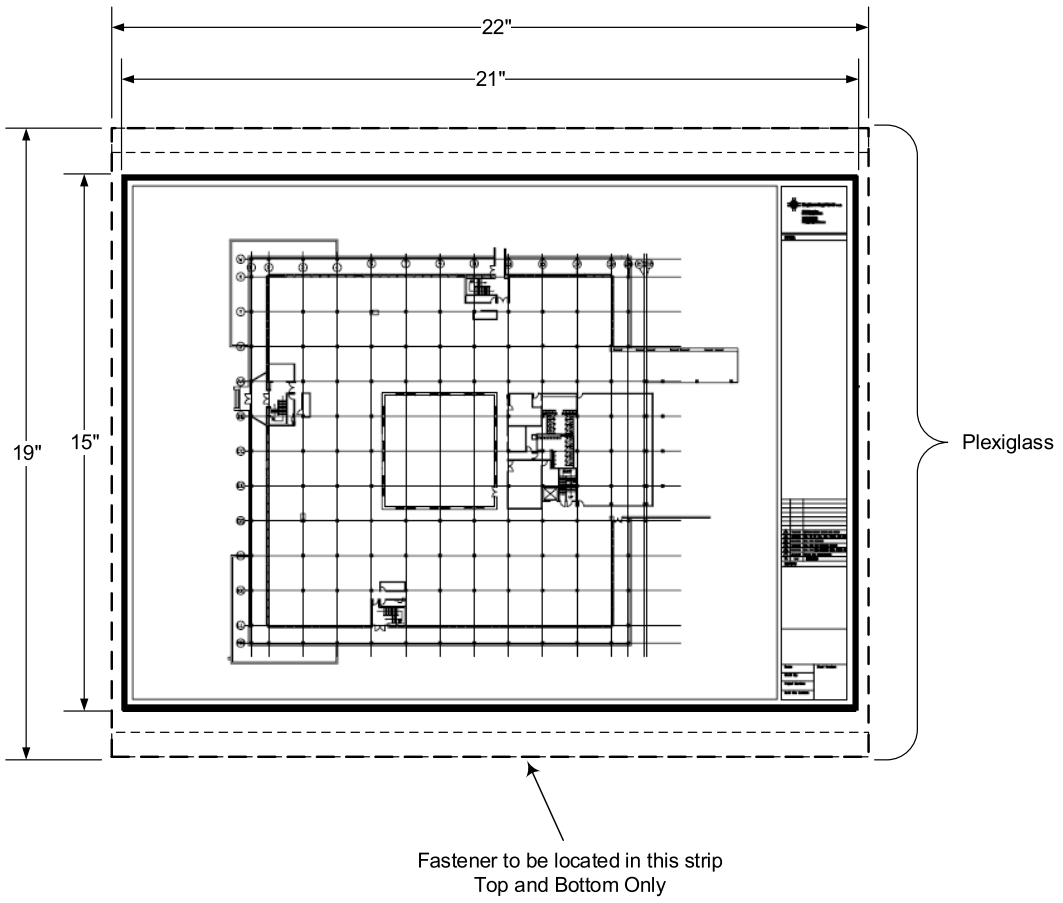
DATE	FILENAME	REVIEWED BY	DESCRIPTION	Faceplate Detail	ANIXTER
06/21/2017	FACEPLATE DETAIL.VSD				2301 Patriot Blvd Glenview, IL 60026
REV	PAGE	DRAWN BY			
A	1 OF 1	DW			



Notes:
Clear plexiglass over print

PRELIMINARY
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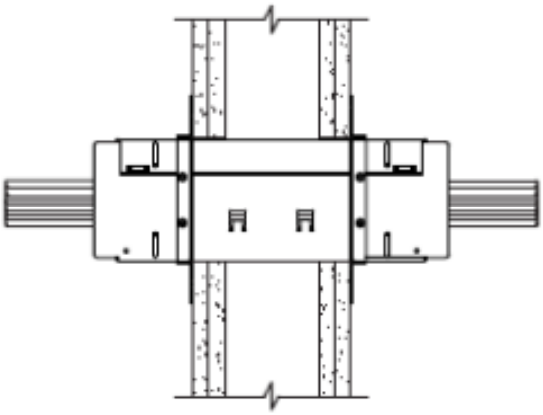
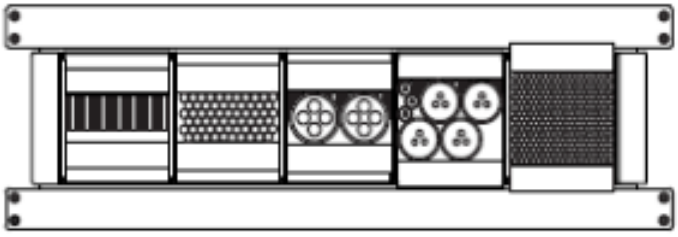
DATE	FILENAME	REVIEWED BY	DESCRIPTION	Tag Plan	ANIXTER
06/21/2017	TAGPLAN.VSD				2301 Patriot Blvd
REV	PAGE	DRAWN BY			Glenview, IL 60026
A	1 OF 1	DW			



Single installed Raceway shown



Multiple Raceways ganged together to meet capacity of tray

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PRELIMINARY
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DATE	FILENAME	REVIEWED BY	DESCRIPTION	ANIXTER
06/12/2017	WALL PENETRATION.V		Wall Penetration	2301 Patriot Blvd Glenview, IL 60026
REV	PAGE	DRAWN BY		
A	1 OF 1	DW		

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