

Structured Wiring Specifications

ERAU Daytona Beach Campus

(Feb 21 2020)

A. Objectives

The Information Technology (IT) Department of Embry-Riddle Aeronautical University (ERAU) seeks to establish a standards-based wiring infrastructure with this document. The contractor must meet the standards and parts list outlined below during the installation.

Compliance to all TIA/EIA standards, as defined in this document, is the adherence to both “Mandatory” and “Advisory” criteria described in the standards. Thus, if the contractor chooses not to follow “Advisory” criteria for a particular portion of the project, he is considered to be in non-compliance. Non-compliance to the standards whether resulting from a specific waiver from the Network/Telecom Team during the site survey or as a result of pragmatic considerations must be documented in the summary report required in item C.1. Failure to document any deviations will be considered a failure to comply with the contract.

In no case will building codes be violated. Building codes will take precedence over TIA/EIA standards should a conflict arise between the two.

The responsibility of the contractor in determining standards compliance includes reviewing any hardware, architectures, and facilities needed to complete the project. The contractor is also responsible for verifying the accuracy of the part numbers before ordering. Finally, the contractor is expected to identify and obtain any tools required to complete the project.

PER NEC IN RENOVATIONS ALL UNUSED CABLING IS TO BE REMOVED BY STRUCTURED CABLING CONTRACTOR.

PER NEC ALL CABLES BELOW GRADE OR IN SLAB TO BE **WET LOCATION** RATED.

B. Site Survey

IT requires a site survey accompanied by the ERAU Network Team as part of any structured cabling project. Once the site survey is complete, the remainder of this document will serve as the required guidelines for installation work. The contractor is required to provide a brief site survey report outlining key issues identified during the survey as called for in item C.1. This document includes general information for numerous types of projects (e.g. copper, fiber, etc). As a result, the contractor need only address those items relevant to the project. For example; if the project only involves horizontal copper installation, the contractor need not concern himself with the requirements identified for fiber. If the vendor has difficulty determining the relevance of a particular requirement, he should contact the Network Team for clarification. (386 226-7944/7628).

C. Required Documentation/Reports

IT requires the following sets of documentation as part of an installation. Some items are described in greater detail in various parts of this document. They are consolidated here for ease of reference.

C.1 Site Survey Report

This report will briefly outline any key items discussed during the survey. This report must be submitted to the network team prior to the start of any installation work. A simple email can suffice as a site survey report. This report must identify non-compliance with standards resulting from a site survey or pragmatic considerations. The site survey report must include the name and contact info of the RCDD. RCDD stamp number is also required.

C.2 Cable Test Reports

Cable test report must be submitted for all installed cables in order to demonstrate certification of all cables to Cat6 and OS2, OM3 standards. OTDR test and certification reports are required for all outside cable plant fiber strands.

C.3 List of Hardware

The contractor must adhere to the list of hardware cited in the Parts list of this document. **NO SUBSTITUTIONS without written permission.** The contractor will complete list of hardware (part number, brief description, and manufacturer) for those items that are not listed on this document. For example, if the contractor makes a part substitution that has been approved by the network team, this must be provided as part of the documentation.

C.4 Outside Cable Routing Information

An illustration showing the routing of new cable for outside cable plant work should include technical details of the type of conduit (note EIA defines raceway with a circular cross-section as conduit) and various pull boxes. The information used to label the fiber (see section M) and the manufacturer's part number should be included on the illustration for cross reference purposes. **Cables must also be labeled in manhole appearances. All outside fiber cable plant must be Corning.**

C.5 Warranty

Applicable warranties for copper and fiber installations must be provided. See section N below.

D. Standards

The work performed for the project must be in compliance with the EIA standards outlined below, unless otherwise noted. The contractor will identify the latest revision of the standard and any new standards that may have recently come out of draft that may be applicable to the project.

TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard

TIA/EIA-568-B.2 Balanced Twisted Pair Cabling Standard

TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard

TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces

TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications

TIA/EIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant

TIA/EIA-526-14A Optical Power Loss Measurements of Installed Multi-mode Fiber Cable Plant

TIA/EIA-598-A Optical Fiber Cable Color Coding

E. General Campus Architecture

In most cases, Embry-Riddle's architecture consists of a modest Entrance Facility (small space in a room serving another function) with a direct backbone connection to Telecommunications rooms. The only two rooms that could be classified as Equipment Rooms are the two server rooms located in Lehman Building and in the Simulation Center.

F. Turn Key Approach

The general intent of this document is to outline a turnkey approach for the wiring infrastructure. **The contractor will also mount all WiFi APs which generally will plug into a surface mount box cabled by the contractor.** AP installation may in some cases require a bucket lift which should be taken into account when pricing the final bid. In practical terms, this means that the ERAU network team will only supply, install, and configure head end equipment (i.e. switches, and UPS's) for the activation of the data network. As a result, **copper patch cords (one for each wired data port and WiFi Access point)**, patch panels (copper or fiber), cable runs, labeling, racks, cable ladder from the racks to the wall, cable ladder in the hallways, and external/internal fiber runs between closets will be supplied, installed, terminated, labeled, and tested/certified by the contractor. The contractor will also ground the racks in accordance with NEC.

G. Project Description and Terminology

The bidder should use terminology consistent with TIA/EIA-568-A when discussing various aspects of the proposal. As an example, the following terms should be used to logically categorize various aspects of project.

Horizontal Cabling

Backbone Cabling (Intra or Inter-building)

Work Area

Telecommunications Closets (Transition Point from Backbone to Horizontal)

Equipment Rooms

Entrance Facilities

Administration

H. Physical Limitations

The contractor will review the lengths of the proposed cable runs and type of cables (plenum vs non-plenum w color scheme) in order to determine compliance with the relevant standards (e.g. CAT6, 90meters) and certification.

Unless noted otherwise, all pairs and strands for all types of cable will be terminated, tested and labeled.

I. Channel Performance and Architectures

One hundred percent of all cables installed will be tested and must pass applicable performance criteria. A test report for all installed cable must be submitted upon completion of the project - see item C.2.

1.1 Horizontal Data UTP Cabling Performance

Copper cable and patch panels are specified in the parts list and meet Cat6 specifications. Thus all installations will be tested and must pass Cat6 standards unless otherwise noted. Cat5E certification are *not* an acceptable substitute. .

1.2 Horizontal Architecture

CommScope Cat6 outlets and connecting hardware (i.e. patch panels) are specified. The general architecture used for horizontal systems is an architecture that allows one patch panel (connecting hardware) with a direct patch cord (equipment cable) from the patch panel to the data networking equipment (common equipment).

In summary, all cabling will be terminated (punched down) at the patch panel and terminated (punched down) at the work area outlet. New installations will be wired to the 568B standard. Installations to existing patch panels will require that the contractor determine the standard in use during the site survey. All cables must be certified.

Rack patch panel count/fill rate is as follows: The bottom half of each data rack is reserved for network hardware and shall not be populated with fiber decks, copper patch panels, and/or horizontal management. Unless authorized specifically by the Embry-Riddle network infrastructure team of IT, no more than the top half of each telecom/data rack shall be populated. **The installation of one spare unpopulated 48-port patch panel per rack is required for future expansion. 24-port patch panels are not to be used for data runs.** One 2U horizontal cable manager must be installed at the top of each telecom/data rack as well as above and below the copper patch panels. Vertical management must be installed between multiple rack installations and at each end. 6" MIN AT SIDES AND 10" BETWEEN ANY TWO CONNECTED RACKS, 2 SIDED, SINGLE HINGED DOOR. BASIS OF DESIGN: CPI MCS SERIES WITH EXTENDED FINGERS. Cable ladder is required in the data closet from the wall from which horizontal cable will be fed. Rack and ladder must be black in color.

The contractor must identify and use the proper punch down tool for specific models of patch panels.

1.3 Horizontal Voice UTP Cabling

Only Cat6 cable will be run to an office faceplate (telecommunications outlet) in a work area regardless if the outlet has been designated for generic phone or data use. All horizontal cable will terminate on 48-port "data" patch panels in the telecommunications room. A separate "voice" patch panel is designated for voice tie cables that are fed from the AT&T demarcation point for specialty phones and devices that may require traditional analog lines. 24-port Cat6 patch panels maybe used for this application. The ERAU campus is a VOIP environment, implying that all phone ports are Cat6 connections unless otherwise noted. Contact the Telecom Team for details. Specialty phone horizontal cabling and phone tie cabling will not appear on the same patch panel. All horizontal cable, in this scenario, must be certified to meet Cat6 specifications regardless of the intended use of an outlet.

The tie cables (typically 25 pair cables with telco connectors - installed by the contractor) will normally originate at the voice patch panel (1pair/tj-45jack) and terminate directly on the AT&T demarcation point using a standard telco connector (to be determined during site survey). Pair number one will be wired to jack position one on the patch panel, pair two to patch position two, and so forth. Since the patch panels are typically equipped with 24 or 48 positions, pair 25 of each tie cable will not be used. Should the building consist of multiple floors or phone/data closets requiring intra-building voice tie cables, confirm tie cable wiring schemes during the initial site survey with the ERAU Network/Telecom Team.

In unusual situations where telco connectors cannot be used on the demarcation point, standard 66 blocks can be used and must be cross connected by the contractor. In short, the contractor is responsible for extending the demarcation point to the newly installed voice patch panels.

Any 66 blocks installed by the contractor should be equipped with blue hinge style covers (e.g Siemon part # MC425LH-6). The contractor is free to choose his own supplier for voice cables (CAT3), 66 blocks, telco connectors, and covers. Patch panels must be selected in accordance with the bill of materials supplied with this document.

All voice cabling/pairs must be test for continuity after installation.

1.4 Horizontal Optical Fiber, OM1 and OM3

IT presently has no plans to implement fiber in the Horizontal for the office space.

Fire Alarm, Access Control, and Environmental control systems are typically monitored over the IP data network but building renovations sometimes require new fiber runs for legacy systems. Contact HVAC or Safety Department to determine responsibility for these specific fiber requirements.

1.5 Backbone Cabling Fiber

OS2 fiber is the default fiber for all backbone cabling between buildings. The exact mix of OM1/OM3/OS2 fiber as listed in section H will depend on the data requirements and legacy systems that will need connectivity. OM1 cable will be used for legacy extensions identified on site survey or construction documents. Fiber strand counts/type will be determined during the site survey. Terminate all strands using LC connectors in rack mounted fiber decks and will generally be placed at the top of the rack. Blue LC connectors are to be used for OS2 single-mode fiber and beige LC for OM1 multimode and Aqua for OM3. Since fiber patch cords (3 each 3 meter OS patch cords per data closet) must also be supplied by the contractor, please note that orange is the requirement for multimode OM1 patch cords, aqua for the OM3 and yellow for single mode.

Bi-directional OTDR testing is mandatory. Test fiber for loss (db) from patch panel to patch panel, and repair any fiber/connectors mated pairs whose insertion loss exceeds 0.75db. Identical patch panels and layout must be used at each end of new fiber runs to facilitate fiber location and troubleshooting. For example, if a strand of fiber appears at position D2 in one building it should appear on D2 at the distant end. Panels must be labeled reflecting remote end's building name. If existing panels are used, the labeling scheme is waived.

OTDR test reports are required for all cable plant fiber strands for the respective standards (e.g. OS2).

In addition to the required test report, power loss budget calculations are required for all 'like' fiber runs (one calculation for multi-mode runs of same length, one for all single mode runs of same length, etc) indicating the expected loss of the cable in question. End to end measured loss must not exceed by 0.5db the calculated/expected value. Include the power budget calculation with the test report called for in item C.2.

The color-coding scheme used for fiber cabling when terminating and connecting fiber to the patch panel shall comply with TIA/EIA-598-A. If the manufacturer's cable does not comply with this standard, then the contractor must obtain prior approval from the network team during the site survey. In addition, the color code standard must be documented in item C.1 if the cable is non-compliant. Notation used on the patch panel at one end of a fiber run should be duplicated at the far end. The intent is to facilitate end-to-end troubleshooting based on tubes associated with a particular vertical panel. Note that ALL fiber strands will be terminated, tested, and connected to the patch panel by the contractor.

Finally, fill rate considerations for any fiber pulled through duct should be briefly discussed in the required item *C.1 Site Survey Report*, in accordance with TIA/EIA 569-A. Reference the particular section of the standard or any other applicable standard used to determine acceptable fill rates.

Please note that new or buildings under renovation with multiple data closet will require that the contractor pull, terminate, and test fiber runs between various data closets internal to a single building. The strand counts are to be determined during the site survey or program review. Again these will be LC terminations to contractor supplied patch panels.

J. Pathways and Spaces

All work within and between buildings must comply with TIA/EIA 569-A, unless otherwise documented. If the site survey determines that it would be pragmatic to make use of existing

facilities that are not TIA/EIA compliant, these non-compliant facilities must be identified in the site survey report, item C.1.

All new building projects require installation and use of ladder or spine cable tray (outside of data closet). NOTE: All visible ladder, trays, and racks must be black in color. Renovation projects require the installation and use of ladder or spine cable tray where feasible (e.g. no complications with circumventing Air Conditioning ducting, etc) or where budget limits do not prohibit their use.

Any special EMI considerations (TIA/EIA 569-A sec. 10.3) should be noted during the survey. If major construction is required, such as the construction of an entrance facility or burial of conduit, a brief technical description should be included.

Direct burial is not an acceptable method of installing outside fiber cable plant. Instead a minimum requirement of 4" PVC type C (direct burial PVC) is called for when designing inter-building pathway facilities. A metallic tracer wire is also required when laying new conduit. All new or empty conduit will be filled with inner duct prior to pulling new cable. Since Annex C of TIA/EIA-569-A discusses maintenance hole, hand hole, and pull box issues, a site survey for outside plant work should include a review of these items for compliance with the standard. As noted before, should pragmatic considerations require the use of non-compliance facilities, then they must be documented and approved.

Split (two piece) manhole covers with spring loaded will be used for new manhole construction. Suggested supplier: (teamgalloway.com). Contact facilities regarding needed load ratings.

The TIA/EIA does not provide a complete set of specifications for cable slack. As a result, please provide at least 6 ft of slack.

K. Grounding and Bonding

TIA/EIA-607 states that it's primary objective is to provide design guidance for new buildings. A contractor will be required to adhere to TIA/EIA-607 if the installation requires a new rack.

L. Qualified Personnel

The contractor must employ at least one Registered Communications Distribution Designer (RCDD) who is certified by The Building Industry Consulting Service International (BICSI). The site survey report must include the name and RCDD stamp of the project's RCDD. The contractor must be a CommScope/Uniprise Certified Installer with a minimum of four CommScope/Uniprise certified installations in the last three years. The contractor must be current with all Commscope trainings to be able provide a 25 year warranty. In addition, the successful bidder must be a Corning Cable Systems LANscape® Solutions Network Preferred Installer (NPI) Member if the project involves fiber installation .

M. Administration

Labeling is considered a critical item for the management of a cabling infrastructure. TIA/EIA-606 provides guidance for the administrative aspects of building cabling infrastructure. Section 3.4 (EIA-606) outlines a suggested naming convention that has been only partially adopted by IT

and refined for the CABLE and BACKBONE CABLE codes CXXX and CBXXX due to patch panel space limitations.

For horizontal wiring, the code will be extended to as many letters/digits as needed based on the rule illustrated below.

C-BDRMFJ

C represents the EIA designator of Cable for the horizontal. The C and dashes are optional and typically not used if label space considerations limit the number of letters. BD represents a two letter building code that will be provided during the survey. The building code (BD) is also typically omitted if the building does not have subsections with different names. RM represents the room number of the work area to which the cable has been pulled. Room numbers are required in all cases. F represents the face plate number in a particular room and takes on values 1,2,3 and so on. J represents the jack position on a particular faceplate and takes the value of A, B, C, and so on. All patch panel appearances must be labeled in accordance with the methodology outlined here. All office faceplates (outlets) must also be labeled using the same scheme. Thus the third face plate in a building called the Aviation Building (AB) in room 512 with four jacks in the face plate would have them labeled as 512-3A, 512-3B, 512-3C, 512-3D.

Note that section 6.2.2.1 of TIA/EIA-606 calls for all cables to be labeled at each end and in all manhole appearances. A printing device is required for making these labels. Handwritten labels are not acceptable.

Backbone fiber will be labeled as described below.

CB-B1-RM1-B2-RM2-#F-LGTHM

B1 is the two letter designator for a campus building (e.g. LB for Lehman) at one end of the cable termination point. RM1 is the room number in which the cable terminates. B2 is the other building at which the cable terminates, in room RM2. #F is the fiber strand count. The count should be defined by mode and core diameter. For example 6SM9/24MM62 (i.e. 6 strands of single mode 9 um core with 18 multi-mode with 62.5 um core. LGTHM is the length of the run in meters. Specially enhanced fiber (special performance characteristics) should be marked as such. Fiber must also be labeled with both designations of both ends in the manhole appearance.

All labeling color schemes should comply with section 8 of TIA/EIA-606.

N. Project Completion

The contractor must deliver a numbered Commscope System Registration Certificate upon completion of the installation.

The successful bidder must be a Corning Cable Systems LANscape® Solutions Network Preferred Installer (NPI) Member and must provide written warranty certification and evidence of current NPI program membership. The successful bidder must offer a twenty-five (25) year extended warranty for the premises fiber cabling solution comprised of covered Corning Cable Systems' products.

The successful bidder must be a CommScope/Uniprise certified installer and in good standing. The successful bidder must provide written warranty certification and evidence of current CommScope/Uniprise certified installer program membership. The successful bidder must offer a twenty-five (25) year extended warranty for the CommScope/Uniprise copper cabling systems' products.

The successful bidder shall warrant that all materials and equipment furnished under the contract are in good working order, free from defects and in conformance with system specifications. All installed equipment must conform to the manufacturer's official published specifications. The warranty shall begin at the system acceptance date and remain in effect for a period of twenty-five (25) years from that date. The successful Bidder shall agree to repair, adjust and/or replace (as determined by the Purchaser to be in its best interest) any defective equipment, materials or other parts of the system at the successful Bidder's sole cost. The Purchaser will incur no costs for service or replacement of parts during the warranty period of 25 years. All third party warranties shall be passed through from Bidder to Purchaser.

The successful bidder shall warrant and supply evidence that the installation of materials and hardware will be made in strict compliance with all applicable provisions of the National Electric Code®, the rules and regulations of the Federal Communications Commission and state and/or local codes or ordinances that may apply.

0. Check Sheet

1. Provide a site survey report prior to installation to ERAU's network team. An E-mail suffices.
2. An RCDD reviewed the design of the project. Please provide name and contact number for RCDD. Deliver a numbered CommScope/Uniprise Certified System Registration Certificate to the Network Team.
3. All installation technicians have read this document in the entirety.
4. All cable and patch panels have been labeled, terminated, tested, and certified. Cat6 tests must be used for copper certification. Certification reports supplied to IT department.
5. Items C1, C2, C3, C4 were supplied to the Network Team. List those items which were not applicable to this project in the summary report. For example, if no outside cable plant work was involved then item C4 is N/A.
6. Patch (copper and fiber) cord delivered to Network Team. Contact IT for proper count and length, typically 7 feet white for Cat6 (one for every wired port) and 3 meters yellow for OS2 (3 each per data closet).
7. Spare horizontal management included in final count. See section 4.
8. Cables in manholes labeled.
9. Provide part number of fiber cable used.
10. Review critical part numbers for accuracy to meet the intent of this document prior to ordering. Bring to the attention of the Network Team any part number discrepancies prior to ordering.

M106FR-4-262

Floor box. 4 port.

For installation of all modular furniture and surface mount
Item presently not used. Called for only if site survey identifies need.

1.5) CommScope/Uniprise

Wall Mount Telephone, one port white

M10LW-262

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Section 2: Backbone Equipment and Cable

2.1) In order to keep bidding between vendors consistent and avoid undesired substitutes Corning fiber termination equipment is called out. Alternate Corning hardware will be considered to meet special needs unique to the project.

CORNING	12 strand break out kit	FAN-BT25-12
CORNING	4 ru holds 12 cards max 144 LC ports	CCH-04U
CORNING	2 ru holds 4 cards max 48 LC ports	CCH-02U
CORNING	bulkhead adapter plate w 6 duplex LC mm OM1	CCH-CP12-A8
CORNING	bulkhead adapter plate w 6 duplex LC mm OM3/4	CCH-CP12-E4
CORNING	bulkhead adapter plate w/6 duplex LC sm OS2	CCH-CP12-A9
CORNING	LC mm OM1 62.5 ceramic tip	95-000-99
CORNING	LC mm OM3/4 50 ceramic tip	95-050-99-x
CORNING	LC sm ceramic tip	95-200-99
CORNING	3 meter OM3 patch cords	
CORNING	3 meter OS2 patch cords	

OUTDOOR and inter building backbone CABLE shall be ALTOS LOOSE tube in 12 or 24 strand counts.

INDOOR and intra building backbone to be armor jacketed MIC cable in 12 or 24 strand counts

CORNING FIBER:

012E88-33131-A3

MIC® Tight-Buffered, Interlocking Armored Cable, Plenum 12 F, Single-mode (OS2)

024E88-33131-A3

MIC® Tight-Buffered, Interlocking Armored Cable, Plenum 24 F, Single-mode (OS2)

012ZU4-T4F22D20

ALTOS® Loose Tube, Gel-Free, All-Dielectric, Non-Armored Cables with Binderless*
FastAccess® Technology 12 F, SMF-28® Ultra fiber, Single-mode (OS2)

012E81-33131-A1

Fiber - MIC Tight-Buffered, Interlocking Armored Cable, Riser, 12 fiber, Single-mode (OS2)

024ZUC-T4F22D20

ALTOS® Loose Tube, Gel-Free, All-Dielectric, Non-Armored Cables with Binderless*
FastAccess® Technology 24F, SMF-28® Ultra fiber, Single-mode (OS2)

In new rack installs, fiber patch panels must be installed at the top of the rack.

The use of free space in existing decks can only be used when permitted by the ERAU Network/Telecom Team. Fiber strands should terminate on the same respective positions at each end.

2.2) Wall mounts patch panels can only be used if the site survey revealed no available rack space and is approved by the ERAU Network/Telecom Team. A strand should terminate on the same respective position at each end.

2.3) Fiber Cable backbone

Single mode: OS2 (default between buildings)

Multimode: OM1 (legacy installs), OM3,

Strand counts and type are unique for each project and must be confirmed.

Outside plant cable splices are not permitted without advanced approval.

Indoor and outdoor fiber cables:

The contractor must make proper distinctions between the need for riser or plenum cable, in addition to indoor or outdoor cable. The need for strand quantity and type (i.e. hybrid cables and core diameter) will be identified during the survey. All outdoor fiber cable will be loose-tube with some form of water blocking required.

Section 3: Horizontal Cable

3.1) CommScope/Uniprise Cat6 **Plenum** Cable: CS34P UN874019914/10 (**White**)
For installation of ALL horizontal wiring to Data and
Telecommunication closets requiring plenum
fire resistant cable installation

3.2) CommScope/Uniprise Cat6 **Riser**: CS37R (**Blue**)

For installation of ALL horizontal wiring to Data and
Telecommunication closets NOT requiring plenum cable.

3.3) CommScope/Uniprise **Outdoor** direct burial Cat6: CS34O UN884019904/10

Meets NEC requirements for wet conditions.
For installation of ALL horizontal cable placed in conduit below slab or grade.

Section 4: Copper, Fiber Wire Management and Miscellaneous

NOTE: All Racks, Ladder, Trays, and Management, and patch panels must be black in color.

Rack patch panel count/fill rate is as follows: The bottom half of each data rack is reserved for network hardware and shall not be populated with fiber decks, copper patch panels, and/or horizontal management. Unless authorized specifically by the ERAU Network/Telecom Team, no more than the top half of each telecom/data rack shall be populated. **The installation of one spare unpopulated 48-port patch panel per rack is required for future expansion. 24-port patch panels are not to be used for data runs.** One 2U horizontal cable manager must be installed at the top of each telecom/data rack as well as above and below the copper patch panels. Vertical management must be installed between multiple rack installations and at each end.

- 4.1) Vertical management on each end of the row of racks: (Double-Sided 6"x7"x16.5"):
CPI 40095-703 MCS-EFX
- 4.2) Vertical management between multiple racks in the row: (Double-Sided 10"x7"x16.5"):
CPI 40096-703 MCSEFX
- 4.3) **Horizontal management at the top of each rack, and also above and below, but not between patch panels:** (Double-Sided 2RU w-extended fingers) Commscope\Uniprise **1933567-1**
- 4.4) Black Aluminum Standard Rack (19"Wx7'H): CPI 55053-703
- 4.5) CommScope 24-Port Patch Panel, 568A/B Wired, Cat6: [UNP-6-DM-2U-24](#)

Use of a 24-ports patch panel requires prior approval. 48-port panels are normally used for all data runs. A single 24-port panel is used only for analog voice, specialty, or very small installations.

- 4.6) CommScope 48-Port Patch Panel, 568A/B Wired, Cat6: [UNP-6-DM-2U-48](#)

For installation in universal 19"equipment racks as designated by Information Technology. This is the default patch panel.

- 4.7) Cat6 Patch Cords (T568B): CommScope
10-5779-00-05 5 ft white
10-5779-00-07 7ft white
10-5779-00-10 10ft white

Note: **WHITE patch cords for each Cat6 cable appearance on the patch panels must be provided. plus one for each WiFi AP, 80% will be 7ft in length and 20% 10 ft in length.**