

PART 1 - GENERAL

1.1 OVERVIEW

- A. This Design Guideline Element includes design standards and requirements for telecommunications service and distribution. This is a design standard and is not intended to be used as a specification.
- B. The institution-wide standards for structured premise wiring on low voltage cabling applications, outlined in this document, are designed to bring all of The University of Texas MD Anderson Cancer Center (MD Anderson) facilities into compliance with industry-wide standards and are based on the latest ANSI/TIA Cabling Standards for commercial buildings. Its goal is to cost effectively accommodate future generations of higher-speed networks while maintaining complete compatibility with the current data and voice technology.
- C. This Design Guideline Element applies to all MD Anderson facilities and includes voice network and data network cabling.
- D. The MD Anderson Information Technology Project Manager will be the first point of contact for questions about non-standard telecommunications cable installations and will engage MD Anderson IT Engineering and IT Operations to review project drawings and specifications. All decisions will be based on MD Anderson user group's requirements and business needs.
- E. MDACC IT Project Manager to be included in design team meetings and the submittal review process overseeing product data.
- F. Refer to Part 5 – Definitions, for an explanation of terms used throughout this document.

PART 2 - DESIGN CRITERIA

2.1 GENERAL

- A. While every effort has been made to ensure that the following criteria are technically accurate and provide necessary site and personal safety, local conditions may require additional professional investigations, modifications, or safeguards to meet site, equipment, environmental, safety, or region-specific requirements.
- B. Design must meet international, federal, state, local, or other applicable codes, laws, or regulations.
- C. Air handling distribution requirements for Telecommunications Rooms shall be per Design Guideline Elements D3001 Load Calculation Criteria and D3041 Air Handling Distribution.
- D. Electrical power distribution requirements for Telecommunications Rooms shall be per Design Guideline Element D501001 Electrical System for Telecommunications Rooms.

2.2 ENTRANCE FACILITY / ENTRANCE ROOM (EF)

- A. The entrance facility consists of the telecommunications service entrance to the building, including the entrance point through the building wall, and continuing to the entrance room or

space. There may be more than one entrance facility depending upon the Project requirements. The entrance facility may contain the backbone pathways that link to other buildings in campus situations.

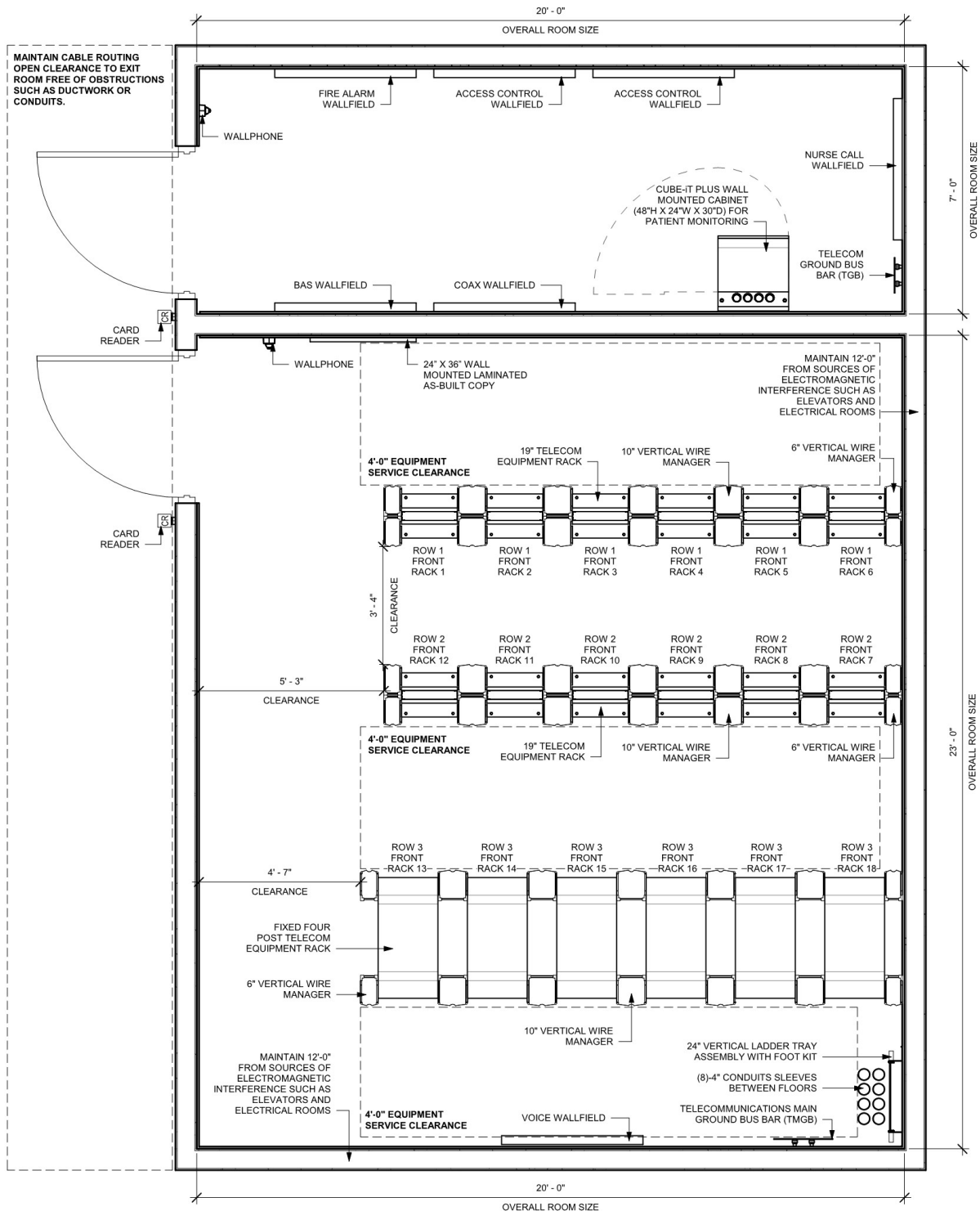
1. For new construction, MD Anderson requires diverse conduit entrances into the building especially in the case of health care facilities (e.g. hospitals, clinics).
 2. Consider the locations of other utilities, such as electrical, water, gas, and sewer, in the site selection of the entrance facility.
- B. In determining the total number of entrance pathways required, consider the following; type and use of building, growth, difficulty of adding pathways in the future; alternate entrance, dual redundancy and the type and size of cables likely to be installed.
1. The quantity and sizing of entrance conduits must be verified with the owner prior to laying out the pathway design. This will incorporate the owners plans for current and future needs.
 2. Building entrance conduits shall be planned to have a pull box immediately (within 5'-0") upon entering a building either below grade or above grade.
- C. The A/E must address the following design criteria for the entrance room:
1. Entrance conduits shall be provided for all possible present and future access providers.
 2. Adequate space shall be provided for provider owned equipment.
 3. All conduits shall be stubbed up to a minimum of 4-inches above finished floor.
 4. The entrance room shall be located in a dry area not subject to flooding and as close as practical to the backbone pathways.

2.3 TELECOMMUNICATIONS ROOM PLANNING

- A. Telecommunication Rooms shall be sized larger for healthcare facilities than those for office or commercial buildings. The IDR's shall be sized at 170 sq. ft. or larger for healthcare facilities (ANSI/TIA-1179-A). For planning purposes, please refer to the following Typical IDR Floor Plan and Elevation illustrations:

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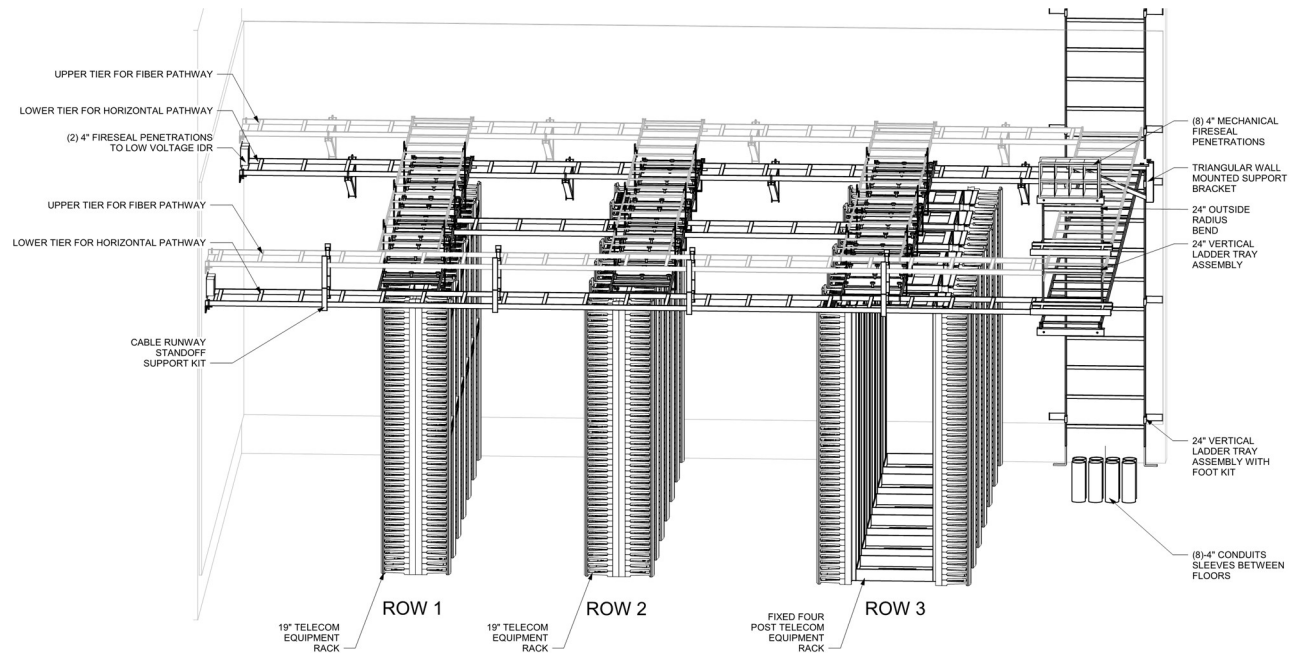
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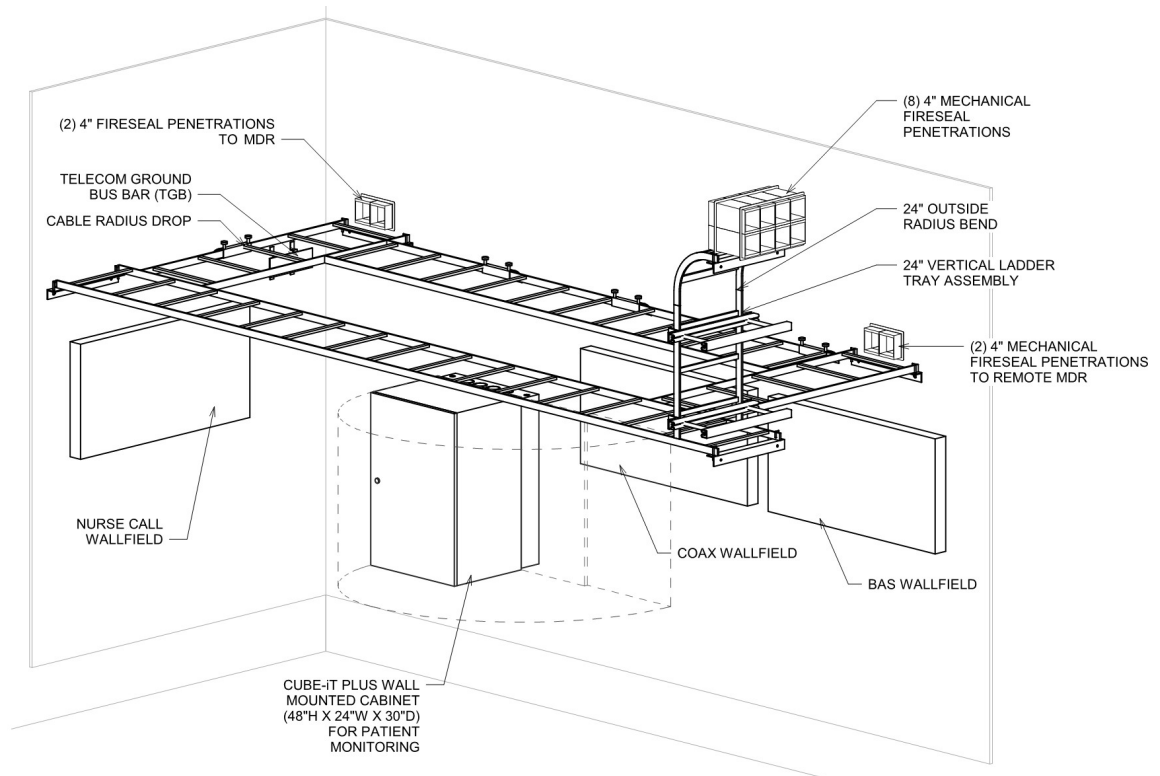
TYPICAL PLAN VIEW CAMPUS MDR/LOW VOLTAGE IDR

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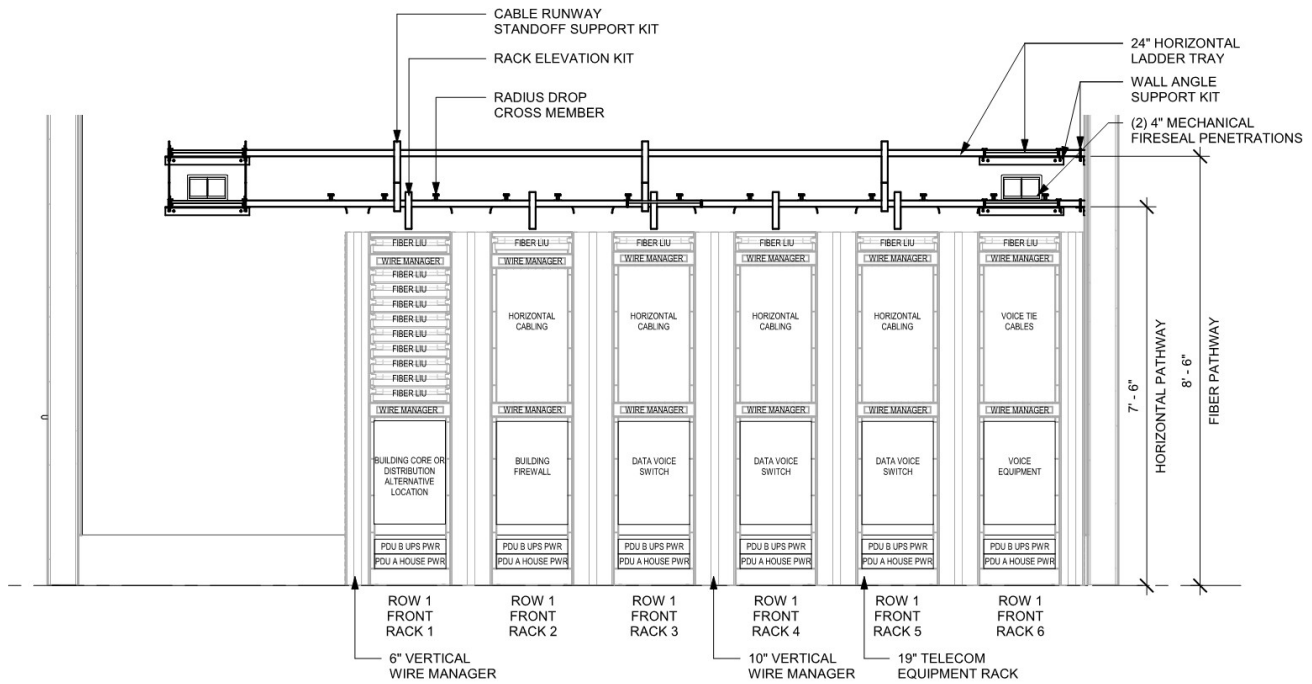
TYPICAL ISOMETRIC VIEW CAMPUS MDR



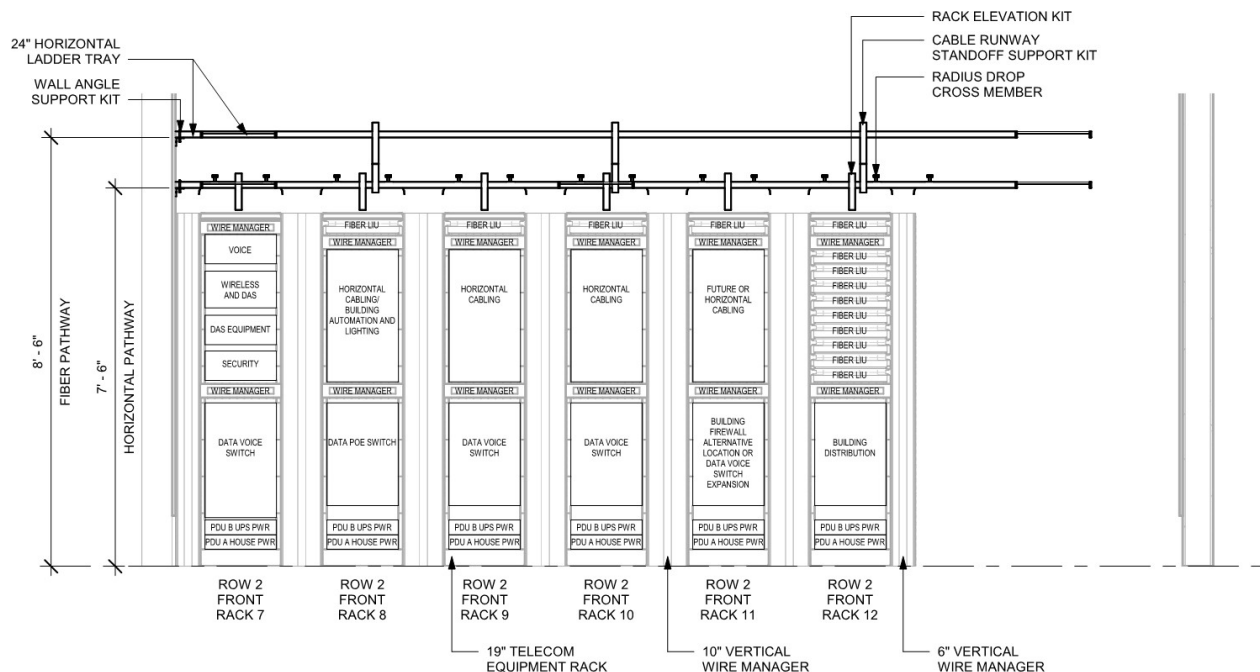
TYPICAL ISOMETRIC VIEW LOW VOLTAGE IDR

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TYPICAL CAMPUS MDR RACK ELEVATION ROW 1



TYPICAL CAMPUS MDR RACK ELEVATION ROW 2

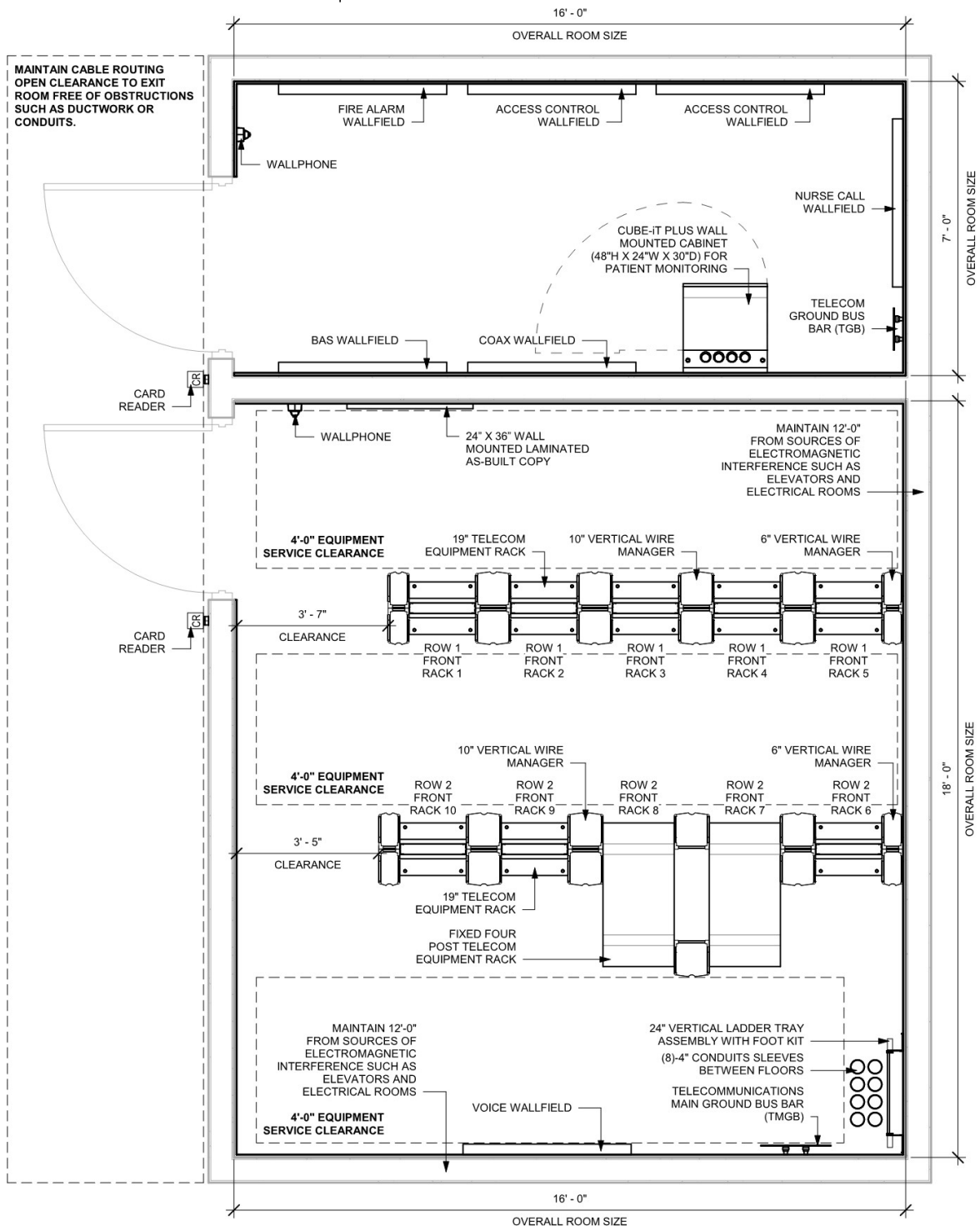
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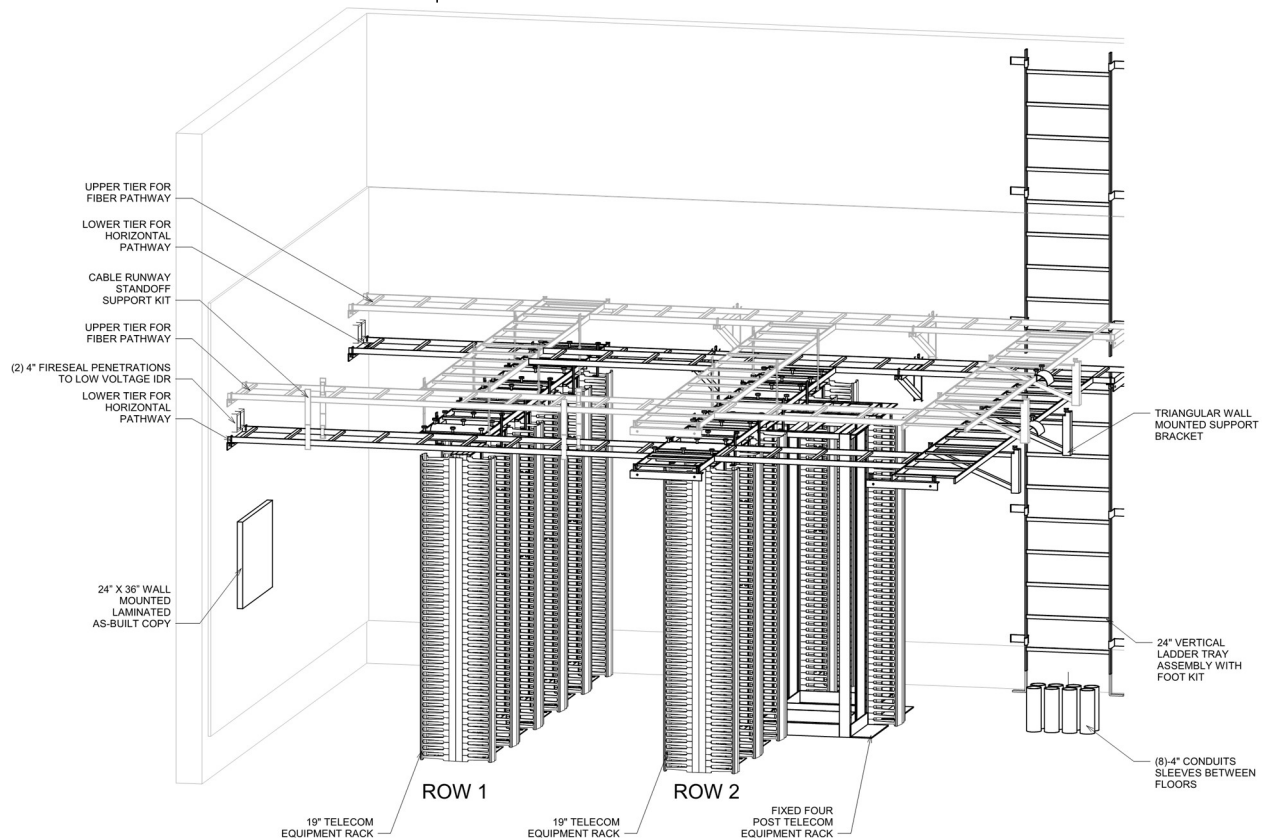


TYPICAL PLAN VIEW REMOTE MDR/LOW VOLTAGE IDR

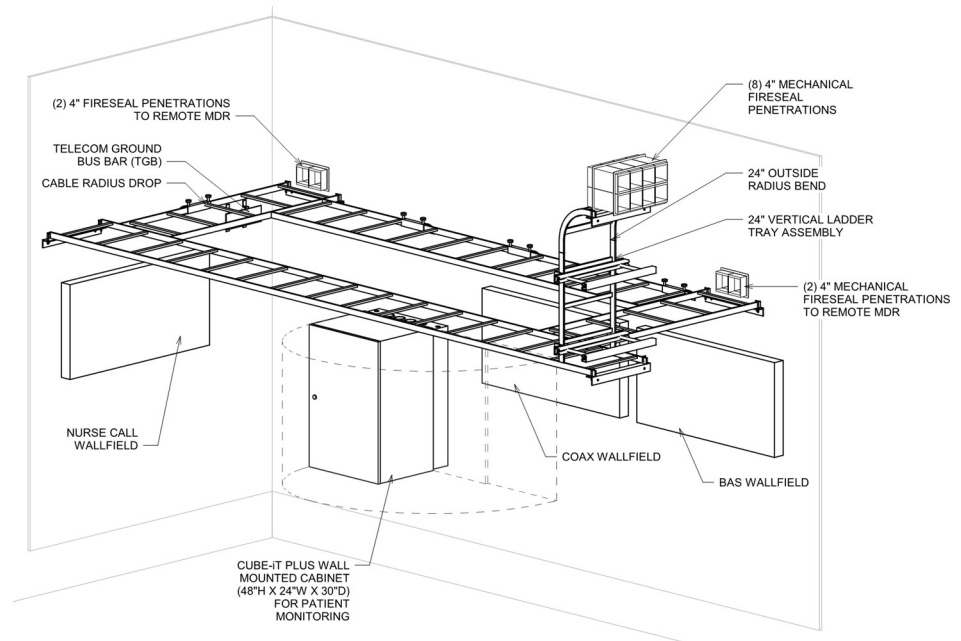
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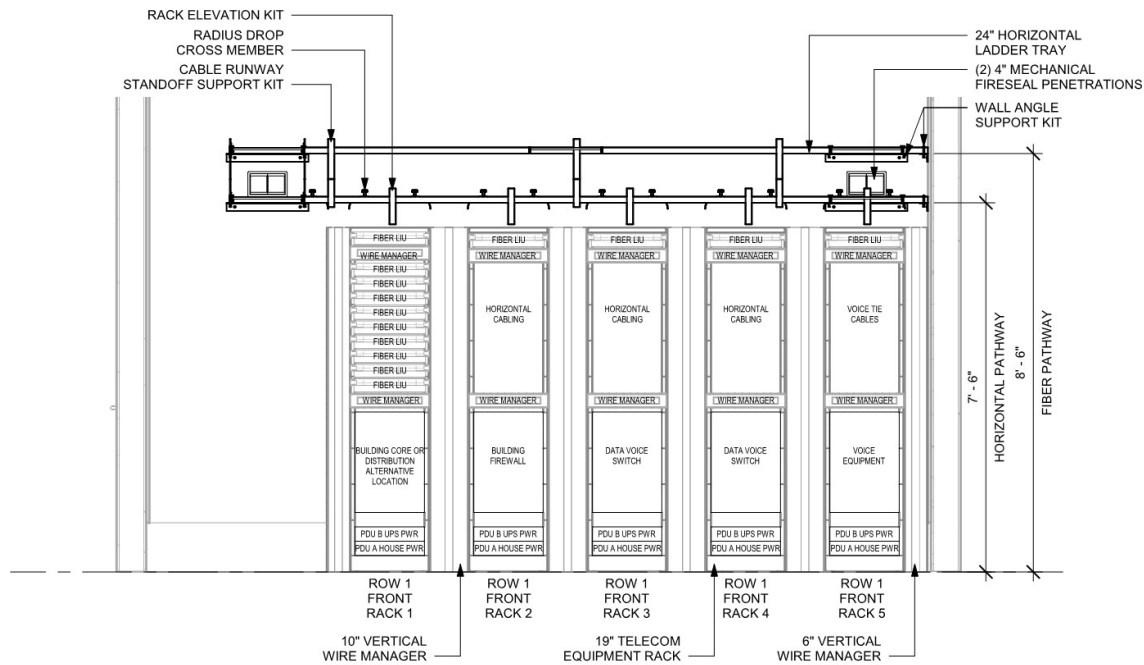
TYPICAL ISOMETRIC VIEW REMOTE MDR



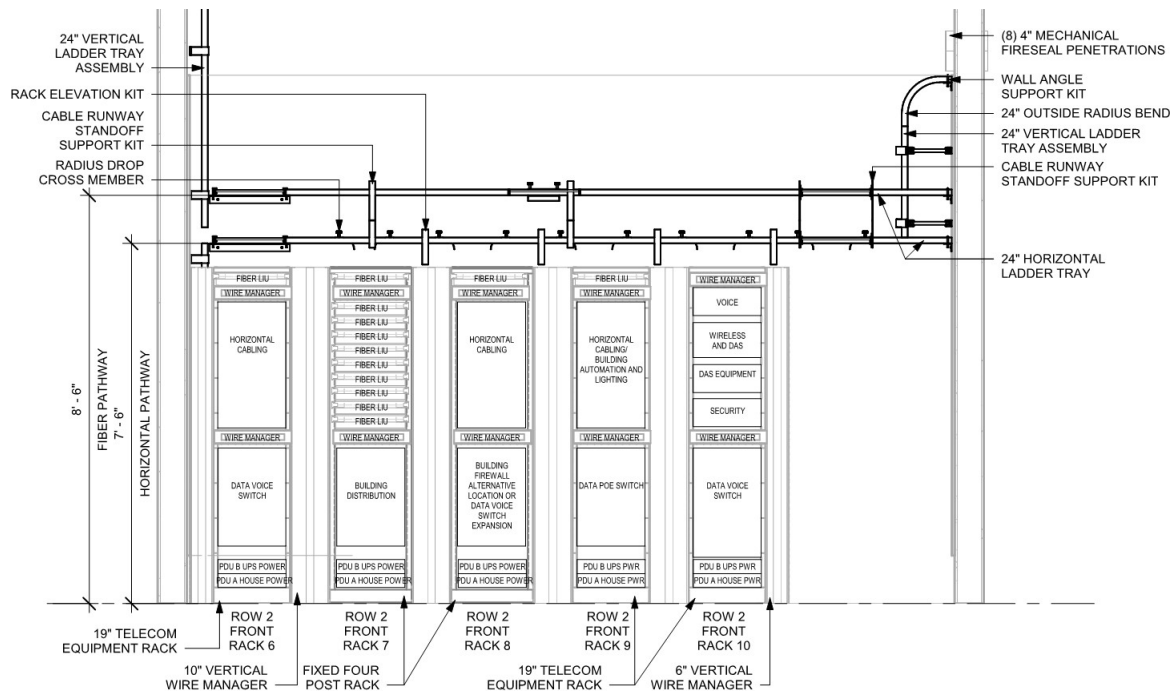
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TYPICAL REMOTE MDR RACK ELEVATION ROW 1

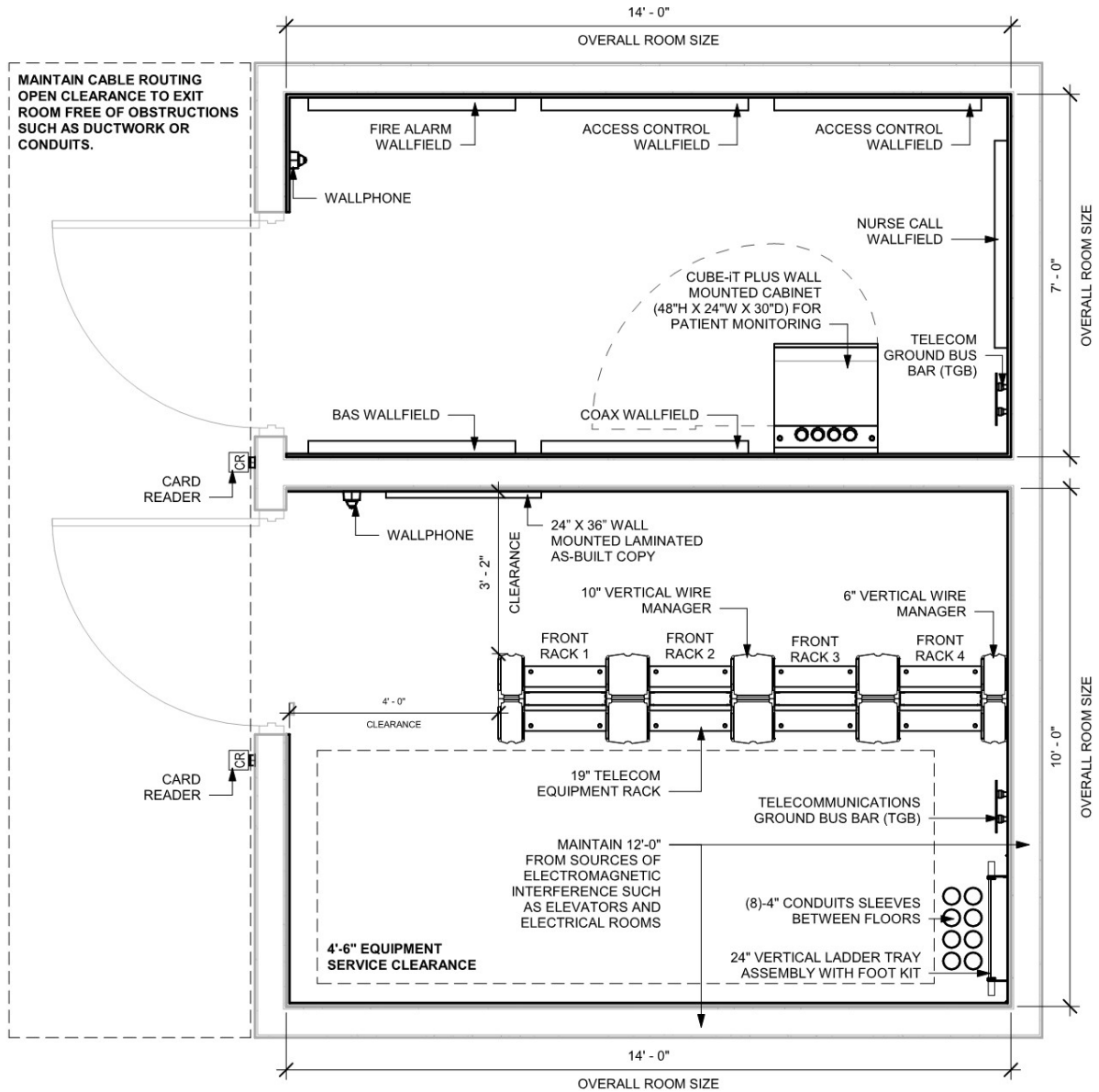


TYPICAL REMOTE MDR RACK ELEVATION ROW 2

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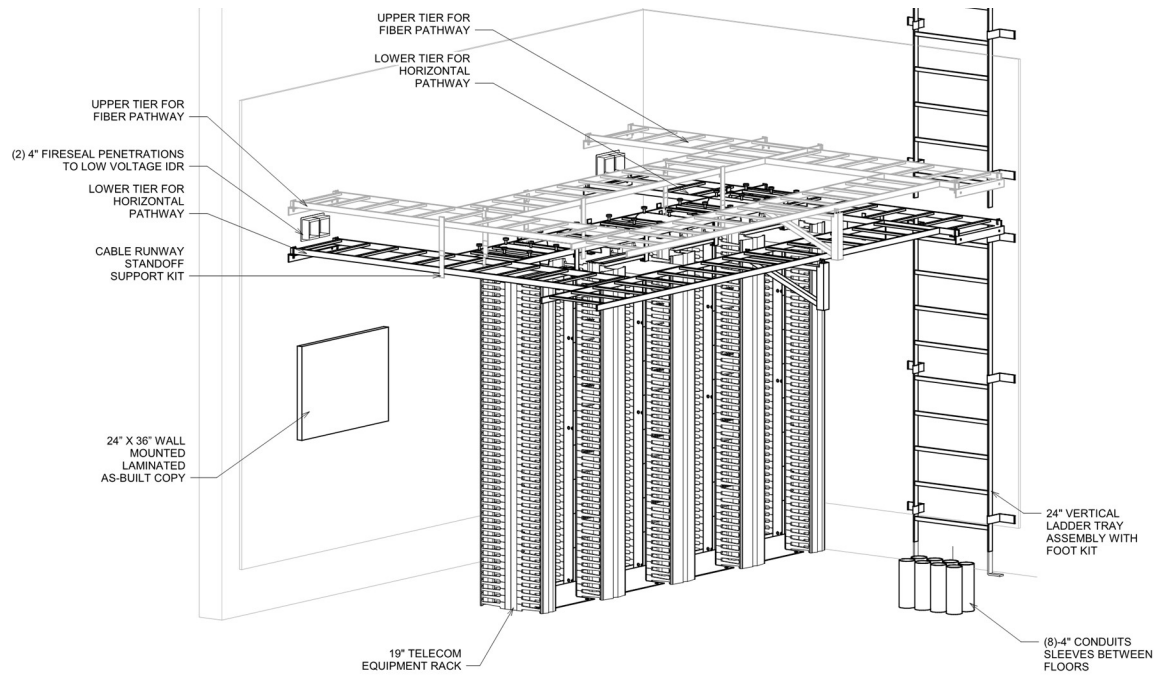
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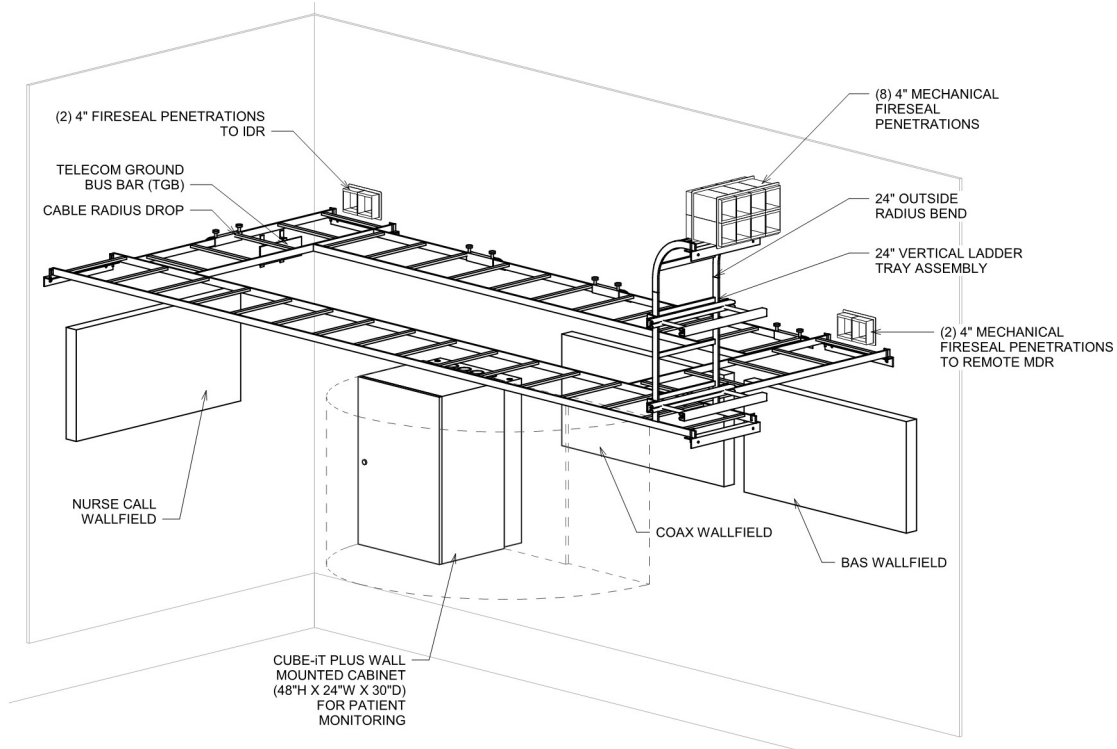
TYPICAL PLAN VIEW IDR/LOW VOLTAGE IDR

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TYPICAL ISOMETRIC VIEW IDR

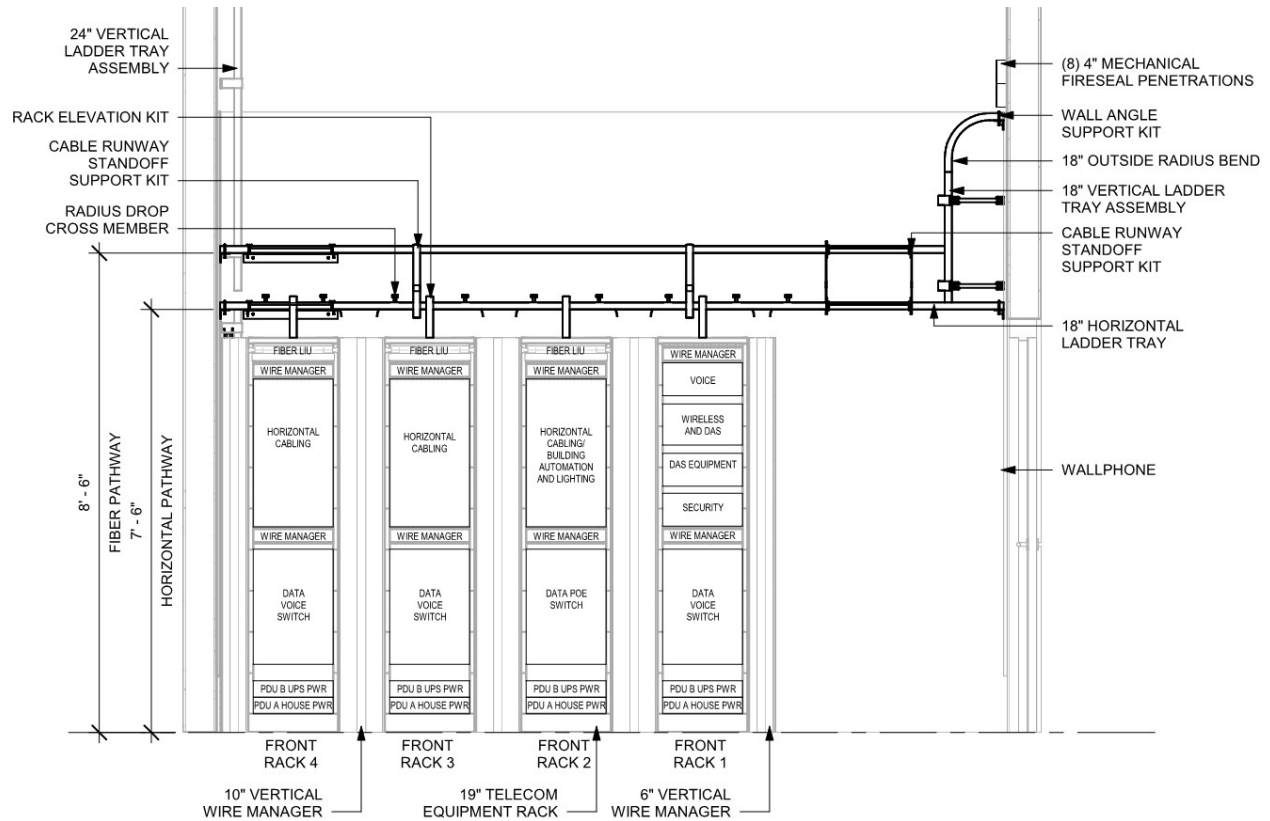


TYPICAL ISOMETRIC VIEW LOW VOLTAGE IDR

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IDR RACK ELEVATION

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- B. This section addresses planning considerations for the design of Telecommunications Rooms, which include Main Distribution Rooms (MDR), Intermediate Distribution Rooms (IDR) and Auxiliary-Intermediate Distribution Rooms (A-IDR).
- C. Telecommunications Rooms shall not be planned as occupied space.
- D. The IDR and shall be located on the same floor as the work areas served.
- E. Telecommunications Rooms do not require suspended ceilings; room shall be open to the structure above.
- F. Telecommunications Rooms must be planned to accommodate future expansion on at least one side of the room. Locate rooms adjacent to “soft space”, such as conference or storage rooms to allow for expansion. In addition, MDR and IDR rooms shall be vertically stacked within a building.
- G. MDR / IDR space must be planned to support multiple disciplines such as voice, data, security, building automation system (BAS), and UT Tele-health (CATV).
- H. University of Texas Police Department (UTPD) equipment & racks should be provided in the A-IDR and shall not be planned on being placed in the MDRs / IDRs,
- I. The A-IDR will serve other services such as Tele-Health Services, Monitoring Services, UTPD Security, Fire and Life Safety, BAS, and Nurse Call.
- J. Telecommunications Rooms must be located within a building’s central core area. The walls of communication rooms shall not be part of an exterior wall, unless the exterior wall is structural concrete, or other impermeable structural material capable of withstanding known environmental and civil hazards.
- K. Plan for Telecommunications Rooms to be 12’ clear from all elevators, elevator equipment rooms and electrical rooms.
- L. Telecommunication Rooms shall be planned in a location that provides at least two (2) sides with clear accessible ceiling adjacent to it.
- M. Rooms should be dedicated to telecommunications and must not be shared with custodial services or mechanical, electrical, plumbing, or air handling equipment. Plumbing and HVAC equipment and system components that do not serve the room, must not pass through Telecommunications Rooms or be allowed to be installed within the walls.
- N. MDR and IDR’s shall only be used to house IT equipment & cable. At no time shall other owner or vendor services or equipment be planned to be in the MDR or IDR’s. Those other services are to terminate in the A-IDR.
- O. Lighting should be minimum 50 foot-candles at the lowest point of termination.
 - 1. Avoid placing lights over Equipment Racks or over ladder / cable trays.
 - 2. Lights should be placed over isles only with clearance above cable trays for workers.

P. Floor Layout and Loading

1. The layout of telecommunications and data equipment must allow for the opening of cabinet doors, drawers, trays, entry doors, passage doors, etc. without the need to remove, temporarily displace, or impair access to other equipment in the room.
2. At a minimum, mounting racks must be installed at least 36 inches in the front and 60 inches in the rear, from any surrounding wall or obstruction, to permit installation, removal, and systems support from the back of the equipment. This distance is measured from the wall to the edges of the back of the rack, not the rack support base (bolting foot plate). Cable trays must be directly above and/or perpendicular to the mounting racks.
3. Equipment racks and server cabinets shall have provisions to allow adequate physical separation of telecommunication cables and power cables.
4. Plan for installation (on all four walls) of a plywood backboard that is fire-retardant treated on both sides, 3/4 x 48 x 96 inches in size. Plywood shall be type AC, with the A side facing inside the room. Plywood shall be painted white or light color with fire-retardant paint.
5. Floor loading of equipment cabinets varies from 50 to 250 lbs./sf. Because of this range and to accommodate the widest variety of equipment over the life of the building, the floor rating under distributed loading must be greater than 100 lbs./sf. and the rating for concentrated loading must be greater than 2000 lbs./sf. in areas that will support telecommunications equipment. These requirements apply to any physical surface on which the equipment is placed.
6. All equipment racks having voice or network equipment:
 - a. Data network rack each switch requires 1 NEMA L6-30R on Utility Power, and 1 NEMA L630R on Uninterruptable Power Supply (UPS).
 - b. Voice equipment racks require 1 NEMA 5-15R quad receptacle on Utility Power, and 1 NEMA 5-15R quad receptacle on Uninterruptable Power Supply (UPS).
 - c. Equipment racks for miscellaneous equipment require 1 NEMA 5-15R quad receptacle on Utility Power, and 1 NEMA 5-15R quad on Uninterruptable Power Supply (UPS).
7. Overhead Ladder tray in MDR/IDR's shall be "Telco" Style. Tray shall be provided in a "two- tier" configuration. The upper tier for routing horizontal cable intended to remain on that floor from where it enters the MDR/IDR to its termination point. The lower level is intended for Copper and Fiber Backbone cable routing so that it does not cross paths with horizontal cable. The two levels of cable tray shall be separated by 12" vertically.

Q. Security

1. Access to the room must be through secured doors with keyed entry and UTPD security card readers that allow the passage of wide equipment. Automatic closer and self-latching locks should also be provided.
2. The room must be secured at all times by a locking mechanism whose key is made available only to appropriate personnel. Telecommunications Rooms shall have keyed

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entry and a UTPD security card reader installed at the entrance door(s).

3. For convenience of use during work performed in the Telecommunications Room, as well as for security reasons, an analog single line telephone, capable of outgoing public network calling, shall be installed within the room. This telephone must work during PBX, and power outages.

R. Working Clearances

1. Provide a minimum of:
 - a. 3 feet of working space between the equipment and the termination field.
 - b. 3 feet wide, 3 feet deep and 7 feet high for each equipment rack or cabinet.
 - c. 3 feet 4 inches for an aisle in front and 3 feet in back of each equipment rack or cabinet in reference to the edge of the rack base.

2.4 MAIN DISTRIBUTION ROOM (MDR)

- A. The MDR is the centralized space to support structured cable equipment and the distribution point for the building's structured cabling system. The MDR is an enclosed room where the service entrance for the building is located.
- B. The room(s) shall be designed to a minimum of 23-feet by 20-feet for multi-level buildings. The minimum clear deck height should be at 10 feet, 0 inches above finished floor (AFF).
- C. The room(s) shall be provided clear of structural obstructions, such as Columns or low Beams encroaching in the space that would not allow complete use and access to the space.
- D. A growth factor of 100% shall be considered when planning for Healthcare Facilities (ANSI/TIA-1179-A).
- E. The MDR's should have their own electrical panels supporting only equipment in the MDR:
 1. Provide / coordinate wall space for electrical panels in MDR.
 2. MDR size may have to be increased due to clearances required by electrical panels. The space that is required by code for electrical clearances should be deducted from the space that is considered usable in the MDR.
 3. Electrical Transformers shall not be placed on the floor in the MDR / IDR.
 4. Electrical panel board for normal power.
 5. Building Emergency / Generator and building UPS electrical panel.
 6. UPS power will be provided for 10-minutes or until generator power kicks in; whichever is longer.
- F. The Telecommunications Services Provider communications tie cable from the Demark to the riser rack must be shielded.

- G. The door(s) shall be a minimum of 48 inches wide x 90 inches high, must open outward, and be placed to maximize usable floor and wall space (e.g. place the door in the corner of a room, not the middle of wall).

2.5 INTERMEDIATE DISTRIBUTION ROOM(IDR)

- A. For multi-level buildings, provisions shall be made for each floor to have its own IDR to serve workstations on that floor. Depending on the floorplate size, more than one IDR room may be required per floor.
- B. Facilities planned at off-site locations that are smaller in scale, may combine the functions of the MDR with the IDR.
- C. The IDR shall be designed to a minimum of 10-feet x 14-feet with a minimum ceiling height of 10 feet, 0 inches above finished floor (AFF).
- D. Consideration for larger IDR's should be considered for Healthcare Facilities (ANSI/TIA-1179-A).
- E. The room(s) shall be provided clear of structural obstructions, such as Columns or low Beams encroaching in the space that would not allow complete use and access to the space.
- F. The door(s) shall be a minimum of 48 inches wide x 90 inches high, must open outward, and be placed to maximize usable floor and wall space (e.g. place the door in the corner of a room, not the middle).

2.6 AUXILIARY- INTERMEDIATE DISTRIBUTION ROOM (A-IDR)

- A. For multi-level buildings, provisions shall be made for each floor to have its own A-IDR to serve specialty or other systems on that floor. Depending on the floorplate size, more than one A-IDR room may be required per floor.
- B. The A-IDR shall be designed to a minimum of 7-feet x 14-feet with a minimum ceiling height of 10 feet, 0 inches above finished floor (AFF).
- C. The room(s) shall be provided clear of structural obstructions, such as Columns or low Beams encroaching in the space that would not allow complete use and access to the space.
- D. The door(s) shall be a minimum of 48 inches wide x 90 inches high, must open outward, and be placed to maximize usable floor and wall space (e.g. place the door in the corner of a room, not the middle).

2.7 PLANNING FOR TELECOMMUNICATIONS OUTLETS AND PATHWAYS

- A. Category 6A cable (UTP CAT6A) and Cat 6A Angled Patch Panels shall be used for all data connectivity in MD Anderson-owned facilities. It is recommended that all normal accessories be installed and used, such as "Lacing Bars" regardless of installer's preference.
- B. MD Anderson leased facilities will be UTP CAT6A.
- C. Structured cable shall be pulled directly from the jack to the patch panel. Zone cabling and consolidation points shall not be allowed.
- D. Rack mounted wire managers shall be used (along with angled patch panels) to help support the cable while allowing easy access for adds and changes. Installer shall

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ensure that both vertical and horizontal wire managers are of the same depth, front and rear.

- E. The maximum distance on any one UTP / Category 6A permanent link cable (excluding patch cables) shall not exceed 295 feet.
- F. In an office or cubicle environment with a raised floor, do not provide jacks under the floor. Network cabling jacks shall be provided in the walls, cubicle wire ways, or flush mount floor boxes.
- G. Faceplates or Wall Boxes
 - 1. Jacks that serve the same work area may be combined into one dual-gang faceplate.
 - 2. The faceplate or wall box must provide adequate space for labeling.
 - 3. Installer must provide adequate cable management both horizontally and vertically for the wiring, sized appropriately for Cat 6A UTP cable.
 - 4. In an open office environment (partitions), the faceplate/wall box must be installed along the center spine of the partition row (Modular Furniture).
 - 5. Outlet faceplates must be labeled with the jack numbers or patch panel ports as appropriate. All jacks must be flush with the faceplate (Flat or Angled).
 - 6. Wall boxes and all surface mounted boxes should be permanently attached with anchors and screws.
 - 7. All data drop/jacks must maintain a minimum 12-inch separation between electrical drop/jacks to reduce any EMI.
 - 8. Administrative Only Type Buildings (no patient care): Conduit is not required for structured cable drops; however, an outlet box is required. Plaster rings and caddy clips are not allowed.
 - 9. Administrative / Office Type Buildings (no patient care): Conduit shall be placed for structured cable drops when the wall has either thermal or sound insulation planned.
 - 10. Patient Care Areas (Patient Rooms, ORs, Radiology rooms, Nurse Stations) and critical Areas/Labs (Animal Labs, Chemical Labs, Pharmacy Compounding, BSL Labs): Structured cable drops must follow the cable tray all the way to the nearest point to the outlet, then supported via hooks and loops to the wall where conduit will then be run to the wall box and outlets.
 - 11. Structured Cable outlet boxes shall be a minimum size of 4 11/16" W X 4 11/16" H X 3" D, to allow for the required working clearance of Cat 6A UTP cable. Outlet boxes shall be provided with either a single or double gang device ring 1/2" deep.
 - 12. For Office Type Buildings, each work area shall be provided with a minimum of 4 data cables.
 - 13. For Health Care Type Facilities, work area cable density should be considered with the following (ANSI/TIA-1179-A);
 - a. Low density – 2 to 6 outlets in each area

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- b. Medium density – 7 to 14 outlets in each area
- c. High density – Greater than 14 outlets in each area

14. Device boxes should be mounted on wireways. This prevents the jacks from being installed directly in the cable path of the wireway. Installing the faceplate and additional cable could interfere with the jack termination if flush mount brackets are used.

2.8 OUTSIDE FIBER PATHWAYS

- A. All spare conduits will have mule-tape, or a pull string provided for future use.
- B. All spare conduits must be labeled as “Spare” for future reference.
- C. All unused conduits in outdoor pull boxes will be properly plugged with removable watertight plugs.
- D. All OSP work will be properly documented and the AutoCAD information including cable burial depths and accurate routing will be provided in electronic format to MD Anderson Information Technology and Services. Accurate measurements shall be provided on OSP conduit and cable taken from Face of Curb or Center of Road, or other permanent features to center or top of conduit.
- E. All underground conduit / pathways shall have a 14AWG solid conductor wire, ORANGE in color, installed within a conduit in the entire length of the path. Locate marker poles shall be provided and installed along the path as designated by owner.
- F. Fiber network pathways shall be provided to new buildings connected to existing IT main Hub(s), location of which will be determined by owner.

2.9 OUTDOOR PULL POINTS

- A. Pull points shall be strategically designed and placed to permit the installation of fiber cables within the manufacturer specifications. Pull points shall be placed based on planned reel length and manufacturer pulling tension requirements. Pull points will be no further than 600 feet apart for fiber cable and copper cable.
- B. Where a pathway enters a building above ground, consider planning a minimum 24-inch x 24-inch x 24-inch, NEMA 3R or 4 junction boxes to accommodate the transition and provide pulling access.

2.10 CONDUITS FOR COPPER & FIBER OPTIC BACKBONE CABLES

- A. At no place along the pathway should the Copper or fiber cable be exposed.
- B. All building OSP conduits should be piped directly to the MDR.

2.11 INSIDE COPPER & FIBER BACKBONE CABLE PATHWAYS

- A. All pathways will consist of cable tray, conduit or a combination of both.
- B. Cables shall be rated according to ANSI/TIA Standards and NEC codes for the environment in which they are installed.
- C. Conduit shall not be longer than 100 Feet without a pull point.

- D. Conduit shall not have more than the equivalent of two 90-degree bends nor more than 5 bends between pull points.

2.12 INDOOR PULL-POINTS

- A. Pull points shall be installed or used at intervals not to exceed the manufacturer's specifications for the cable being placed.
- B. Reference D5030-2.10 for additional requirements.

2.13 PATHWAYS, CABLE TRAYS, WIREWAYS AND CONDUIT

A. General:

1. Basket style cable trays are the preferred method of installation. Upon departing from main cable pathways J-hook or saddle-bag style plenum rated supports shall be used to support cables to the point of the cable termination. J-hooks shall be supported with the use of 1/4-inch or larger threaded rod, anchored to permanent building structure.
2. Cable trays shall be supported Trapeze style, not center hung.
3. Cable pathways shall be so configured to avoid EMF and RFI interference. All cable runs must be installed a minimum of 12-inches from all fluorescent lighting fixtures and EMF sources.
4. Cascade transitions (waterfalls) shall be used if height variations occur between the cable tray equipment and the ladder rack and must be located directly above the vertical wire manager channel between the 19-inch racks.

B. Ladder Trays

1. Inside of the MDR or IDR Rooms, 18-inch to 24-inch ladder tray is to be used for wire management. This tray is designated for structured cabling, fiber patch cords, and voice switch tails. Any implementation of this tray will include spill brackets / posts at all inside corners.
2. Inside the MDR and IDR rooms, 18-inch ladder racks should be used for horizontal wire management above the 19-inch racks.

C. Cable Trays

1. Cable tray / basket tray shall be designed to be installed parallel to building lines. Cable trays, routed throughout the building, must have a continuous path for all cables to run in. The cable tray should terminate at wall penetrations into the IDR/MDR to allow for clearance between it and the fire stop system to be placed in the wall of the MDR/IDR. The interior ladder rack inside the MDR/IDR should be routed properly to deliver the riser, station/horizontal, and fiber to the end destination (i.e., rack, wall field, or BET).
2. Cable tray location shall be planned to be above corridors / walkways.
3. Cable tray pathways / locations shall be coordinated with MEP designers / plans to avoid obstructions and installation problems later on.

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4. Vertical cable trays shall run and tie into the horizontal tray. In addition, the vertical cable trays should be mounted on fire rated plywood or solidly anchored to the wall so as not to pull loose.
5. Floor and ceiling penetrations for all riser cabling (fiber and/or copper) will have a vertical tray installed to support all telecommunications cabling. The vertical, ladder-type cable tray to be a minimum of 18 inches wide. All vertical riser cabling is to be secured to relieve stress (minimum of 3 attachments between each per floor). It is preferred to have the vertical penetrations lined up through the floors for a continuous vertical cable tray path, especially in new building design. Otherwise, the concrete penetrations must have an acceptable form of protection installed to avoid cable contact with the concrete.
6. All cables shall be secured when exiting or leaving the cable tray and will have proper support at all times. Use cable drop out waterfalls if needed to provide continuous support.
7. Cable tray located above the ceiling must meet the following criteria:
 - a. A minimum of 6 inches of vertical clearance is to be maintained above suspended ceiling tiles and T-bars.
 - b. A minimum of 12 inches of vertical clearance is to be maintained above high voltage conduits and exposed cables (when parallel).
 - c. A minimum of 12 inches of clear vertical clearance is to be maintained above cable trays, for working clearance at least within 6 feet horizontally of any point.
8. Any floor penetration shall be provided with a 6" high concrete curb and appropriate fire rating per A/E requirements.

D. Cable Management Hook-and-Loops

1. Cable management precautions that should be observed include the elimination of cable stress as caused by tension in suspended cable runs not located in cable tray or conduit. In addition, the maximum distance on any suspended cable run will not exceed 5 feet (1.5 meters).
2. Hook-and-loop cable management are to be spaced no greater than 5 feet (1.5 meters) apart. They are not to support more than 50 single 4-pair cables. Routing network cable through bar-joists or other trades supports is not acceptable.

E. Conduit

1. Minimum requirements for installed conduit are covered in Division 26. No continuous section of conduit to be longer than 100 feet without pull boxes and contain no more than two 90-degree bends (or the equivalent sum of 180 degrees) per every 100 feet. Note: If a conduit exceeds 100 feet (30m) in a continuous run, a pull box must be installed every 100 feet.
2. If a conduit requires more than two 90-degree bends, the equivalent sum of 180 degrees, or over 5 bends/offsets, then a pull box must be provided between the sections.
3. If a conduit requires a reverse bend (between 100 degree and 180 degree), then a pull box must be provided at each bend having an angle from 100 degree to 180 degree.

4. If a conduit requires a third 90-degree bend (between pull points or junction boxes) and

one of the following is true, then an additional junction box will have to be installed:

- The total run is no longer than 33 feet
- The conduit is increased by one trade size
- One of the bends is located within 12 inches of the cable feed end.

Trade Size	Number of Cables
1"	3
1-1/4"	6
1-1/2"	8
2"	14
2-1/2"	25
3"	38
4"	64

- Conduit Fill Chart Cat6A (0.33in) - Electrical Trade Size and Number of Cables (per TIA-569).
- Conduit to be run in the most direct route possible along building lines or perpendicular to building lines.
- The inside radius of a bend in conduit shall be at least 6 times the internal diameter. When the conduit size is greater than 2 inches (50mm), the inside radius shall be at least 10 times the internal diameter of the conduit. For fiber optic cable, the inside radius of a bend shall always be at least 10 times the internal diameter of the conduit.
- A nylon, fish tape pull cord (rated at 200 lbs. and with increments marked every foot) shall be placed in the installed conduit and replaced when cable is pulled through the conduit.
- OSP Conduit
 - All conduits between buildings will be a minimum of 4-inch diameter in size.
 - All OSP conduits shall have a minimum of three (3) 3-inch-3-cell Maxcell sleeves installed.
 - All OSP conduits shall be marked with locatable marking tape buried 12" above conduits or duct bank.
- Pull Boxes
 - Where required, install pull boxes in easily accessible locations and immediately above suspended ceilings. They must be rated for the space in which they are

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located and clearly labeled. Pull boxes are not to be used in lieu of a bend. All pulls

through a pull box are to be straight with no turns. Align conduits that enter the pull box from opposite ends with each other. (Refer to Division 26)

- b. Pull boxes for pulling and looping cables with an outside diameter greater than 2 inches are not allowed in ceiling spaces and must be located on a wall or column. The length of a pull box is to be a minimum of 12 times the diameter of the largest conduit.

2.14 FIRE PROTECTION

- A. All penetrations through fire-rated walls and floors must be properly sealed with Owner approved materials or devices to block the spread of fire, smoke, toxic gases, and fluids in accordance with applicable building codes and architectural specifications (Refer to Division 07 and AHJ).
- B. The Telecommunications Rooms shall be designed with a National Fire Protection Association (NFPA) fire-extinguishing system and alarm system approved for electrical fires.
- C. All MDR and IDR's shall be protected with a dry, pre-action type, fire suppression system.

2.15 NOISE AND ELECTROMAGNETIC INTERFERENCE (EMI)

- A. All telecommunications cables and related equipment should be placed at least four (4) feet away from equipment such as elevator motors, air conditioning units, large electronic office machines, copiers, and transformers that could interfere with the electrical signal and cause electromagnetic radiation.
- B. Telecommunications cables and pathways should provide a clearance of at least one foot from fluorescent lighting and conduit or cables for power distribution.
- C. Pathways should cross perpendicular to fluorescent lighting and electrical power cables or conduit. Installation shall be in compliance with ANSI/TIA-568-D.

2.16 TELECOMMUNICATIONS ROOM BONDING

- A. All metal racks, frames, cabinets, and miscellaneous equipment enclosure shall be bonded together using green, insulated copper wire (low smoke, plenum rated, 6 AWG, 600V, UL Listed) so that all equipment, structured cable racks are at the same ground potential. A VOM measurement between any two points on metal racks and equipment enclosure in the Telecommunications Room shall be less than 1.25 volts dc or ac potential.
 - 1. All approved grounds used must be bonded together to form a single grounding electrode system as required in Article 250 of the National Electrical Code.
 - 2. Grounding and bonding shall comply with ANSI-J-STD-607-B.
 - 3. The surface must be prepared to provide a proper path to ground. Any surface that is to be grounded must be free of paint or other coating that might prevent an effective grounding. Paint should be scraped or filed away until a metallic surface has been exposed before the attachment of grounding or bonding wire.
 - 4. Active and passive hardware being installed in equipment racks or cabinets shall utilize

~~Star Washers to dig into the metallic surface of the rack or cabinet to bond the~~

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hardware.

5. All system components (i.e. ladder-style cable raceway, basket trays, equipment racks, etc.) shall be bonded to the TMGB with at least a 6 AWG solid or stranded copper wire with a green insulation jacket.
6. No daisy chaining of equipment bonding conductors. All components shall be connected directly to the buss bar.

2.17 LIGHTNING PROTECTION

- A. In general, lightning protection shall be per ANSI, NFPA 780, Owner's Master Construction Specification Section 26 41 00, and Design Guideline Element D5090 Other Electrical Systems.
- B. A coupled bonding conductor is tie-wrapped to all trunks. The coupled bonding conductor can be any one of the following:
 1. 10 AWG ground wire
 2. Continuous cable sheath
- C. The coupled bonding conductor connects the cabinet single-point ground block and runs all the way to the approved ground located nearest the telephone company-owned protector block at the building entrance facility.
- D. When an auxiliary cabinet is provided with multi-carrier cabinet system, a 6 AWG ground wire connects the system cabinet single-point ground block to the auxiliary cabinet ground block. It is recommended that the ground wire be routed as close as possible to the cables connecting the system cabinet and the auxiliary cabinet.
- E. If auxiliary equipment is not mounted in the auxiliary cabinet, then the power supply for this equipment must be plugged into one of the two convenience outlets located on the back of the multi-carrier cabinet to preserve ground integrity. The convenience outlet is fused at 5 amps. The dedicated terminal should be plugged into the other convenience outlet.
- F. Building Entrance Terminals:
 1. Building entrance terminals house the Surge Protection Modules that protect the building wiring and circuit packs from "foreign potential" by providing a current interruption capability (Required by NEC).
 2. Surge protection modules (Sneak fuses) are to be installed on the switch side of the network interface. All incoming and outgoing trunks and off-premises station lines pass through the sneak fuses.
 3. Surge protection modules shall be industry standard 5-pin module style.
 4. Surge protection modules shall be provided that provide Sneak Current protection.
 5. Building Entrance terminals shall be provided with 110 termination, internal fusible link protection and be wall mounted near the Entrance Facility / OSP conduit entrance.
 6. Building Entrance terminals shall be properly bonded to the TGMB.

2.18 WIRELESS OVERVIEW

- A. The wireless infrastructure at MD Anderson facilities is based on IEEE 802.11ac access points powered by power over Ethernet (IEEE 802.11af). Access points are attached to the access layer switches in the areas they are installed.
- B. Wireless design must support VOIP, RFID, DAS, and Health Device Communications (IEEE 11073).
- C. All RF technology's, regardless of the type construction, renovation, or upgrade, must be submitted and approved by the Owner.
- D. All wireless surveys are done to the 802.11ac radios to provide extra coverage on the larger 802.11B footprint. The 802.11B radios are used for mobility. Redundant pairs of Wireless Controllers are used to manage mobility. Mobility is defined as the ability to roam from one area of the institution to another while maintaining wireless connectivity. The 802.11A radios are not used for mobility. The Wireless Controllers are used to manage the wireless access points and end devices.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.1 GENERAL

- A. Carefully coordinate design and layout of telecommunications rooms, cable trays, and other telecommunications system components with other building systems, including HVAC piping, ductwork and terminal units; electrical lighting and power distribution, and plumbing and fire suppression system piping.
- B. Specify that abandoned telecommunications cable shall be removed per NFPA 70 Article 800 requirements.
- C. If flexible conduit is used in lieu of a specified non-flexible conduit, MD Anderson IT Network Engineering must be consulted prior to design. Flexible conduit shall be planned to be one conduit size larger as a replacement to regular conduit.
- D. Plan for the total length of a conduit run kept to 100 feet or less (including sections through pull boxes). Any installation requiring a longer distance must be approved prior to installation by MD Anderson IT Network Engineering.
- E. Note on the drawings that all vertical chase openings must be properly finished and shall have a 6" high concrete curb around the slab opening to prevent water migration between floors.
- F. The following information should be noted on the Construction Drawings for future fiber-optic cable pulls:
 - 1. Conduits shall have 200 lb. test pull rope/mule tape (not Jet line) placed and secured with the length of the conduit run attached. Also note the location of the other end.
 - 2. Conduits running to equipment enter from the bottom (if possible) if on raised floor or floor other than ground floor.

PART 4 - PRODUCTS

4.1 GENERAL

- A. Refer to Owner's Master Construction Specifications. These are available on the Owner's DesignGuidelineswebsite: <http://www2.mdanderson.org/depts/cpm/standards/specs.html>
- B. Do not specify cabling hardware that is of a lower category than the cable being used.
- C. Basic wiring materials must comply with requirements of Division 26 Basic Electrical Materials and Methods sections, "Raceways" and "Electrical Boxes and Fittings".
- D. Horizontal cable tray systems must be able to support a minimum of 100 lbs. of cable per lineal foot.
- E. All ladder trays in Telecommunications Rooms must have spill brackets at each inside corner.
- F. MD Anderson specifications require all conduits to be no less than 1-inch in diameter.
- G. All conduit used for fiber, must have Maxcell type inner duct installed prior to fiber cable being installed. Inner duct should have a 200lb test pull rope/mule tape (not Jet line) placed and secured with the length of the inner duct run attached. Size Junction boxes per TDMM.

PART 5 - DEFINITIONS

5.1 DEFINITIONS FOR TELECOMMUNICATIONS DOCUMENTS

- A. Attenuation: The loss of signal power between two points. Attenuation is a ratio of input power vs. output power, measured in decibels per unit length db./km.
- B. Backbone Cabling: That portion of the telecommunications cabling systems that provides interconnections between MDR, IDR, and entrance facilities (EFs), access provider (AP) spaces, service provider (SP) spaces, equipment rooms (ERs) telecommunications rooms (TRs) and telecommunications enclosures (TEs). As such, the backbone cabling shall meet the requirements of ANSI/TIA-568-D.0 Cabling Subsystem 2 and Cabling Subsystem 3. Backbone cabling consists of the backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to- backbone cross-connection.
- C. Bandwidth: A range of frequencies, usually the difference between the upper and lower limits of the range, typically expressed in megahertz (MHz). It is used to describe the information-carrying capacity of a medium. In copper and optical fibers, the bandwidth decreases with increasing length. Optical fiber bandwidth is specified in megahertz kilometers (MHz-km).
- D. Bonding: The permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.
- E. Bundled Cable: An assembly of two or more cables continuously bound together to form a single unit prior to installation (sometimes referred to as loomed, speed-wrap or whip cable constructions).

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- F. Cable Pathway: An MD Anderson approved routing path for low voltage cables designed by MD Anderson engineers that must be followed during installation.
- G. Cat6A Cable (Augmented Cat6): 4 pair 23 AWG copper cable manufactured in accordance to A N S I / TIA 568-D.2-10. Supports 10BASE-T through 10GBASE-T.
- H. Channel: The end-to-end transmission path connecting any two points at which application specific equipment is connected. Equipment and work area cables are included in the channel.
- I. Optical Class: optical fiber links are characterized from 10 MHz and above.
- J. Coaxial Cable: Self-shielded cable used for transmission of telecommunications signals,

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such as those for television, telephone, or computer networks.

- K. Cross-connect: A facility enabling the termination of cables as well as their interconnection or cross-connection with other cabling or equipment. Also known as a distributor.
- L. Cross-connection: A connection scheme between cabling runs, subsystems and equipment using patch cords or jumpers that attach to connecting hardware on each end.
- M. Crosstalk: Noise or interference caused by electromagnetic coupling from one signal path to another. Crosstalk performance is generally expressed in decibels.
- N. Electromagnetic Interference (EMI): The interference in signal transmission or reception caused by the radiation of electrical and magnetic fields.
- O. Entrance Facility (EF): An entrance to a building for both public and private network service cables (including wireless), including the entrance point at the building wall and continuing to the entrance room or space. Entrance facilities are often used to house electrical protection equipment and connecting hardware for the transition between outdoor and indoor cable.
- P. Entrance Point, Telecommunications: The point of emergence of telecommunications conductors through an exterior wall, a concrete floor slab, or from a rigid metal conduit or intermediate metal conduit.
- Q. Main Distribution Room (MDR): An MDR may alternatively provide any or all of the functions of a MDR or IDR. The main cross-connect (MC; Distributor C) of a facility is located in an MDR. Intermediate cross-connects (ICs; Distributor B), horizontal cross-connects (HCs; Distributor A), or both, of a facility may also be located in an MDR. When additional telecommunications equipment that is outside the scope of what is listed in this document is present in the MDR, the size of the space should be increased accordingly.
- R. Fiber Optic Cable: Light transmission through optical fibers for communication or signaling.
- S. Firestop: A material, device, or assembly of parts installed in a cable pathway at a fire-rated wall or floor to prevent passage of flame, smoke or gases through the rated barrier (e.g., between cubicles or separated rooms or spaces).
- T. Ground: A conducting connection, whether intentional or accidental, between an electrical circuit (telecommunications) or equipment and earth, or to some conducting body that serves in place of the earth.
- U. Home-run Cabling: A distribution method in which individual cables are run directly from the horizontal cross-connect to each telecommunications outlet. This configuration is also known as star topology.
- V. Horizontal Cabling: The cabling between and including the telecommunications outlet and the horizontal cross-connect.
- W. Horizontal Wiring: All cables installed from a work-area wall plate or network connection to the MDR and the IDR. The outlets, cable, and cross-connects in the closet are all part of the horizontal wiring.
- X. Local Area Network (LAN): A geographically limited data telecommunications system for a specific user group consisting of a group of interconnected computers, sharing applications, data and peripheral devices such as printers and CD-ROM drives intended for the local transport of data, video, and voice.

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- Y. OSP: Outside plant. All of the telecommunications apparatus and cable systems outside (i.e., not housed in buildings) such as central offices or customer premises. OSP includes all the components of cable systems such as the aerial, buried, and underground cables, amplifiers and repeaters, cross-connect boxes, and remote neighborhood nodes, some of which may be located in vaults or sheds.
- Z. Patch Cord: A length of cable with connectors on one or both ends used to join telecommunications links at a cross-connect.
- AA. Patch Panel: Connecting hardware that typically provides means to connect horizontal or backbone cables to an arrangement of fixed connectors that may be accessed using patch cords or equipment cords to form cross-connections or interconnections.
- BB. Pathway: A facility (i.e., conduit) for the placement and protection of telecommunications cables. Same as raceway or ducting.
- CC. Plenum Cable: Structured cabling made of fire-retardant materials that generate little smoke. These cables are installed in plenum air ducts, vertical shafts, etc.
- DD. Private Branch Exchange (PBX): A private switching system usually serving an organization, such as a business, located on the customer's premises. It switches calls both inside a building or premises and outside to the telephone network and can sometimes provide access to a computer from a data terminal.
- EE. Pathway: A facility for the placement of telecommunications cables.
- FF. Riser: The pathway for indoor cables to pass between floors.
- GG. Telecommunications: Any transmission, emission or reception of signs, signals, writings, images, sounds or information of any nature by cable, radio, visual, optical or other electromagnetic systems not explicitly covered in any other Design Guideline Element.
- HH. Intermediate Distribution Rooms (IDR) & Telecommunications Enclosures (TE): Provide a common access point for pathways, backbone cabling and horizontal cabling. IDRs and TEs may also contain cabling used for cross-connection. The horizontal cross-connect (HC; Distributor A) is located in an MDR or IDR. The intermediate cross-connects (IC; Distributor B) may also be located in an IDR.
- II. Wireless Access Point: In computer networking, a wireless access point (WAP or AP) is a device that connects wireless communication devices together to form a wireless network.
- JJ. Work Area: The area where horizontal cabling is connected to the work area equipment by means of a telecommunication outlet. A station/desk which is served by a telecommunications outlet. Sometimes this is referred to as a workstation.

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PART 6 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Revised By
	20220121	Original Issuance	PRH_ITE
Rev. 1	20240430	Revised conduit requirements	G. Gabino/T. Shewan

END OF ELEMENT D5030