Contents (MU and UMSL Campus)

1. Telecommunications Rooms

1.1. Main Telecom Room

1.1.1. There shall be a main telecommunications room in which the telecommunications service entrance facilities are housed and where the backbone cables in the building connect to the service entrance cables.

1.1.1.1. For UMSL campus, there shall be redundant/divergent backbone cabling to the main telecommunications room. Backbone cables should enter the building in separate penetrations located as far from each other as possible with each having a divergent path to the main telecommunication room.

1.1.2. The location of the main telecommunications room must be based on detailed information about the building and the site. The location of the main telecommunications room has a significant impact on all other aspects of telecommunications distribution design. The three main considerations of telecommunications room location are: 1) OSP conduit access into the building; 2) access to cable pathways; 3) horizontal data cabling distance limitations 90 meters (295 feet).

1.1.3. The main telecommunications room should be located on an outside wall at or near the location of the conduit penetration into the building. The best location for horizontal cabling is mid-building. A compromise between these two will locate the main telecom room.

1.1.4. If the main telecommunications room is not located at the conduit entrance point, EMT or rigid metal conduit shall be extended from that point into the main telecommunications room with appropriate sized pull boxes, not exceeding 150 feet and no more than two 90°bends. Conduit must be grounded at both ends with a #6 stranded conductor, not attached to the closest point in the service grounding electrode system.

1.1.5. When referring to the nearest telecommunications room in the building, it shall be defined as the nearest telecommunications room on the same floor as the location being discussed.

1.2. Telecom Room Location and Size

1.2.1. In order to better utilize electronic equipment, the number of telecommunications rooms should be minimized. This is limited by the maximum length of 90 meters (295') for horizontal cable runs.

1.2.2. Telecommunications rooms shall be accessible from common areas and not from occupied space.

1.2.3. Telecommunications rooms should be vertically stacked (in multi-floor buildings) and must be sized according to the services provided from each telecommunications room based in the following guidelines. Please note that square feet requirements as well as room configuration should be decided taking rack clearances into consideration.

1.2.4. Please note that square footage specifications take into account the space needed for voice, data, security, and CATV services, while rack clearances listed in the following (rack clearance) chart cover clearances needed for data services.

Number of data drops	# of Racks (MU)	# of Racks (UMSL)	Space Required
1 - 144	1	1	9'x6' | 9'x6'
144 - 288	2	1	9'x8' | 9'x6'
193 - 384	3	2	9'x10' | 9'x10'
385 - 576	4	2	9'x12' |9'x10'

Rack clearances:

Item	Clearance (MU)	Clearance (UMSL)
Rack foot print	20"x24"	20"x24"
Front	36"	36"
Rear	36"	36"
Sides (between racks)	6"	12"
Exterior Side	36"	36"

1.2.5. There should be one telecommunications room on each floor unless the total number of outlets in the building is less than 150. For buildings with less than 150 total data drops, all outlets may be consolidated into one room as long as the distance limitation of 90 meters is not exceeded. (For UMSL campus, consolidate telecommunications room to maximum extent regardless of total data drops as long as the distance limitation is not exceeded.)

1.3. Telecom Room Environment

1.3.1. Note #1 shows the location of a dedicated L5-30 circuit per rack. A L5-30 using emergency power is also required if available per rack. All outlets near 18" AFF.

1.3.2. HVAC needs to be conditioned to the same standards and the occupied areas in the building. This temperature and humidity need to be maintained 24/7/365.

Environmental Factor…	**Requirement…**
Temperature Range	18°C to 24°C 68°F to 75°F
Humidity Range	30 percent to 70 percent relative
Air Quality	Filtration systems may be

	required to minimize particle levels in the air

1.3.3. A 12,000 BTU heat load per rack should be used for calculations.

1.3.4. Lighting shall be 2' x 4' LED troffers (or similar fixture used in similar spaces in the building) located on each side of the racks, parallel with the rack. A minimum 500 lx (50 foot-candles) measured 3 feet above the floor. Lights should be mounted at 8'5".

1.3.5. Access door shall be 3 feet wide by 7 feet high and should open outward. For rooms where the door opens inward, the room shall be sized larger in order to provide for lost useable square footage.

1.3.6. ¾ inch AC grade plywood shall be securely fastened to all 4 supporting walls. Painted with a light color. Fire retardant paint shall be used.

1.3.7. No ceiling in the telecom room.

1.3.8. Flooring should be sealed concrete or tile.

1.3.9. No surface mounted electrical conduit should be used.

1.3.10. A 2"x6"x ¼" minimum grounding buss bar connected to the building grounding system specified by ANSI/TIA-607-B. Mounted near the rack.

1.3.11. 6 standard electrical outlets spaced around the room at 18" AFF.

1.3.12. All telecom rooms will be locked. Plumbing supply and drain lines are not allowed in the space.

1.3.13. A pre-action double interlock fire sprinkler system should be used in telecom rooms if possible to protect equipment.

1.3.14. Electronic card access is needed for telecom room security and access.

2. Building Wiring System Design

2.1. General Information

2.1.1. Construction projects for new buildings and major renovations shall include costs for wiring/re-wiring per the standards indicated.

2.1.2. Division of IT will work with consultants on the following issues:

2.1.2.1. Telecommunications room sizes, locations, and quantities

2.1.2.2. Vertical risers, spaces, and cabling

2.1.2.3. Horizontal pathway and spaces

2.1.2.4. Horizontal cable and connecting hardware

2.1.3. Except for pathway construction, Division of IT will provide all material and equipment. This includes cable, voice/data/catv outlets and faceplates, equipment racks, and electronic equipment and all miscellaneous hardware at

MU campus. At UMSL campus, the Cisco switches and UPS are provided by Owner, the contractor shall purchase all other required equipment.

2.1.4. The contractor will install owner-provided cable at **MU campus**. At UMSL campus, the contractor installs contractor provided cable.

2.1.5. Project design shall call for adequate backbone conduits between telecommunications rooms. Conduit size and quantity shall be dictated by the size, type and quantities of the cables to be installed but preferred not to be less than four (4) inches in diameter.

2.1.6. Cables do not need to be labeled by the contractor at **MU campus**.

2.1.7. Division of IT will terminate, label and test all cabling and install all electronic equipment **at MU campus**. At UMSL, the contractor does this.

2.1.8. Cat6A shall be installed directionally from the telecom room outward.

3. Horizontal Pathways and Spaces

3.1. General Information

3.1.1. To avoid electromagnetic interference (EMI), all pathways shall provide clearances of at least 4 feet from motors or transformers, 1 foot from conduit and cables used for electrical power distribution, 5 inches from fluorescent lighting.

3.1.2. Ensure construction drawings include details for all the proposed firestopping systems that could be encountered on the project based on the construction type and rating of the assemblies being penetrated. A specific Division 27 firestopping spec can be inserted, or reference related section 078400 for details.

3.1.3. Horizontal Pathways

3.1.3.1. Pathways must support cables and provide protection. Pathways should be planned to facilitate original installation as well as ongoing maintenance, additions, and relocations.

3.1.3.2. Conduit, trays, or other pathway hardware are to be used above the ceilings. Appropriate design of horizontal pathways should accommodate the hanging of cables loosely above suspended ceilings requires appropriate hardware (J-hooks, rings, etc.). Support hardware must not have sharp edges.

3.1.3.3. Cable trays should have twelve (12) inches of clearance above the tray. The designer should ensure that other building components (e.g., lighting fixtures, structural supports, air ducts) do not restrict access to the cable tray.

3.1.3.4. Cable routing, support, and sealing of penetrations must meet applicable UMC codes.

3.1.3.5. EZ Path series 44 fire wall sleeves are requires where a cable tray path crosses a firewall. The quantity of EZ Path series 44 fittings will equal the capacity of the cable tray, not just the initial cabling demands.

3.1.3.6. Conduit, cable tray, and J-hooks will be designed to allow a 40% growth.

3.1.3.7. Hanging cable supports must be no more than 5 feet apart as the installed cable must exhibit some sag in hanging. This provides visual evidence that cable tension is within 25 pounds as required in EIA-568-A.

3.1.3.8. Bundles of cables supported by typical J-hooks should not be larger than 50 cables, unless additional support is provided.

3.1.3.9. Horizontal pathway design should take into consideration the horizontal cabling distance limitations of 90 meters (295 feet) from the telecommunications room to the outlet.

3.1.3.10. When conduit is used, sections of conduit shall be no longer than 150 ft and must not have more than or the equivalent of 270° bends between pull points or pull boxes.

3.1.3.11. Conduit inside bend radius must be:

Conduit size…	**Bend radius…**
2" or less	Six times the inside diameter
More than 2"	Ten times the inside diameter

3.1.3.12. Pull boxes should be placed directly after a bend or sized accordingly if the pull box is located at the bend.

3.1.3.13. Conduit fill limits must be followed to avoid over-packing cables:

Conduit Size…	**# of cables…**
1"	3 cables max
1-1/4"	4 cables max
1-1/2"	6 cables max
2"	12 cables max
3"	20 cables max

3.1.3.14. At a minimum, 1" conduit shall be extended from the outlet location box into the ceiling for entrance into the building cable distribution system. The conduit should turn 90° then bushed. This conduit must terminate before passing through a fire rated wall.

3.1.3.15. Outlet boxes shall be 4" x 4" x 2½" and shall have plaster rings to accommodate a 2" x 4" faceplate. A sample faceplate will be provided

upon request. Joint power and telecom boxes are not allowed, even with separation.

3.1.3.16. Outlet boxes must be specified for all openings including walls, systems furniture, wiremold, etc. When using wiremold a WIREMOLD brand model 5744S outlet box (or approved equal) must be provided.

3.1.3.17. Dual channel raceway such as Wiremold 4000 a decora (GFCI) style device plate opening.

3.1.3.18. When possible, outlet locations should be placed above the work surfaces for easy access. Outlet boxes built into the floor are not recommended.

3.1.3.19. Cabling shall be supported above drop ceiling completely by cable tray or J-hooks.

4. Backbone Cable Design

4.1. Twisted pair copper cable, fiber, and coaxial backbone cabling and connecting hardware shall be installed in accordance with the requirements of the building.

4.1.1. A hybrid 12 strand multi-mode and 12 strand single-mode fiber will be installed between the main telecommunications room and all other telecommunications rooms.

4.1.2. Copper coaxial cable and the appropriate connecting hardware will be installed as required for current or future CATV services.

4.1.3. Copper twisted pair will be sized for the building needs.

5. Work Areas

5.1.1. General Requirements

5.1.1.1. Current standards call for installation of two CAT6A cable for data and voice at each outlet location. Ethernet is the supported protocol for data applications.

5.1.1.2. On a case-by-case basis, Division of IT will work with the owner to design/install multi-mode fiber to the desk-top.

5.1.1.3. Building areas not designed as office space shall be designed according to the occupant's requirements. This includes areas such as labs, conference rooms, lobbies, etc.

5.1.1.4. End-user voice/data outlets should be located within 3 meters (10 feet) of the work area or possible work areas.

5.1.1.5. Electrical outlets should be placed near data outlet locations.

5.1.1.6. Copper coaxial cable for use in classrooms, labs, office space, etc. will be installed only upon request of the owner.

5.2. Office Space

5.2.1. All office space shall be designed with three (3) data outlets for on two opposite walls. Cubicles or enclosed office areas with less than 150 sq. ft. shall have at a minimum two data outlets.

5.3. Classrooms

5.3.1. All classrooms shall be designed with a minimum of four (4) data outlets.

5.3.2. CATV outlets in classrooms shall be installed as required by the owner.

5.4. Auditoriums

5.4.1. All auditoriums shall be designed with a minimum of three (3) data outlets at the front stage area and the same in the rear "control room" if such a room exists.

5.4.2. At least one (1) copper coaxial cable, for CATV service, will be installed in every auditorium. Additional outlets in auditoriums will be installed upon request.

5.5. Systems Furniture

5.5.1. Systems furniture should be designed/ordered with electrical and telecommunications wiring requirements in mind. Panels that cover wall outlets are not permitted.

5.5.2. Separate power poles should be provided to separate voice/data wiring from electrical wiring, or physical separators must be provided within the pole.

5.5.3. Voice/data wiring should be accommodated within the "top-cap" of the furniture. If the top-cap cannot be used, physical separation of voice/data and electrical cables in the base of the panels is required.

5.5.4. The outlet box should be integrated within the furniture above desktop level.

5.5.5. It is not recommended to have cabling enter systems furniture panels through floor access boxes.

5.6. Wireless Access Points

5.6.1. Wireless access points require one data outlet terminated above the accessible ceiling with a ten (10) foot slack coil.

5.6.2. Spacing of the wireless access points should be based on a 25-foot grid for patient care facilities or high capacity areas.

5.6.3. Spacing for other areas should be based on a 45 foot grid pattern.

5.7. Alertus Devices

5.7.1. Shall be installed:

5.7.1.1. In public areas where people can gather without computer access.

5.7.1.2. In common gathering areas outside classrooms that have less than 100 seats.

5.7.1.3. In large classrooms of 100 seats and larger. Located inside the classroom at the teaching wall.

5.7.1.4. Public areas, not near the entry way of a building. Not visible from the exterior of the building.

5.7.1.5. In all E&G buildings.

5.7.1.6. Installed at 56" AFF with a double gang box.

5.7.1.7. With one data cable.

5.7.1.8. Not required in secure facilities.

5.7.1.9. **MU campus** - Installed by DoIT. UMSL campus – Installed by contractor.

5.8. Security Cameras

5.8.1. Shall be installed:

5.8.1.1. In areas to capture the front view of people entering and exiting a building.

5.8.1.2. In areas leading to connected buildings capturing the front view of people entering and exiting.

5.8.1.3. Exterior cameras will cover student gathering areas.

5.8.1.4. Exterior cameras will be installed in a flush 2x4 electrical box.

5.8.1.5. Interior cameras will be terminated on a jack above the ceiling or in a flush 2x4 box depending on the ceiling type.

5.8.1.6. Network based by DoIT for Campus and Hospital Security for the Hospitals and Clinics.

5.8.1.7. With one data cable to the local telecom room.

5.8.1.8. In all E&G buildings.

5.8.2. More cameras can be added at the customer's request and expense.

6. Cabling Installation and Distribution

6.1. Cable Type, Source of Materials, and Assignment of Tasks.

6.1.1. All vertical and horizontal in-building cable shall be plenum rated.

6.1.2. All cable will terminate in a telecom room on the same floor as the outlet.

6.1.3. Division of IT will install all backbone cable and perform terminating and testing of such facilities.

6.1.4. **(MU only)** The contractor shall install owner provided cabling as specified for the project. The Division of IT will terminate and test all contractor

installed cabling. Division of IT will provide all materials including cable, connecting hardware, terminals, equipment racks, etc.

6.1.5. The contractor/installer shall consider the following critical installation practices when installing telecommunications cabling.

6.1.5.1. Physical separation from all sources of EMI is critical. Sources of EMI include but are not limited to: motors, transformers, copiers, construction equipment, and branch circuit power cables. Cabling that leaves physical pathways and extends into office areas must not lay on fluorescent lighting.

6.1.5.2. Conduit or other raceway pulling tensions should be minimized using suitable equipment and practices.

6.1.5.3. Cables must not lie on or be suspended from suspended ceiling support wires or frames.

6.1.5.4. Eliminate cable stress caused by tension in suspended cable runs. Cables must exhibit some sag in hanging between supports. Hanging supports, such as J-hooks, must be within 5 feet of each other.

6.1.5.5. Cables bundles should not be larger than 50 cables and shall not be tightly cinched together. Tie wraps must be hand tightened without tools. Cables must never be twisted.

6.1.5.6. Installations of CAT6A cable should have bend radii less than six (6) times the cable diameter. For fiber optic cable, the minimum recommended bend radius is ten (10) times the cable diameter, twenty (20) times the cable diameter if loaded.

6.1.5.7. Cables shall not be spliced under any circumstances. Damaged or broken cables must be completely replaced or decommissioned with a label attached at both ends.

6.1.5.8. Conduits should not be daisy chained together.

6.1.5.9. Provide adequate slack at both ends to accommodate terminations:

Location…	**Slack length…**
Outlet	12 inches
Telecom Room	10 feet past termination point

7. Special Considerations for Patient Care Facilities

7.1. Patient care facilities require a higher standard of network service and reliability than other areas. The following is a guide to achieve this level.

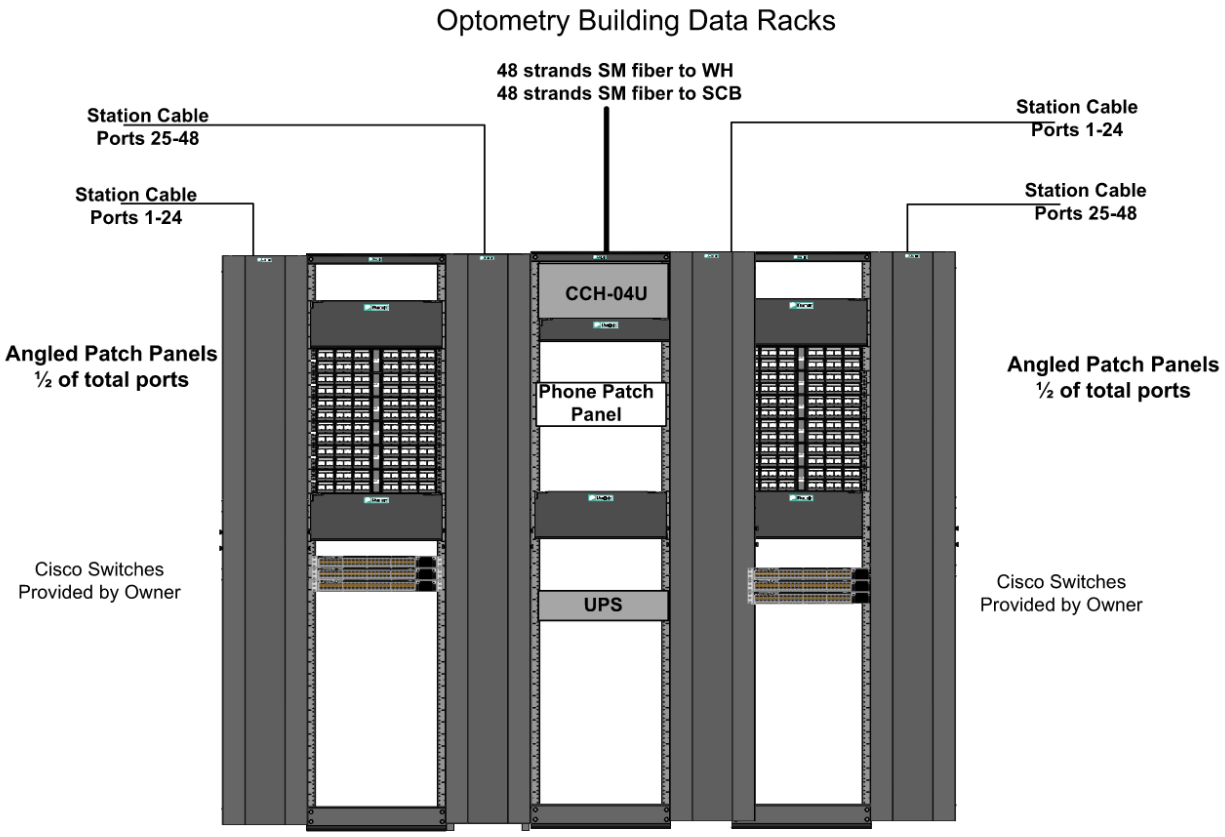
7.2. 1-1/4” conduit minimum for outlet boxes.

7.3. Spacing of the wireless access points should be based on a 25 foot grid for patient care facilities or high capacity areas.

7.4. Proximity sensors and door signs require three (3) data outlets terminated above each door in the facility six (6) inches above the ceiling tile in a standard flush wall box.

7.5. Electronic card swipe access is required for telecom room security.

UMSL EXAMPLE OF DATA RACK INSTALLATION



Parts List
Qty 3 Panduit CMR19x84 Panduit
Qty xxx CPPLA48WBLY (angled patch panel, quantity as needed)
Qty xxx Panduit CJ6X88TGWH data jack (quantity as needed)
Qty 4 Panduit PEV12 (High capacity vertical manager with doors)
Qty 5 Panduit NCMHAEF4 (High capacity horizontal manager)
Qty 1 Panduit NCMHAEF2 (horizontal manager, 2U)
Qty 1 Corning CCH-04U fiber enclosure with 8 Corning CCH-CP12-A9 adapter panels
Qty 1 Shelf unit (Hoffman ESHDV19)
Qty 1 APC UPS + Batter pack (SMX1500RM2U, SMX48RMBP2U, AP9361)
Qty 1 APC Metered PDU AP7800

Final layout of data racks should be coordinated with Owner.

Note: The first data port of each floor should start on a new 48 port panel.