

Network Infrastructure Standard

Vanderbilt University - Information Technology
Network Services



1. General Project Terms and Conditions
2. Standards and Contractor Qualifications
3. General Specifications for ANSI/TIA 568C Wiring Standard
4. General Specifications for Fiber Optic Cabling
5. General Specifications for Coaxial Cabling
6. General Specifications for Unshielded Twisted Pair Cabling (cat. 3)
7. Cabling Pathways
8. Building and Communications Equipment Rooms
9. Labeling Requirements
10. Grounding and Bonding
11. Fire Stopping

Appendix A: Racks

Appendix B: Building and Equipment Room Layouts

Appendix C: Material List

Appendix D: Acronyms

Appendix E: Approved Cabling Vendors

Appendix F: BER/CER General Contractors Expectations

Appendix G: BER/CER BER/CER Design Expectations



General Project Terms and Conditions

- 1.0 The information in this document shall be used as a guideline for the design and installation of communications infrastructure as required by Vanderbilt University Information Technology (VUIT) in Vanderbilt owned and/or occupied facilities. This document does not address any other low voltage needs or requirements. It is intended for use by Architects, Engineers and Contractors to guide in the design and installation of a comprehensive network distribution system, which is to include but not limited to copper and fiber distribution both internal and external to the building.**
- 1.1 All projects require a custom design of communications components to meet the specific architectural requirements of the facility; representatives from VUIT will work with the project design team to assist in the development of the distribution design.**
- 1.2 The contractor must provide all notices, file all plans, acquire any licenses and permits, pay all fees and back charges, and obtain all necessary approvals from the Authorities having Jurisdiction (AHJ) so as to perform all work required, this is to include specifications, drawings, addendums, and change orders, in accordance with the legal requirements.**
- 1.3 A representative of VUIT will be assigned at the start of the project. All communications concerning the project should be addressed to the VUIT representative. The “official” response for any issues or concerns will be from the VUIT appointed representative.**
- 1.4 The communications contractor shall have a project superintendent available to answer any queries, for the duration of the project.**
- 1.5 The communications contractor shall comply with all National Electric Codes, American National Standards Institute, Electronic Industry Alliance and the Telecommunications Industry Association (ANSI/EIA/TIA) standards.**



- 1.6 The communications contractor shall be responsible for supplying all labor and tools required for a complete installation of the structured cabling, fiber optic system, and CaTV systems (if required), meeting all terms, conditions, and the requirements of this document and local codes or ordinances.**
- 1.7 The Contractor shall perform all work according to Federal, State, and local codes, rules, regulations, and ordinances governing the work, and as fully part of the specifications as if herein repeated or hereto attached. If the Contractor should note items in the drawings or the specifications, construction of which would be code violations, promptly call them to the attention of the owner's representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.**
- 1.8 The communications contractor must provide brand names and part numbers of all items to complete the project. Vanderbilt University requires the communications contractor to utilize the items listed in Appendix C. Any item not listed in Appendix C, the contractor shall submit to VUIT brand names, item numbers and any pertinent data sheets for approval.**
- 1.9 The communications contractor, upon request, shall provide a per drop cost. This will be used in the pricing of any additional drops not listed on drawings or in bid documents.**
- 1.10 All penetrations made by the communications contractor in floors, ceilings and walls shall be fire-stopped according to the appropriate NEC code. All penetrations must maintain the fire rating of the surface being penetrated.**
- 1.11 Any penetrations must be sized to accommodate two (2) times the number of cables being installed.**
- 1.12 All penetrations in ceilings, walls and other parts of the building made by the contractor must be restored to their original condition or better.**



- 1.13 If the contractor must disturb any materials that are suspected to be toxic or hazardous, the contractor shall cease work in that area until written notice to proceed is received from Vanderbilt University.**
- 1.14 When penetrating through walls or floors, the contractor is responsible for controlling the resulting dust by shielding areas and covering furnishings to prevent contamination. The contractor is also responsible for controlling dust and debris caused by the removal and replacement of ceiling tiles.**
- 1.15 The contractor shall remove all rubbish and equipment and shall leave the premises in a neat and clean condition at the end of each workday.**
- 1.16 All work and material movement must occur in the least disruptive manner as possible, and at the convenience of Vanderbilt University. If access to an area necessitates the movement of furniture or other items, it is the contractor's responsibility to move or coordinate the removal and return of these items to their original location and orientation. Unless authorized by the project coordinator, all items must be return to their original locations before ceasing work each day.**
- 1.17 Removing and replacing ceiling tiles is the responsibility of the contractor. Replacement of damaged or soiled ceiling tiles is also the responsibility of the contractor.**
- 1.18 Contractor shall provide a twenty (20) year warranty for workmanship and compliance as defined by Commscope/Systimax PartnerPro™ warranty as it pertains to the structured cabling system.**
- 1.19 Contractors must wear an I.D. badge while on site. This badge must include a picture of the employee and the company name.**
- 1.20 There may be other contractors working in the area, it is the responsibility of the contractor to coordinate with other contractors in order to complete their work within allotted time frame.**



- 1.21 The contractor, upon request, shall submit, in writing, the planned work schedule and progress reports to the VUIT representative.**
- 1.22 The contractor may be required to attend status meeting as designated by the VUIT representative.**
- 1.23 In the event that a BER/CER is not completed at the time of the cabling installation, then the contractor will neatly bundle, label (contractor's name and contact information) and secure all cabling so as not to interfere with the construction of the BER/CER.**



- 1.24 All materials and equipment shall be manufactured, installed and tested as specified in the latest editions of the following:**

ANSI/TIA/EIA

- 1.24.2 TIA-526-7 – Optical Power Loss Measurement of Installed Single-Mode Fiber Cable Plant**
- 1.24.3 TIA-526-14-B – Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant**
- 1.24.3 TIA-568-C.0 – Generic Telecommunications Cabling for Customer Premises**
- 1.24.4 TIA-568-C.1 – Commercial Building Telecommunications Cabling Standard Part 1: General Requirements**
- 1.24.5 TIA-568-C.2 – Balanced Twisted-Pair Telecommunications Cabling and Components Standards**
- 1.24.6 TIA-568-C.3 – Optical Fiber Cabling Components Standard**
- 1.24.7 TIA-568-C.4 – Broadband Coaxial Cabling and Components Standard**
- 1.24.8 TIA-569-C – Telecommunications Pathways and Spaces**
- 1.24.9 TIA-570-C – Residential Telecommunications Infrastructure Standard**
- 1.24.10 TIA-598-C – Optical Fiber Cable Color Coding**
- 1.24.11 TIA-606-B – Administration Standard for Commercial Telecommunications Infrastructure**
- 1.24.12 TIA-607-B – Commercial Building Grounding and Bonding Requirements for Telecommunications**
- 1.24.13 TIA-758-B – Customer-Owned Outside Plant Telecommunications Infrastructure Standard**
- 1.24.14 TIA-942-A – Telecommunications Infrastructure Standard for Data Centers**
- 1.24.15 TIA-942-A-1 – Telecommunications Infrastructure Standard for Data Centers, Addendum 1-Cabling Guidelines for Data Center Fabrics**
- 1.24.16 TIA-1179 – Healthcare Facility Telecommunications Infrastructure Standard**



- 1.24 All materials and equipment shall be manufactured, installed and tested as specified in the latest editions of the following:**

ANSI/TIA/EIA

- 1.24.2 TIA-526-7 – Optical Power Loss Measurement of Installed Single-Mode Fiber Cable Plant**
- 1.24.3 TIA-526-14-B – Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant**
- 1.24.3 TIA-568-C.0 – Generic Telecommunications Cabling for Customer Premises**
- 1.24.4 TIA-568-C.1 – Commercial Building Telecommunications Cabling Standard Part 1: General Requirements**
- 1.24.5 TIA-568-C.2 – Balanced Twisted-Pair Telecommunications Cabling and Components Standards**
- 1.24.6 TIA-568-C.3 – Optical Fiber Cabling Components Standard**
- 1.24.7 TIA-568-C.4 – Broadband Coaxial Cabling and Components Standard**
- 1.24.8 TIA-569-C – Telecommunications Pathways and Spaces**
- 1.24.9 TIA-570-C – Residential Telecommunications Infrastructure Standard**
- 1.24.10 TIA-598-C – Optical Fiber Cable Color Coding**
- 1.24.11 TIA-606-B – Administration Standard for Commercial Telecommunications Infrastructure**
- 1.24.12 TIA-607-B – Commercial Building Grounding and Bonding Requirements for Telecommunications**
- 1.24.13 TIA-758-B – Customer-Owned Outside Plant Telecommunications Infrastructure Standard**
- 1.24.14 TIA-942-A – Telecommunications Infrastructure Standard for Data Centers**
- 1.24.15 TIA-942-A-1 – Telecommunications Infrastructure Standard for Data Centers, Addendum 1-Cabling Guidelines for Data Center Fabrics**
- 1.24.16 TIA-1179 – Healthcare Facility Telecommunications Infrastructure Standard**



- 1.24.17 TSB-67 – Performance Specifications for Field Testing of UTP Cable Systems**
- 1.24.18 AV-DRM – Audio/Visual Design Reference Manual**
- 1.24.19 ESS-DRM – Electronic Safety and Security Design Reference Manual**
- 1.24.20 ITS-IMM – Information Transport Systems Installation Methods Manual**
- 1.24.21 N-DRM – Network Design Reference Manual**
- 1.24.22 OSP-DRM – Outside Plant Design Reference Manual**
- 1.24.23 TDMM – Telecommunications Distribution Methods Manual**
- 1.24.24 W-DRM – Wireless Design Reference Manual**
- FCC**
- 1.24.25 Title 47 CFR Part 15 – Electromagnetic Radiation**
- 1.25.26 Title 47 CFR Part 68 – Direct Connection of Telecommunications Equipment and Customer Premises Wiring**
- IEEE – Institute of Electrical and Electronics Engineers, Inc.**
- 1.25.27 NEC – National Electric Code**
- 1.25.28 NFPA 70 – National Fire Protection Association**
- NESC – National Electrical Safety Code**
- OSHA – Occupational Safety and Health Act**

**Standards and Contractor Qualifications**

- 2.0** Vanderbilt University's structured cabling standard is the ANSI/TIA 568-C. The University has chosen the CommScope Systimax solution to the ANSI/TIA 568-C standard. The communications contractor must be certified and be in good standing as a CommScope PartnerPRO™.
- 2.1** Vanderbilt University's fiber cabling standard is the ANSI/TIA 568-C. The University has chosen the CommScope Systimax solution to the ANSI/TIA 568-C standard. The communications contractor must be certified and be in good standing as a CommScope PartnerPRO™.
- 2.2** The communications contractor shall have the following:
 - 2.2.1** Comprehensive knowledge and understanding of the latest revision of the Building Industry Consulting Services International's (BICSI), Telecommunications Distribution Methods Manual (TDMM).
 - 2.3.2** At least one (1) Registered Communications Distribution Designers (RCDD) on staff and must be available to resolve any field installation issues.
 - 2.3.3** Installation crews should be familiar with the BICSI ITS Cabling Installation Program
- 2.3** The communications contractor shall have at least five (5) years of experience installing and servicing structured cabling systems. The contractor shall provide, upon request, a list of projects that are similar in scope and magnitude, this list is to include references and contact information.
- 2.4** The accuracy and completeness of the services provided by the communications contractor, all analytical laboratory testing, and all sub-contractors may be subject to quality assurance audits by Vanderbilt University.
- 2.5** The communications contractor must be on the approved vendor list as determined by Commscope Enterprise Solutions and Vanderbilt University Information Technology (VUIT). See Appendix E.

**General Specifications for the ANSI/TIA Structured Cabling System**

- 3.0 All horizontal UTP cabling to be installed for a typical telecommunication outlet shall meet or exceed ANSI/TIA Category 6 specifications and be yellow in color. See Appendix C for part numbers. In certain situations, different cables will be needed, refer to the drawings to determine number and types of cables.**
- 3.1 All horizontal UTP cabling to be installed for a wireless access point outlet shall meet or exceed ANSI/TIA Category 6A specifications and be green in color. See Appendix C for part numbers.**
- 3.2 All horizontal cabling from BER/CER's to outlet locations will be concealed in ceilings, walls or surface raceway. No exposed cabling will be allowed unless otherwise authorized by the VUIT network infrastructure representative.**
- 3.3 Any cables in ceilings are to be installed in existing cable trays. Any cable not installed in cable trays shall be supported by appropriate supporting hardware, every five (5) feet. The supporting hardware shall be attached to the building structure (concrete, cement blocks or steel beam), at no time are ceiling supports, electrical conduits or hangers used to support other trades equipment are to be used.**
- 3.4 All horizontal cable runs shall be loosely wrapped using Velcro™ type straps between cable supports. Plastic cable ties are not permitted.**
- 3.5 No cabling is to be laid on ceiling tiles, lights etc. All cable runs must maintain a minimum distance of eighteen (18) inches from fluorescent lights, motors or other sources of EMI radiation and fire suppression systems.**
- 3.6 All metal stud penetrations are to be a minimum of one (1) inch in diameter with a non-conductive grommet installed to protect the cable from damage.**
- 3.7 All cabling runs are to be continuous without transition points or splices.**
- 3.8 At a minimum, all outlets must have one (1) cable installed and terminated.**
- 3.9 No more than four (4) cables shall be installed in a single gang outlet box.**



- 3.10 No more than eight (8) cables shall be installed in a double gang outlet box.**
- 3.11 Communications cabling SHALL NOT be co-located within the same outlet box as electrical circuits and must not share the same faceplate.**
- 3.12 A minimum of twelve (12) inches of cable slack shall be available at the outlet location. This slack is not to be stored within the outlet box.**
- 3.13 A minimum of ten (10) feet of cable slack shall be available in the CER/BER's. This slack will be attached to the wall directly behind the racks, with appropriate cabling management.**

**General Specifications for Fiber Cabling**

- 4.0 The installer shall provide a minimum of 12 strand single-mode fiber optic cable. This count may vary depending on circumstances, VUIT in conjunction with the low voltage designer will determine actual strand count. All fiber optic cable shall be installed, terminated and tested in accordance with the manufacturer's recommendations.**
- 4.1 All fiber optic cables are to be installed in orange inner-duct, labeled every ten (10) feet and supported every five (5) feet per the ANSI/EIA 568C standard. At no time is a fiber optic cable to be installed exposed.**
- 4.2 All fiber optic cabling shall be installed as a continuous run between points – splices are not acceptable, if a transition is necessary then approval by the VUIT representative is required.**
- 4.3 Multiple connectors may be used, consult the VUIT representative for direction. All fiber strands shall be terminated with UPC/LC connectors, except for a fiber strand needed for CaTV utilization, if applicable, then this connector shall be an APC/LC connector.**
- 4.4 If applicable, the last strand in the entrance fiber cabling will be terminated with an APC/LC connector to accommodate CaTV systems. The strand to be used shall be specified in the telecommunications design/construction documents.**



General Specifications for Coaxial Cabling

- 5.0 Coaxial cabling between the CER and the BERs shall be 75 Ohm, NEC riser rated, and flame-resistant RG-11 cable. This cable shall be homerun from the originating location (CER) to the terminating location (BER).**
- 5.1 Coaxial cabling between the CER/BERs and outlet faceplate shall be 75 Ohm, NEC riser rated, and flame-resistant RG-6 cable. This cable shall be homerun from the originating location (CER/BER) to the terminating location (communications outlet).**
- 5.2 The RG-11 and RG-6 cables shall be terminating utilizing a snap and seal type connector**
- 5.3 CaTV terminating hardware will be provided by VUIT and be installed before the termination of coaxial cables can be done.**
- 5.4 The CaTV distribution design will be provided by VUIT prior to the installation of coaxial cabling.**



General Specifications for Unshielded Twisted Pair Cabling (Cat. 3)

- 6.0 Installer shall provide only new ARMM riser cable for installation.**
- 6.1 All patch panels and 110 termination blocks shall be installed, terminated and tested in accordance with the manufacturer's recommendations and as set forth in the standards listed in section 1.24 of this document.**
- 6.2 A riser rated 25 UTP cable shall be installed from the terminating location in the BER to each rack located in the CERs.**
- 6.3 When using patch panels, the 24th port in each panel will support a 2-pair termination scheme so that all pairs are terminated.**
- 6.4 Provide and install the necessary number of patch panels and/or 110 termination blocks to terminate all installed voice riser cables.**
- 6.5 Patch panels are to be installed within equipment racks as noted in the rack elevations found in Appendix A.**
- 6.6 The design of the CER will dictate whether the use of patch panels, 110 termination blocks or both is required – coordinate specifics with the VUIT representative.**

**Cabling Pathways**

- 7.0 All conduit pathways of 2" or greater diameter shall be filled with MaxCell™ inner-duct as noted in the table below. The telecommunications plan may also call for flexible plenum or riser rated inner-duct in certain situations, with the approval from the VUIT representative.**

Maximum

Conduit Diameter	MaxCell Innerduct
2"	1 - 2" 3-cell
3"	2 - 3" 3-cell
4"	3 - 3" 3-cell

- 7.1 Internal conduit pathways in all areas with hard ceilings shall extend from the faceplate to the cable tray or main cable pathway with no junction or pull boxes.**
- 7.2 All conduits shall be bonded to the cable tray when present.**
- 7.3 Conduit pathways, not run to cable trays, shall be stubbed above finished ceiling. The remaining cable path shall be supported via j-hooks or similar device to the cable tray or main cable pathway.**
- 7.4 Conduits utilized for horizontal cabling shall be sized as indicated in the table below:**

# of Cables	Conduit O.D.
1-4	3/4"
5-8	1"

- 7.5 Conduits and pathways shall be provided to ensure that if a network connection is needed outside of the building, cabling can be installed. The locations should be determined during the design phase.**



- 7.6 Conduits and pathways shall be provided to ensure that wireless access points can be attached to the outside of the building to provide coverage for the external areas surrounding the building. These locations should be determined during the design phase.**
- 7.7 Pathways through “hard ceilings” will be continuous without junction or pull boxes unless ceiling access is provided to allow unimpeded access.**
- 7.8 Pathways through “hard ceilings” shall be sized to provide two (2) times the capacity of the initial installation.**
- 7.9 Outside Plant (OSP) conduit pathways shall consist of the appropriately sized UL listed, NEMA TC6 schedule 40 or 80 rigid PVC and encased in concrete. The duct bank shall be installed with a minimum of 24” depth of cover.**
- 7.10 All OSP fittings shall be UL listed, NEMA TC9 and matched to the conduit material.**
- 7.11 All OSP sweeps shall be factory manufactured and have a minimum 15-foot radius.**
- 7.12 All OSP end caps shall be factory manufactured and watertight. (Tape is not acceptable).**
- 7.13 All OSP duct bank spacers must be used when appropriate and shall be high density, interlocking spacers.**
- 7.14 Six-inch-wide metallic warning tape, orange in color, shall be placed 12” above all underground conduit paths and marked every 24” with cable type identifier.**
- 7.15 All conduits shall include a polypropylene pull rope with a minimum tensile strength of 200 pounds.**

**(BER/CER) Equipment Rooms****SPACE REQUIREMENTS**

- 8.1.1 Building Entrance Rooms (BER) and Communications Equipment Rooms (CER) shall be appropriately sized and rectangular in shape.**
- 8.1.2 Variances to BER and CER sizing are acceptable but must be approved by the VUIT representative.**
- 8.1.3 The sizing of BERs/CERs are contingent on the number of network drops installed. VUIT has determined that for every 240 drops, one (1) network rack must be installed. See Appendixes A and B for typical BER/CER and rack layout.**
- 8.1.4 Depending on the usage the square footage of building may determine the size of a BER or CER, if this method is to be used then the following guidelines are recommended:**

If the Serving Area Is...	Then the Interior Dimension of the Room Shall be at Least...
5000 sq. ft or less	10 ft x 8 ft
>5000 sq. ft to 8000 sq. ft	10 ft x 9 ft
>8000 sq. ft to 10,000 sq. ft	10 ft x 11 ft

- 8.1.5 VUIT requires a minimum of two (2) racks in BERs and CERs. These racks shall be designated as VUIT use only.**
- 8.1.6 There shall be one more rack installed than is needed. Ex: if two racks are needed then a third rack shall be installed.**
- 8.1.7 There shall be a minimum of three feet on three sides of the rack. See Appendix B for typical BER/CER layout. If equipment is to be mounted on the walls, then the three feet of clearance shall be measured off the furthest point of the equipment that extends into the room.**
- 8.1.8 These space requirements only address VUIT's network service's needs, any additional services to be installed in the BER/CERs must provide the space requirements needed which may impact the size of the room.**



8.1.9 In multi-floor buildings, rooms shall be vertically stacked so to provide a straight vertical riser.

8.1.10 Depending on the usage of the building it may be possible to place CER/BER rooms on alternating floors, however cabling distances must be within EIA/TIA specifications. This design must be approved by the VUIT representative.

ELECTRICAL REQUIREMENTS

8.2.1 Each rack shall have one (1) quad NEMA 5-20R and two (2) NEMA L5-30R receptacle attached to the rear of the rack. These outlets are to be mounted approximately 18" AFF.

8.2.3 All electrical outlets mounted on the racks shall be conduit at no time is a flexible portable power cord (SO) is to be used.

8.2.4 The electrical outlets shall not impede the rack mounting screw locations.

8.2.5 Convenience outlets shall be NEMA 5-20R installed on walls per applicable codes.

8.2.6 In some instances, certain BERs will require two (2) NEMA L6-30R receptacles attached to the rear of the racks. These outlets are to be mounted approximately 18" AFF. This will be determined prior to construction by VUIT network infrastructure representative.

ENVIROMENTAL REQUIREMENTS

8.3.1 All BERs and CERs shall include a HVAC system capable of maintaining a temperature within the range of 64 to 75 degrees Fahrenheit at 30 to 55 percent relative humidity.

8.3.2 System control shall be within and dedicated to the individual BER/CER.

8.3.3 Rooms must always be kept clean and dust free.

8.3.4 The amount of potential equipment will determine the BTU dissipation for each BER/CER.



- 8.3.5 If a split unit HVAC unit is necessary within an equipment room, then a water catch is to be installed drained to the plumbing drainage location.**

MISCELLANEOUS REQUIREMENTS

- 8.4.2 Rooms shall be located centrally within the facility to accommodate as large an area as possible, while maintaining a 285 feet maximum horizontal cable length between faceplate and patch panel.**
- 8.4.3 All communications rooms must be accessible 24 hours a day, 365 days a year.**
- 8.4.4 All communications rooms must have corridor access. At no time should the access be through another room.**
- 8.4.3 BERs shall be located within proximity to where inter-building communications cables enter the facility.**
- 8.4.4 Floors shall be sealed and have anti-static properties. Carpet is NOT permitted.**
- 8.4.5 All walls shall be covered with ¾" Fire Retardant-treated wood (FRTW) mounted 6" AFF and be painted white. All applicable inspection quality stamps must remain unpainted.**
- 8.4.6 The ceiling height in BERs and CERs shall not be less than 8ft. 6in. AFF. False ceilings are NOT permitted.**
- 8.4.7 Some BER's/CER's may house core/distribution network components. These components are larger in size than typical network equipment. These rooms will need to be identified with the VUIT representative. These rooms will require double doors**
- 8.4.8 Core Distribution rooms shall have double doors each measuring 80"H x 36" W and constructed without a doorsill or center post, these doors need to swing out and lay flat. 8.4.8 BER/CERs shall have a single door measuring 80"H x 36" W, this door needs to swing out and lay flat.**

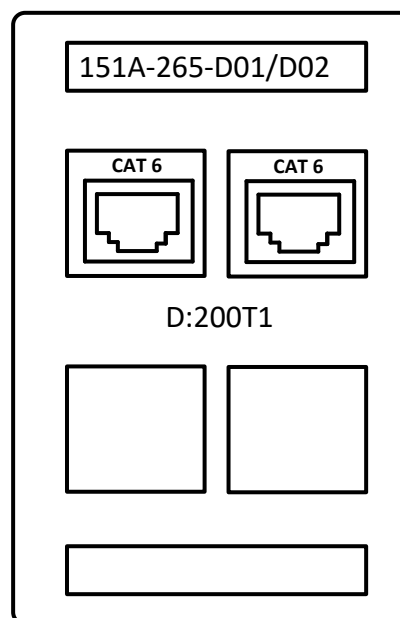


- 8.4.9 Sufficient lighting shall be provided to ensure a minimum of 50-foot candles, measured 3' above the finished floor after all racks, cable trays and cables are in place.**
- 8.4.10 Rooms shall be secured via the electronic building access control system. If no system is present, then all doors shall have the capability of adding card readers and electronic door strikes and be identically keyed utilizing Vanderbilt key number 1872.**
- 8.4.11 BER and CERs shall have a clean agent fire extinguisher located within the space below the light switch – See NFPA 75 for guidance.**
- 8.4.12 Water, chemical or any type of drain piping not associated with telecommunications equipment shall NOT be present or installed directly above the BER/CERs.**
- 8.4.13 BERs or CERs that contain supporting water or drain piping that is associated with telecommunications equipment must also be equipped with a leak detection system**
- 8.4.14 Condensate or steam piping shall NOT be present in the BERs or CERs.**
- 8.4.15 The BER shall have minimum two 4" conduits constructed for Carriers/ISPs that extend from the BER to the nearest pole/maintenance hole/pedestal at the public right of way**
- 8.4.16 All racks are to be bolted to the floor per manufacturer's specifications.**
- 8.4.17 Each door shall have a dust sweep installed to mitigate any dust or debris intrusion.**



Labeling Requirements

- 9.0** Installer shall label all installed cabling.
- 9.1** Labeling shall not take place until all faceplates, patch panels, wiring blocks and termination hardware are secure in their final location and testing has been completed.
- 9.2** All labels shall be machine printed; handwritten labels are not acceptable.
- 9.3** Outlets within rooms shall be sequentially labeled, left to right
- 9.4** Sample faceplate-labeling scheme:
- 151A-265-D01/D02:
 - 151A represents the building code
 - 265 represents the room number the jack is in
 - D01 represents the jack number in the room
 - D02 represents the jack number in the room
 - D:200T1 represents the terminating BER/CER

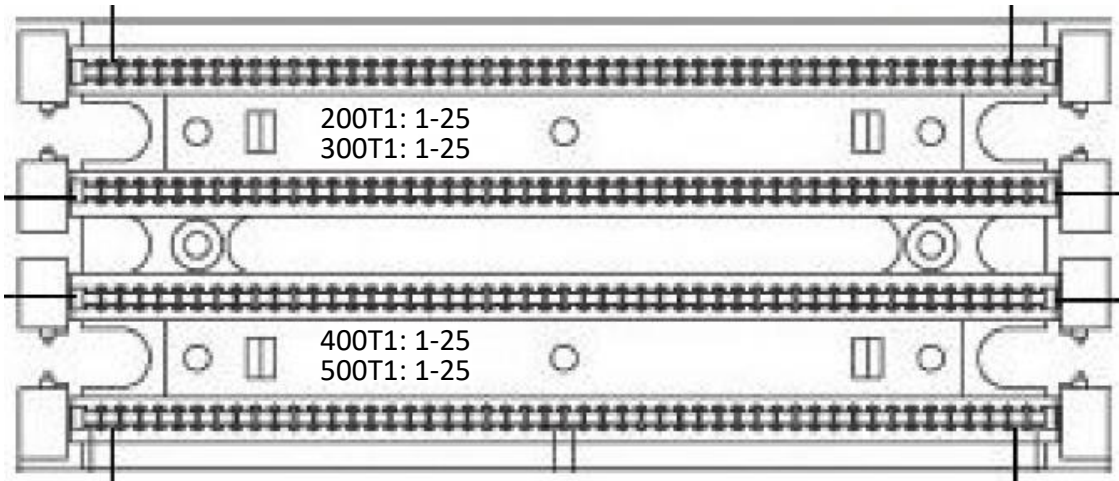




9.5 Voice Riser Cabling:

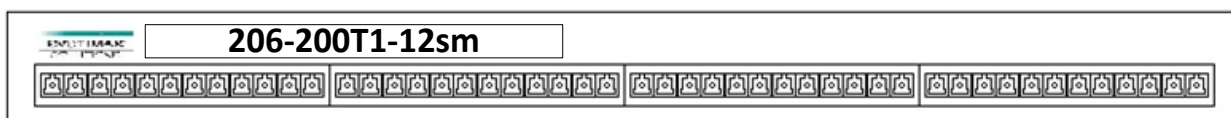
Building Equipment Room

- 200T1: 1-25
 - 200T1 represents the BER/CER
 - 1-25 represents the cable count



9.6 Fiber Riser Cabling

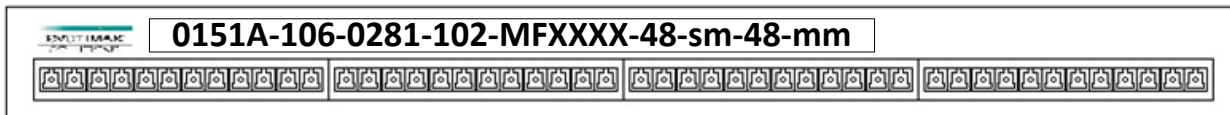
- All cables shall be clearly marked with a unique identifier at both ends of the cable
- Individual strands shall be labelled left to right and top to bottom
- Sample patch panel labeling scheme:
 - 206-200T1-12-sm
 - 206 represents the originating BER/CER
 - 200T1 represents the terminating BER/CER
 - 12sm represents the number or fiber strands, sm represents the fiber type





9.7 Fiber Entrance Cables

- All cables shall be clearly marked with a unique identifier at both ends of the cable
- Individual strands shall be labelled per manufacturer's specification.
- Sample patch panel labeling scheme:
 - 0151A-106-0281-102-MFXXXX-48sm-48mm
 - 0151A represents the originating building code
 - 106 represents the originating CER
 - 0281 represents the terminating building code
 - 102 represents the terminating CER
 - MFXXXX represents the cable number (provided by VUIT)
 - 48sm represents the strand count and single-mode fiber
 - 48mm represent the strand count and multi-mode fiber





Grounding and Bonding

- 10.0 The telecommunications grounding system shall meet ANSI/TIA-607 standard, the National Electric Code, and all related grounding codes and standards.**
- 10.1 All BERs shall contain the Telecommunications Main Grounding Busbar (TMGB).**
- 10.2 The TMGB shall have the minimum dimensions of 6mm thick by 100mm wide and be of sufficient length to support the number of connections required.**
- 10.3 A ¾" EMT conduit shall be provided from the main building grounding electrode to the TMGB.**
- 10.4 An appropriately sized grounding wire shall be installed to connect the main building grounding electrode to the TMGB.**
- 10.5 All CERs shall contain a Telecommunications Grounding Busbar (TGB).**
- 10.6 The TGB shall have the minimum dimensions of 6mm thick by 50mm wide and be of sufficient length to support the number of connections required.**
- 10.7 A ¾" EMT conduit shall be provided from the TMGB to all TGBs.**
- 10.8 An appropriately sized grounding wire shall be installed to connect the TMGB to all TGBs.**
- 10.9 All busbars shall be predrilled with standard NEMA bolt hole sizing and spacing for the type of connectors to be used.**
- 10.10 Position all busbars low on the telecommunications backboard so that they will not interfere with future riser or station cable.**



10.11 Route all ground wires near the edges of the telecommunications backboard to leave the backboard unobstructed.



Fire Stopping

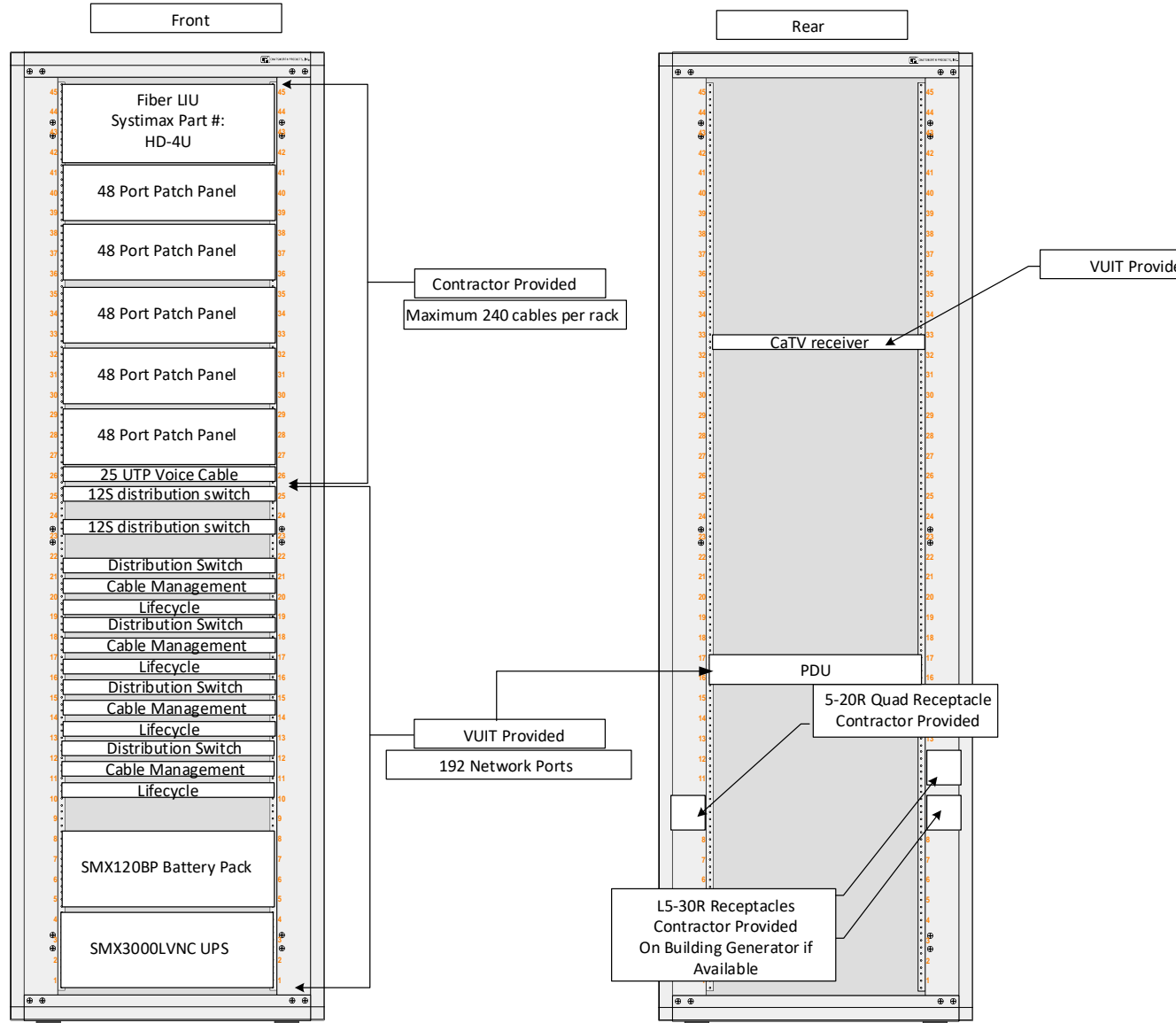
11.0 FIRE STOPPING

- 11.0 Installer shall seal all communications penetrations in accordance with the National Fire Protection Association (NFPA), the National Electric Code (NEC) and EIA/TIA 569 standards.**
- 11.1 Abesco CT120 Cable Transits are the preferred method for cable sleeve penetrations through fire rated barriers.**
- 11.2 Fire rated pillows/putty shall be used to seal all cable tray and conduit penetrations through fire rated barriers.**
- 11.3 Use of acoustic putty, concrete or any other non-pliable fire/smoke barrier is prohibited.**



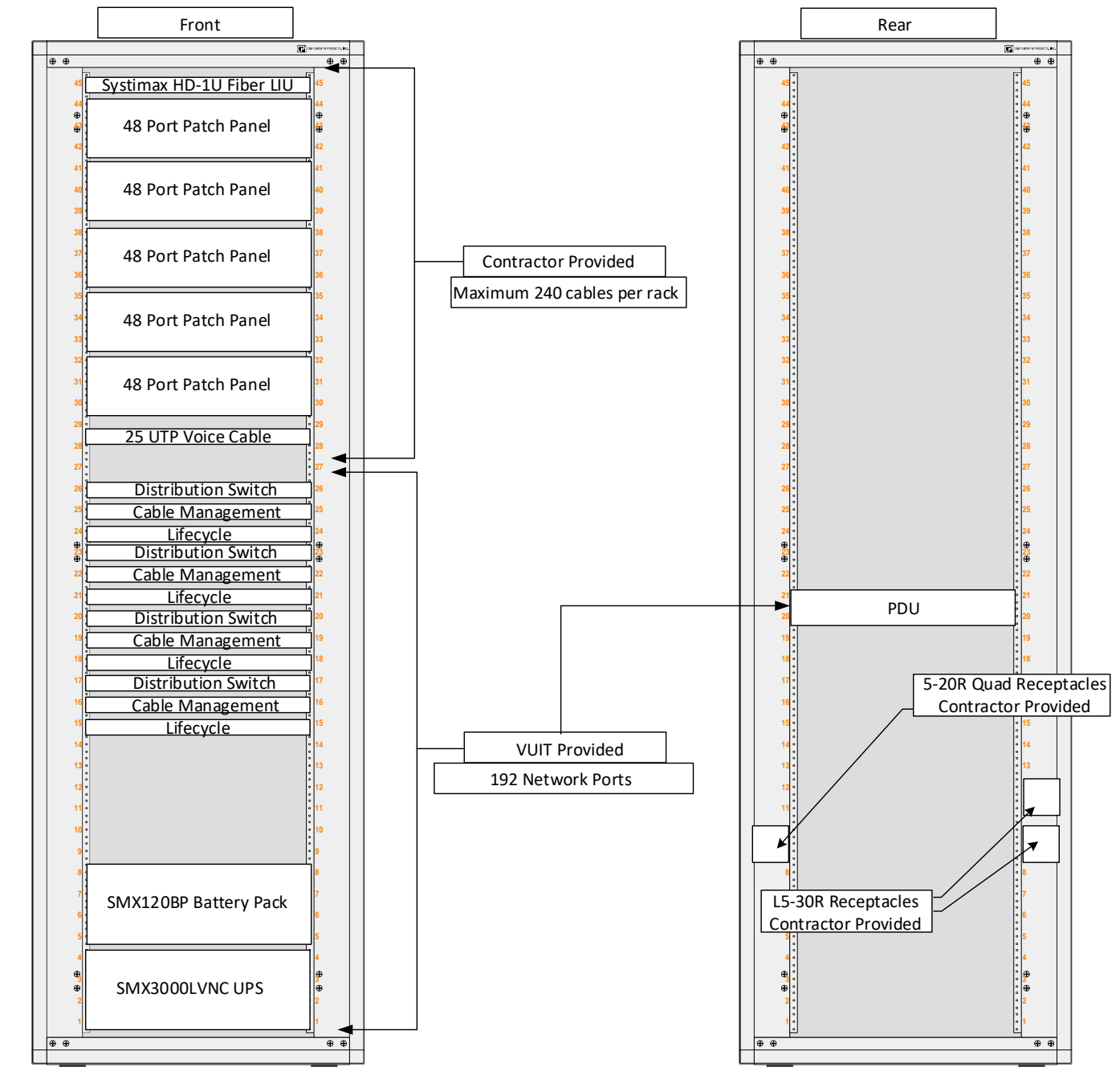
APPENDIX A: Racks

Typical Building Equipment Room Rack Layout



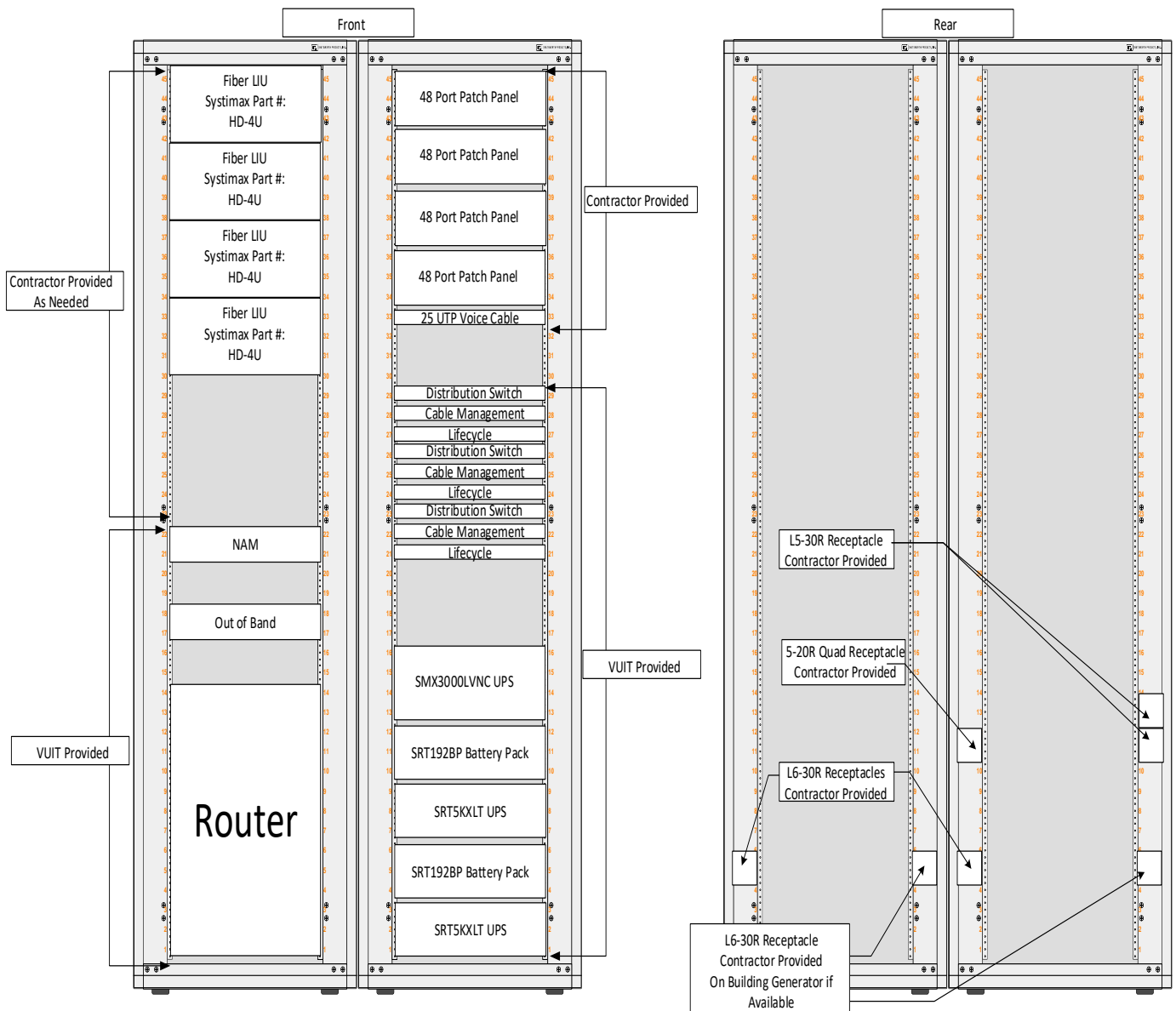


Typical Communication Equipment Room Rack Layout





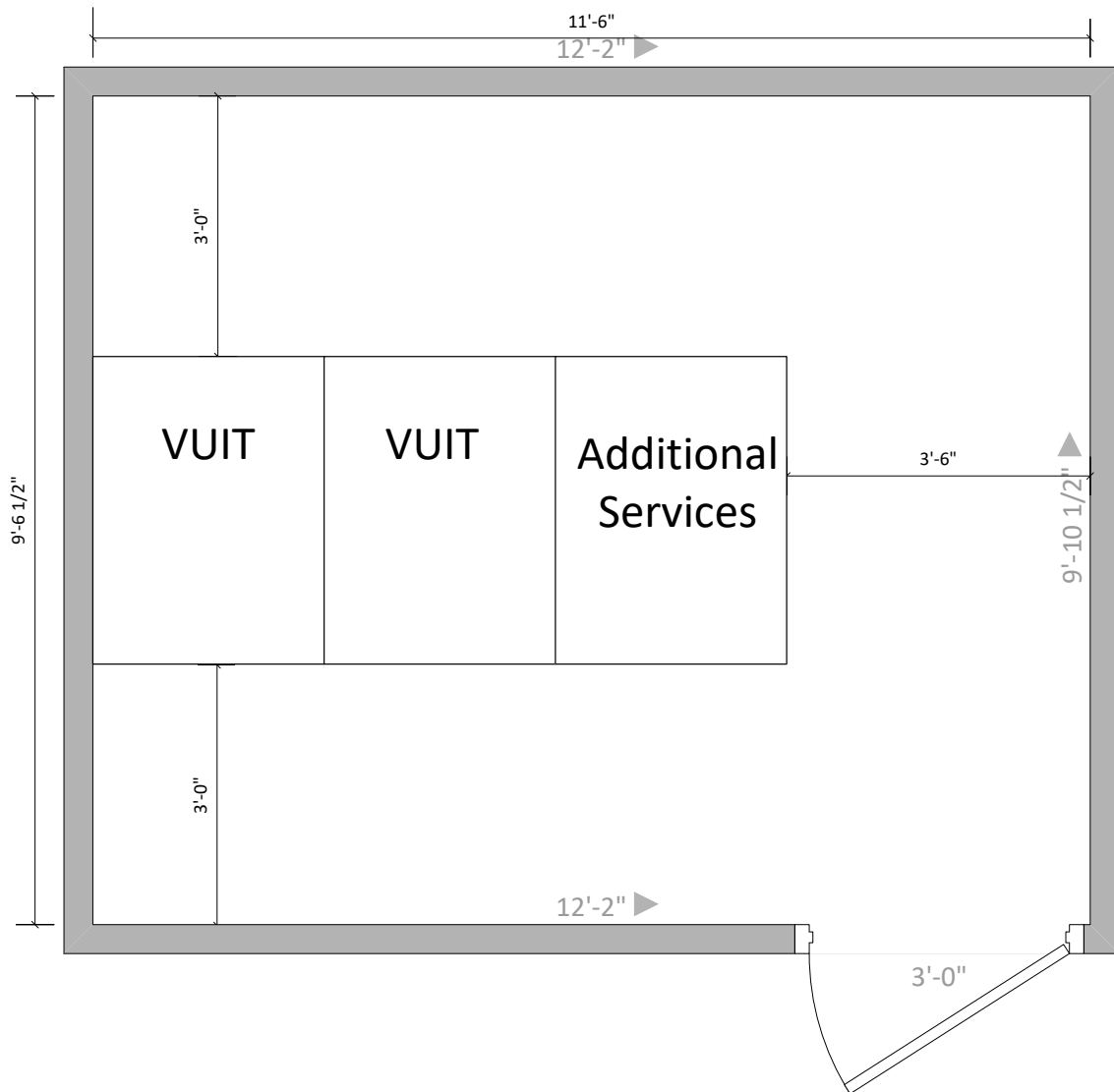
Typical Core Distribution Room Rack Layout

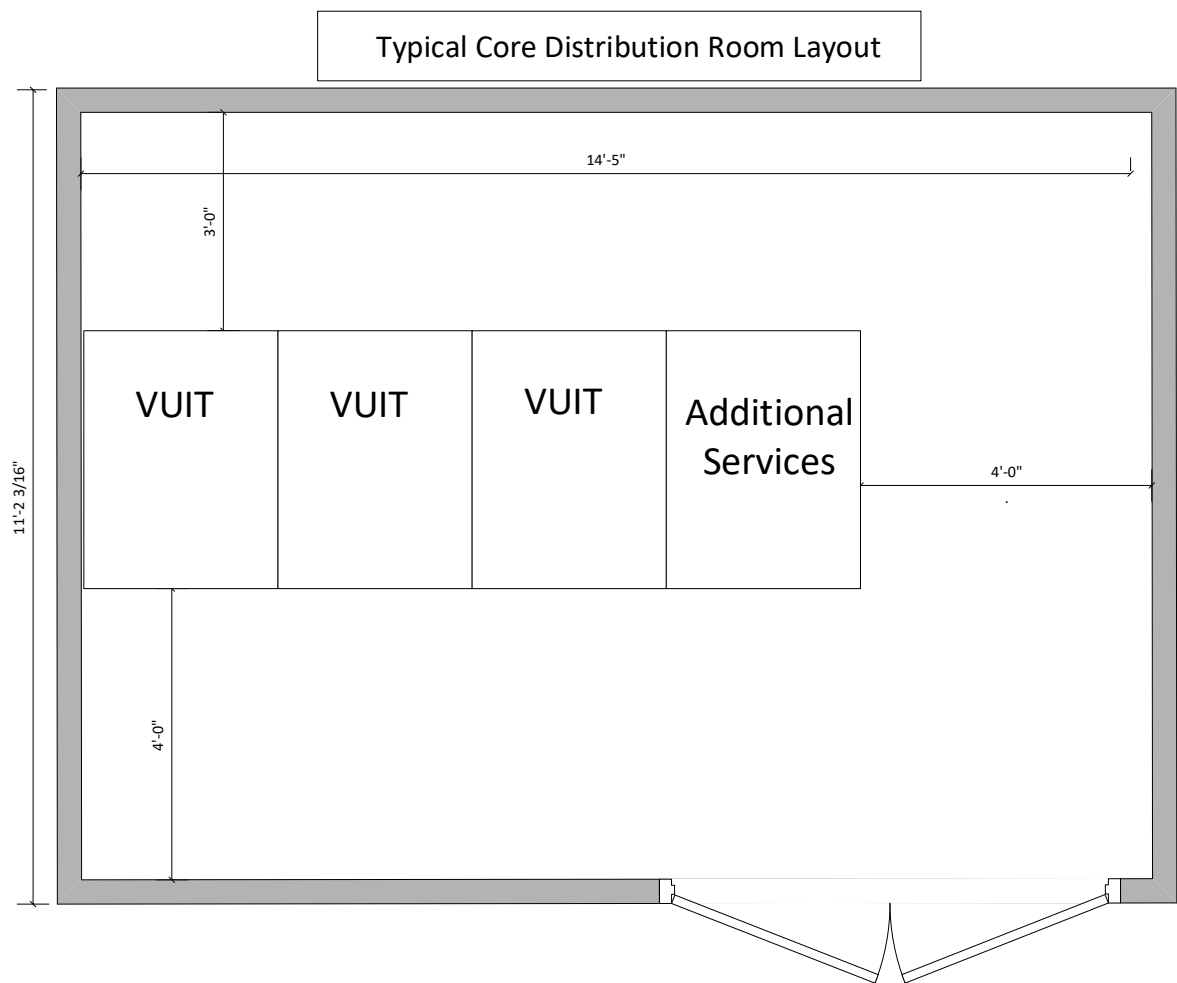




APPENDIX B: Room Layout

Typical BER/CER Layout





**APPENDIX C: Material List****Horizontal Cabling**

DESCRIPTION	PART NUMBER
Systimax (1071) NON-PLENUM, CAT 6, 4-pair Yellow	1071E YL
Systimax (1091) NON-PLENUM, CAT 6A, Green	1091B GR
Systimax (2071) PLENUM, CAT 6, 4-pair Yellow	2071E YL
Systimax (2091) NON-PLENUM, CAT 6A, Green	2091B GR
Systimax (MGS400BH1-123) Gigaspeed CAT 6 Insert	MGS400BH1-123
Systimax (MGS600-226) CAT 6A Insert - green	MGS600-226
Systimax (360-MOD-1U-24) 360 UTP Modular 24 port panel CAT 6A	360-MOD-1U-24
Systimax CAT 6A Patch Panels (360-PM-GS6-2U-24) 24 Port CAT 6A	360-PM-GS6-2U
Systimax CAT 6A Patch Panels (360-PM-GS6-2U-48) 48 Port CAT 6A	360-PM-GS6-2U-48P
Systimax (M101SMB-B-246) single port surface box ivory	M101SMB-B-246
Systimax (M102SMB-B-246) dual port surface box ivory	M102SMB-B-246
Systimax (M104SMB-B-246) quad port surface box ivory	M104SMB-B-246
Systimax (M10L-246) ivory Single faceplates	M10L-246
Systimax (M12L-246) ivory Dual faceplates	M12L-246
Systimax (M14L-246) ivory Quad faceplates	M14L-246
Systimax (M14SP) Stainless Quad faceplates	M14SP
Systimax (M10LW-246) Ivory Wall Phone Plate	M10LW-246
Systimax (M10LW-STAINLESS) Stainless Wall Phone Plate	M10LW-STAINLESS
Systimax (M81C-B) Coax Video Insert	M81C-B
Systimax (M106FR2-246) Adapter	M106FR2-246
Systimax (360-PM-GS3-48) 48 port patchmax patch panel	360-PM-GS3-48
Systimax (360-PM-GS3-24) 24 port patchmax patch panel	360-PM-GS3-24
Systimax CAT 6 Patch Panels (360-PM-GS3-2U) 24 Port CAT 6A	360-PM-GS3-2U
Systimax CAT 6 Patch Panels (360-PM-GS6-2U-48P) 48 Port CAT 6A	360-PM-GS3-2U-48P
Systimax (M20AP-246) blank modules 100pk	M20AP-246

**CER/BER Build-Out**

DESCRIPTION	PART NUMBER
CPI TeraFrame Open Frame Cabinets	NF0J-200N-C40-1
CPI Megaframe Vertical Manager 12465-707	12465-707
CPI Rack Busbar 10610-019	10610-019
CPI 6" Vertical Wire Manager 30162-703	30162-703
CPI 4" Vertical Wire Manager 30161-703	30161-703
Middle Atlantic (MK-19-45) Equipment Rack	MK-19-45
Panduit 2-hole ground connectors - LCCX6-14A-L	LCCX6-14A-L
Panduit Ground Bar - GB2B0306TP-1	GB2B0306TP-1
6" Metal D-rings	Generic
Panduit (HLS-15RO) Velcro 3/4" x 15' Roll	HLS-15RO
Junction Splice Tee Kits 11302-701	11302-701
CPI Butt Splice Kit Kits 11301-701	11301-701
CPI Ladder Racking 12" - 10250-712	10250-712
CPI Ceiling Support - 11310-003	11310-003
CPI 12" wall Bracket 12" - 11421-712	11412-712
CPI Radius Drops - 12100-710	12100-710
CPI 24" Ladder Racking- 10250-724	10250-724
CPI 18" Ladder Racking- 10250-718	10250-718
CPI 18" Triangle Brackets - 11746-718	11746-718
CPI 24" Wall Brackets - 11421-718	11421-708
CPI 18" Wall Brackets - 11421-724	11421-724

**Intra-Building Fiber, Copper & RG11 Backbone**

DESCRIPTION	PART NUMBER
Commscope (Z-012-DS-8W-FSUBK) 12 Strand SM In/out	Z-012-DS-8W-FSUBK
Systimax 4U Fiber Shelf	HD-4U
Systimax 1U Fiber Shelf	HD-1U
Systimax (360G2 CARTRIDGE 6-LC-SM-BL) 6 Port SM LC Coupler Panel	360G2 CARTRIDGE 6-LC-SM-BL
Systimax SC SM non tunable connectors SFC-LCR-30-BL	SFC-LCR-30-BL
Belden 7999AP RG11 PVC Riser	7999AP
25 Pair ARMM	25 Pair ARMM
Maxcell between CERs 4" - 3 cell	MXC4003GR
Systimax 300 Pair 110 Block	110AA2-300FT
Systimax (1100GS3-24) 24 port patchmax patch panel	1100GS3-24

**Appendix D: Acronyms**

AhJ	Authorities having Jurisdiction
ANSI/TIA	American National Standards Institute/Telecommunications Industry Association
APC/LC	Angled Physical Contact/Lucent Connector
BER/CER	Building Equipment Room/Communications Equipment Room
BICSI	Building Industry Consulting Service International
FRTW	Fire Retardant Treated Wood
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OSP	Outside Plant
RCDD	Registered Communications Distribution Designer
TDMM	Telecommunications Distribution Method Manual
TGB	Telecommunications Grounding Busbar
TMGB	Telecommunications Main Grounding Busbar
UPC/LC	Ultra Physical Contact/Lucent Connector
UTP	Un-shielded Twisted Pair
VUIT	Vanderbilt University Information Technology



Appendix E: Approved Cabling Vendors

Beacon Technologies

1441 Donelson Pike
Nashville TN 37217
www.beacontech.net

Black Box

1010 Haley Rd
Murfreesboro TN 37129
www.blackbox.com

Boe-Tel TN Company

2948 Foster Creighton Dr
Nashville TN 37204
www.boetel-tn.com

Digital Group

913 Myatt Industrial Dr
Madison TN 37115
www.digitalgroupllc.com



Appendix F: General Contractor Expectations

Date: 4/21/2020
From: VU Information Technology
To: VU Campus Planning & Construction Contractors
Contact: John Giampaolo, VUIT Relationship Manager

The purpose of this document is to clarify the expectations of VUIT regarding the network data equipment rooms. To ensure a sound network infrastructure and institutional excellence, VUIT expects the equipment rooms to be Clean, Conditioned, Secure, and Complete. These requirements must be met before any network equipment will be installed. Care should be taken if a network equipment room is in or near a construction area to ensure equipment be protected from construction dust and debris.

For detailed information concerning Vanderbilt University's network requirements please find VUIT's standards located at <https://it.vanderbilt.edu/services/network/wiring-standard.php>

1. **Clean:** See section 8.3 of the University's wiring standard. Rooms should be free of any dust and debris; and the "final clean" must be completed before VUIT will install equipment.
2. **Conditioned:** See section 8.3 of the University's wiring standard for specification on environmental requirements
 - All controls and conditioning equipment should be installed and operating to manufacture's specification.
 - Any conditioning components passing through the equipment rooms should be completed before any networking equipment will be installed.
3. **Secure:** See section 8.4.10 of the University's wiring standard for specification on securing equipment rooms.
 - Locks must be installed and keyed to Vanderbilt University key number 1872, once secure access must be obtained through the Plant Operations key request process.
4. **Complete:**
 - All electrical outlets must be active and labeled. (see 8.2.1-6)
 - Plywood installed and painted. (see 8.4.5)
 - Doors must be installed, finished, and working properly. (see 8.4.7 or 8.4.8)
 - VUIT racks must be installed and bolted to the floor. (see 8.4.6)
 - Cabling must be routed to the rack location, with all supports and cable tray installed.
 - Grounding and bonding of racks and cabling trays must be complete. (see sec. 10)
 - Lighting must be installed and working. (see 8.4.9)
 - Floors must be installed and sealed. (see 8.4.4)
 - Fire extinguisher must be installed. (see 8.4.11)
 - All fiber and copper connections must be completed, tested, and certified. (see Sections 3, 4 & 6)



Appendix G: BER/CER Design Expectations

The purpose of this document is to provide architects and network system designers a high-level overview of VUIT's equipment room requirements. For detailed information on Vanderbilt University's network requirements please find VUIT's standards located at: <https://it.vanderbilt.edu/services/network/VUIT-NetworkInfrastructureStandard.pdf>

1. VUIT needs dedicated, separate rooms in which to place networking equipment. These room should have vertical and horizontal accessibility in order to access all areas of the building.
2. Each rack located in an equipment room may house 240 cables. If there are >240 network cables, then additional racks will need to be installed.
3. One (1) additional rack needs to be installed above the racks necessary, this rack is for additional services.
4. Current rack dimensions are 32" x 42"x 78".
5. The racks must have a minimum of 3 feet of clearance on 3 sides. See drawing; page 2.
6. A minimum of two (2) racks are to be installed in equipment rooms
7. Provide for each rack to have one (1) 5-20 quad receptacles and two (2) L5-30 receptacles.
8. Network cabling should by a maximum of 285 feet from the equipment room to network outlet.
9. Equipment room should be accessible through a hallway or corridor.
10. If possible, the equipment rooms need to be vertically stacked.
11. Equipment rooms can be located on alternate floors, provided the cabling distance stays within the 285 feet maximum.
12. All equipment rooms require a dedicated HVAC system; this system should be able to maintain a temperature range of 64 to 75 degrees and have a dedicated system control located within the equipment room.
13. If possible, please avoid using the communication room as a pass through for plumbing, fire sprinkler systems or HVAC needs.
14. Space requirement only address VUIT needs, if additional low voltage is to be housed within the equipment room then the space needs of the additional services will need to be addressed and extra space may be required.

