SECTION 27 05 27 – COMMUNICATIONS SPACES

PART 1 - GENERAL

1.1 REFERENCES

A. General provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections.

B. Architectural, Electrical, and Technology Drawings. Other systems drawings may apply. Division 26 Basic Electrical Materials and Methods sections apply to work of this section.

1.2 SUMMARY

A. This section describes the codes, standards, specifications, recommendations, and practices required for construction at the University of Colorado Denver | Anschutz Medical Campus for the Office of Information Technology (OIT) department. Section 27 00 00 applies to all telecommunications projects at the university.

B. The project general contractor (GC) is responsible for building telecommunications pathways and spaces as per the requirements described in this document. The project GC shall provide these specific items: spaces (work areas, telecommunications rooms, telecommunications entrance faculty, and equipment rooms), pathways (riser and horizontal distribution), grounding system, and fire protection systems, as described below. The OIT department is responsible, through its contractor, for providing cabling, data networking, and voice equipment.

Planning.

1. To facilitate provisioning of telecommunications services, the architect/engineer shall provide the university OIT with floor plan drawings for new building construction and major renovation projects during design and at construction. CAD drawings of the Electrical/Communications plans shall be provided to OIT upon release of construction document through the university project manager.
2. The project's technology consultant shall meet with the building's projected occupants, OIT Telecommunications Network Infrastructure (TNI) team, and other interested parties to determine the telecommunications requirements of the occupants. Compliance with overall campus telecommunications plans will also be validated during these meetings. The technology consultant shall submit all findings to OIT for review and approval.
3. The preliminary plans, indicating service locations and space requirements, will be returned to project managers for inclusion in the final plans.

Consult with university OIT for the following.

1. Acceptability for specific substitutions of specified products.
2. Guidance in the application of a standard or specification in a non-listed or design situation.
3. Approval for deviation from standards and specifications or industry-standard methods and procedures if indicated by special circumstances

E. Workmanship. All materials and equipment shall be installed in accordance with recommendations of the manufacturer as approved by the architect, to conform to initial design requirements or specification's and contract documents.

1.3 SUBMITTALS

A. Refer to Section 27 05 00 for requirements.

1.4 QUALITY ASSURANCE

A. Applicable Codes, Standards, and Specifications: The following list of codes, standards, specifications, recommendations, and methods and procedures are applicable to the provisioning of telecommunications services for the university. The latest editions are incorporated by reference.
1. ANSI/EIA/TIA-526: Standard Test Procedures for Fiber Optic Systems.
2. ANSI/EIA/TIA-568-C.0: Generic Communications Cabling for Customer Premises.
3. ANSI/EIA/TIA-568-C.1: Commercial Building Communications Cabling Standards, Part 1: General Requirements.
4. ANSI/EIA/TIA-568-C.2: Balanced Twisted-Pair Communications Cabling and Components Standard.
5. ANSI/EIA/TIA-568-C.3: Optical Fiber Cabling Components Standard.
6. ANSI/EIA/TIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces.
7. ANSI/EIA/TIA-606-A: Administrative Standard for Commercial Telecommunications.
8. ANSI/J-STD-607-A: Commercial Building Grounding and Bonding Requirements for Communications.
9. TIA-758-A: Customer-Owned Outside Plant Communications Cabling Standard.
10. ANSI/TIA-942: Telecommunications Infrastructure Standard for Data Centers.
11. ASTM: American Society for Testing and Materials
12. BICSI CO-OSP Design Manual (current edition): Customer-Owned Outside-Plant Design Manual.
13. BICSI Electronic Safety and Security (ESS) Design Reference Manual (current edition).
14. BICSI Network Design Reference Manual (current edition).
15. BICSI TDM Telecommunications Distribution Methods Manual (current edition).
16. BICSI Wireless Design Reference Manual (current).
17. EIA/TIA TSB67: Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling.
18. ICEA: Insulated Cable Engineers Association
19. IEEE-802.11 a, b, g, n: Wireless Local Area Networks
20. IEEE-802.3: 10 Mb/s, 100 Mb/s, 1 Gb/s, and 10 Gb/s Ethernet Standards as applicable based on media types (twisted pair copper, fiber optics, etc.)
21. IEEE-802.3ak: 10 Gb/s Ethernet (evolving copper standard).
22. IEEE-802.3af: Power-over-Ethernet (PoE).
23. IEEE-1100-1999: Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.
24. IEEE-141: Recommended Practice
25. IEEE-241: Recommended Practice for Electric Power Systems in Commercial Buildings.
26. ISO/IEC 11801: International Standard on Information Technology – Generic Cabling of Customer Premises.
27. NESC: National Electrical Safety Code
28. NEMA Stds Pub No. VE 1, Cable Tray Systems. Additionally, comply with current edition of NEC, as applicable to construction and installation of cable tray systems.
29. NEMA Std 250: Enclosures for Electrical Equipment (1000 Volts maximum).
30. NFPA-70/NEC: National Electrical Code.
31. NFPA-72: National Fire Alarm and Signaling Code
32. UL Compliance: Provide products which are UL-listed and labeled.
33. USDA Bulletin 1751F-643: Underground Plant Design.

B. Requests for variations from code shall be submitted to the university Code Official via the university project manager and must have OIT approval. The university Code Official will either disapprove or approve the request. In general, requests for code variations shall not be looked upon favorably. Variations from standards may be authorized by OIT on a case-by-case basis and must be requested in writing by the designer through the university project manager.

C. OIT owns and maintains the university's telephone and communications distribution system. OIT will provide design parameters for the distribution systems and for systems in individual buildings. OIT shall be consulted during project design through the assigned the university project manager.

1.5 DEFINITIONS

A. Telecommunications. Any transmission, emission, or reception of signs, signals, writings, images, and sounds, or information of any nature by wire, radio, visual, or other electromagnetic systems. Includes, but is not limited to, voice communications networks, Local Area Networks (LAN), Wide Area Networks (WAN), and Local Exchange Carriers (LEC).

B. Telecommunications Room (TR). A floor serving facility for housing telecommunications equipment, cable terminations, cross-connections, and network electronics. The TR is the recognized transition point between the building backbone and the horizontal pathway facilities.

C. Equipment Room (ER). A campus serving space. An ER houses primary system electronics, power, and media distribution for a campus or groups of buildings. ERs require extensive planning due to their size, nature, scope, and complexity. ERs are not typically required or funded for most projects. ERs may also be called server rooms, PBX rooms, disaster recovery rooms, data centers, and a variety of other terms. Contact OIT for clarification about what is placed in an ER.

D. Telecommunications Entrance Facility (TEF). Serves as the entry point into a building for the campus backbone media. TEFs interconnect the building backbone to campus backbone. The TEF is where conductive copper media receives it primary protection from sustained hazardous voltages. Therefore, significant wall space in the TEF may be required for primary protection of copper circuits. Also called the Service Entrance (SE).

E. Telecommunications Main Grounding Busbar (TMGB). The building's main telecommunications grounding point. The TMGB is busbar placed in the TEF, ER, or a selected TR to provide interconnection to the building's power ground via a bonding conductor for telecommunications.

F. Telecommunications Grounding Busbar (TGB). A common point of connection for telecommunications systems and equipment for bonding to ground. TGBs are required in all TRs and ERs.

G. Telecommunications Bonding Backbone (TBB). A conductor that electrically interconnects the TMGB to all TGBs.

H. Grounding Equalizer (GE). A conductor used to interconnect two or more vertical TBBs in multistory buildings. Previously called a Telecommunications Bonding Backbone Interconnecting Bonding Conductor (TBBIBC).

I. Network. Backbone media and electronics for transport of electronic information between campus entities.

J. Horizontal Distribution. The facility used for installation of media from the TR to the work area. Usually consists of cable tray and J-hooks to the work area faceplate.

K. Work Area (WA). A building space where the occupant generally interacts with the telecommunications equipment. WAs are typically defined as 100 ft^2 of usable space.

L. Building backbone. The pathways between floors for distribution of media. Building backbone was previously called riser cabling.

M. Campus backbone. The pathways and media that provide connectivity between the campus core and other buildings on campus. The campus backbone provides connectivity between buildings. The campus backbone represents the outside plant (OSP) infrastructure.

N. Office of Information Technology (OIT). University department responsible for telecommunications on the University of Colorado Denver | Anschutz Medical Campus.

O. Technology Consultant. A firm or member of a firm that has considerable technology design experience and possesses working knowledge and subject matter expertise in telecommunications code (NEC and NESC), industry standards (see TIA/EIA commercial standards in references), and BICSI methods and procedures (Telecommunications Distribution Methods Manual, LAN Design Manual, and Customer-Owned Outside Plant Design Manual).
1. OIT maintains a list of pre-screened technology consultants that can be obtained from the university project manager via OIT.
2. Technology consultants used for university projects shall be selected from the pre-screened technology consultant list.
3. Technology consultants not listed on the pre-screened technology consultant list must meet with OIT for certification and possible inclusion on the list. Firms vying for campus technology consultant designation must possess a registered communication distribution designer (RCDD) on staff. The RCDD must be thoroughly familiar with campus standards and methods and procedures and be dedicated to the assigned project. Contact the OIT Director of Telecommunications Networking Infrastructure (303.724.0423) for possible interview times.

PART 2 - DESIGN REQUIREMENTS FOR COMMUNICATIONS SPACES

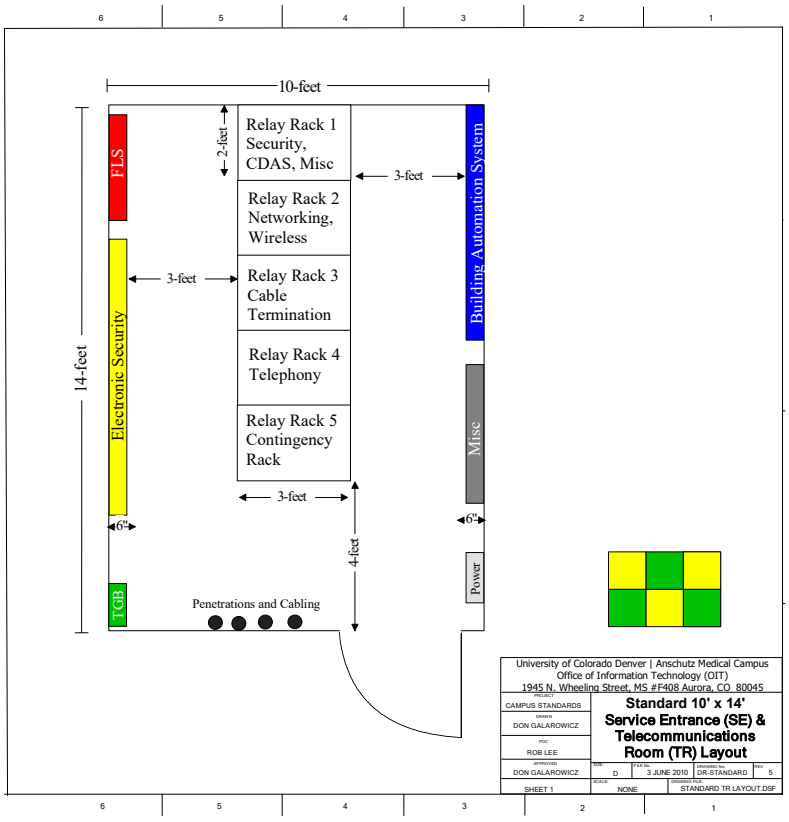
2.1 SPECIFIC DESIGN SPECIFICATION AND CONSTRUCTION REQUIREMENTS

A. Work Area (WA).
1. A WA is defined as a building space where occupants interact with telecommunications services such as voice, data, and video. A WA may be an office, conference room, training room, demonstration room, laboratory, copy/mail room, classroom, auditorium, loading dock, areas specified by the architect or university project manager, and other areas requiring access to telecommunications.
2. Each office WA typically requires two (2) telecommunications faceplates. As a minimum, each faceplate supports an A–jack and a B–jack. Typically, telephone service is provided by the A–jack and data networking connectivity is provided from the B–jack. However, the jacks are interchangeable and can be used by either application. This enhances the infrastructure's flexibility. One-inch conduit is used to provide a pathway inside the wall to each faceplate. The conduit is stubbed out to the top of the wall and is physically oriented towards the floor's cable tray. Connection to the cable tray is typically by a J-hook pathway.
3. All horizontal, low-voltage cables run back to the floor serving TR as part of the university's structured cabling standard.
   a. Horizontal cable shall be Commscope Category 6 or Category 6A (Augmented Category 6), as specified by OIT.
      1) Maximum length of horizontal cable – 90 meters or 295 feet.
         a) Allow 40 feet for access to and from the overhead cable tray and slack in the TR, yielding a maximum horizontal run length of 255 feet.
      2) Maximum length of WA station cables – 5 meters or 16 feet.
      3) Maximum length of TR patch cords – 5 meters or 16 feet.
4. The IT RCDD consultant shall identify and document the end user's WA connectivity requirements. This includes A/B jack faceplate locales and numbers, data network requirements, voice requirements, and wireless needs. These requirements shall be delivered to OIT so a budget can be created to provide the requisite systems.

5. The IT consultant shall identify and document the placement of Emergency Services Phones (ESP) or red phones. These phones are typically placed near elevator banks or restrooms. The design goal is to place at least one ESP per floor.
   a. All ESP and wall phone installations shall comply with the following ADA side reach requirements: 1) maximum side reach height shall be 54", 2) minimum side reach height shall be 9", 3) maximum side reach height over an obstruction that is 24" wide and 34" high shall be 46".
   b. All ESP and wall phone installation shall comply with the following ADA front reach requirements: 1) maximum forward reach height shall be 48", 2) minimum forward reach height shall be 15", 3) maximum front reach height over an obstruction shall be 44".
   c. The ESP solution consists of three parts: red analog phone, A/B cable run, and approved signage. OIT provides this solution under a separate budget.

B. Telecommunications Entrance Facility (TEF) or Service Entrance (SE).
1. All buildings require a TEF. The TEF serves as the entry point into a building for the campus backbone media. TEFs interconnect the building backbone to the campus backbone. The TEF shall be solely dedicated to telecommunications services. Space shall not be shared with electrical installations other than those designed and intended for telecommunications. The TEF shall be vertically aligned or stacked with the TRs to facilitate interconnection with the floors above and below. The university OIT must be consulted if the TEF does not align with the building's TRs.
2. TEFs may be co-located inside TRs or ERs, depending on the size of the building they support. Buildings larger than 100,000 ft2 may require a dedicated TEF. Buildings with 5 or more stories shall have a shared TR/TEF that is 10' x 16'. These larger TEFs shall support 5 equipment racks, with one rack being dedicated to fiber optics cable management.
3. TEF ceiling height shall be a minimum of 8' 6".
4. The TEF shall be dry and free from the danger of flooding. The TEF shall not be located where water ingress is possible or probable. No water or drain piping shall be routed through the TEF that is not associated with TEF equipment. Steam, heat, and any other source of environmental hazard shall be avoided.
5. Accessibility for the delivery of equipment as well as expansion should be provided for. TR location must also be designed for maximum cable lengths as specified in associated documents listed in References.
6. The TEF location should not be adjacent to any source of electromagnetic interference (EMI). The TEF shall be located away from sources of EMI at a distance which will reduce the interference to 3.0 V/m throughout the deployed frequency range. Interference may not exceed 3.0 V/m throughout the usable bandwidth of the communications cabling. Bandwidth for telecommunications is up to 1000 MHz.
7. Typical equipment requirements have a temperature range from 64°F to 75°F (18°C to 24°C) with a desired non-condensing, relative humidity range from 30% to 55%. Humidifiers are not typically required in TEFs. Generally, 24,000 BTUs of cooling are required in the TEF. Consult OIT for specific TEF cooling requirements. HAVC systems shall be placed with a drip pan or trough if placed in the TEF. The desired HVAC placement is outside the TEF. TEF HVAC units shall be placed on emergency power.
8. The TEF is where conductive copper media receives it primary protection from sustained hazardous currents. Therefore, significant wall space in the TEF may be required for primary protection of copper circuits. All four TEF walls shall be covered by 3/4" non-combustible A/C plywood mounted 6" above the finished floor (AFF) to 8'6" AFF. The A-side (smooth side) of the sheet shall be outward facing. The A/C plywood shall be securely fastened to the wall.
9. TEF design must conform to vibration requirements specified in TIA/EIA−569, current edition.
10. The TEF lighting shall be a minimum of 500-lux (50 foot-candles) measured 1 meter from the finished floor and shall be mounted to meet the design configurations of the room.

11. Emergency lighting is required. Lighting shall be placed to light the front and rear of the racks.
12. The TEF door shall be a minimum of 36” wide and 80” high, without doorsill, hinged to open outward, unless restricted by building code. The TEF shall have an electronic lock. All TEF doors shall egress into a common hallway or corridor to facilitate equipment placement.
13. Floors, walls, and ceiling shall be treated and sealed to eliminate dust. Wall finish shall be bright white in color to enhance room lighting. Antistatic flooring materials shall be used.
14. All TEF ceilings shall be a minimum of 8' 6" high, unobstructed; to provide space over the equipment frames for suspended cable trays or ladder racks. Suspended cable trays and ladder racks are typically installed at 7’ AFF. TEFs shall be free of false or suspended ceilings. Ceiling protrusions (i.e. fire suppression sprinkler heads) must be placed to assure a minimum of 8 feet of clearance from the finished floor.
15. A dedicated electrical panel shall be placed in each TEF to support telecommunications equipment. The panel shall be rated at 100 Amps or higher, as specified by OIT, to facilitate future growth. The power panel shall not be shared; it is for the exclusive use of the TEF’s equipment.
16. A typical TEF layout is shown.
17. Emergency generator power is required for the TEF. Label the panel per campus standard. For TEF planning purposes, assume 60 W/ft^2.



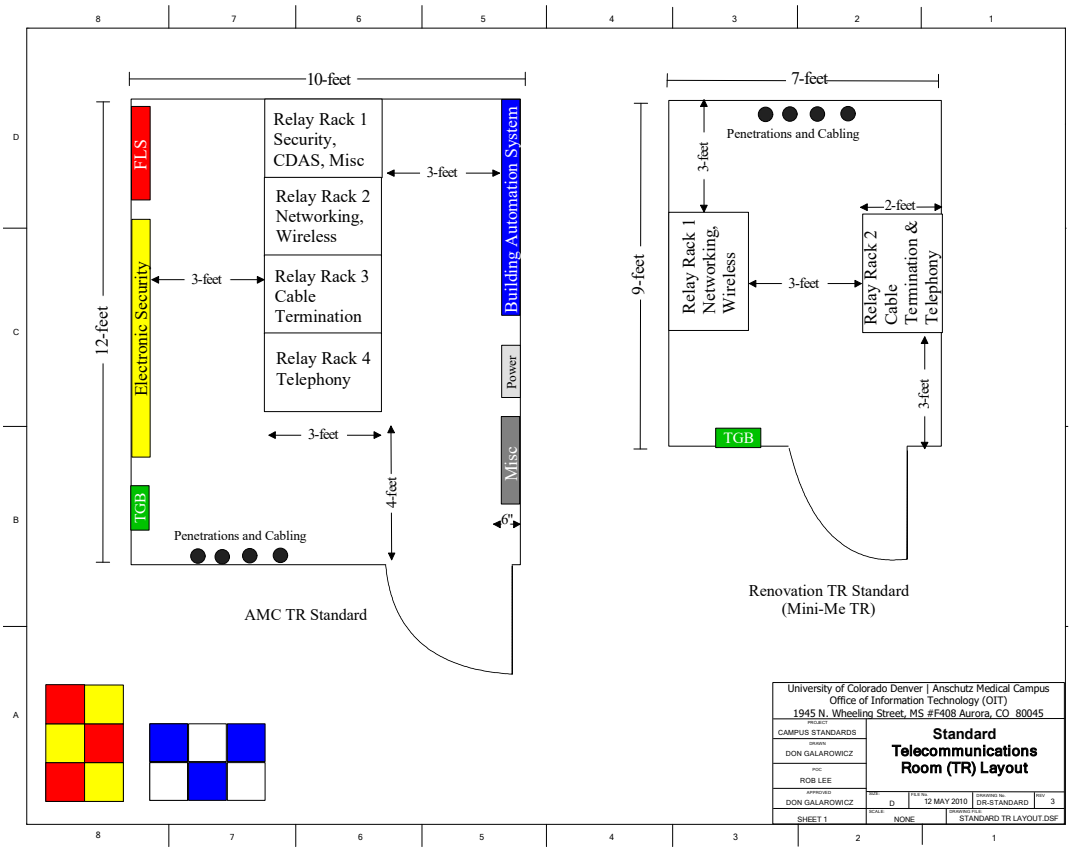
18. A minimum of three (3) dedicated, unswitched 20A, 120-VAC duplex outlets, each on a separate circuit in the dedicated TEF power panel, shall be provided for equipment power at heights and locations specified by OIT during the design phase. These three dedicated circuits shall be installed from above into the equipment racks as directed by OIT. Label all outlets to the campus standard.
19. Convenience duplex outlets, on a separate dedicated unswitched circuit, should be provided at 6’ intervals around the room. Install the convenience receptacles 15” AFF or as directed by OIT. Label all outlets to the campus standard.
20. Sleeves or slots through walls and floors shall be fitted with approved re-enterable firestopping.
21. Building backbone pathways connecting the TEF to TRs will require a minimum of four Trade Size 4” sleeves/conduits for interconnection, except where cable tray exists. A

minimum of two (2) spare conduits must be installed when the TEF is not vertically aligned from floor-to-floor to allow for lower fill ratios.
Sprinkler heads shall be provided with wire cages to prevent accidental discharge. Preaction sprinklers are preferred over wet pipe or dry pipe systems. If wet pipe or dry pipe systems are employed, then drainage troughs shall be provided under the sprinkler heads and pipes to prevent leakage onto the TEF equipment. High temperature heads are preferred.

C. Telecommunications Room (TR).

1. A minimum of one TR shall be designated per floor and that TR shall be solely dedicated to telecommunications services. Space shall not be shared with electrical installations other than those designed and intended for telecommunications.
2. TRs shall be vertically stacked to facilitate interconnection with the floors above and below.
3. All low voltage cables placed on a floor are homed back to the floor serving TR, as part of the structured cabling standard.
4. The TR shall be dry and free from the danger of flooding. The TR shall not be located where water ingress is possible. No water or drain piping shall be routed through the TR that is not associated with TR equipment. Steam, heat, and any other source of environmental hazard shall be avoided.
5. The minimum TR size is 10’ x 12’. Ceiling height shall be a minimum of 8’ 6”. Variations in size shall be approved by OIT on a case-by-case basis and will be dependent upon the floor size and applications to be served.
6. TRs shall be designed to meet floor loading (minimum floor loading of 50 lbf/ft^2) as specified in the references section.
7. TR location should not be adjacent to any source of EMI. The TR shall be located away from sources of EMI at a distance which will reduce the interference to 3.0 V/m throughout the deployed frequency range. Interference may not exceed 3.0 V/m throughout the usable bandwidth of the communications cabling. Telecommunications bandwidth is up to 500 MHz.
8. TRs require a temperature range from 64°F to 75°F (18°C to 24°C). The desired non-condensing, relative humidity range is from 30% to 55%. Humidifiers are not typically required in TRs. Temperature sensors shall be configured for alarm reporting and HVAC support units shall be installed on emergency power. A minimum of one air change per hour is required. Each TR supports 4 racks of equipment, with 20,000 BTUs of cooling required. Fan coil units are the usual cooling source. HAVC systems shall be placed with a drip pan or trough if placed in the TR. The desired HVAC placement is outside the TR. TR cooling shall be placed on emergency power.
9. All four TR walls shall be covered by 3/4" non-combustible A/C plywood mounted 6” AFF to 8’6” AFF. The A-side (smooth side) of the sheet shall be outward facing. The plywood shall be securely fastened to the wall.
10. TR design must conform to vibration requirements specified in TIA/EIA−569.
11. The lighting shall be a minimum of 500-lux (50 foot-candles) measured 1 meter from the finished floor and shall be mounted to meet the design configurations of the room. Emergency lighting is required in all TRs. Lighting shall be placed to light the front and back of the racks.
12. The TR door shall be a minimum of 36” wide and 80” high, without doorsill, hinged to open outward, unless restricted by building code. The TR shall have an electronic lock.
13. Floors, walls, and ceiling shall be treated and sealed to eliminate dust. Wall finish shall be bright white in color to enhance room lighting. Antistatic flooring materials shall be used.
14. All TR ceilings shall be a minimum of 8' 6" high, unobstructed; to provide space over the equipment frames for suspended cable trays or ladder racks. Suspended cable trays and ladder racks are typically installed at 7’ AFF in TRs. TRs shall be free of false or suspended ceilings. Ceiling protrusions (i.e. fire suppression sprinkler heads) must be placed to assure a minimum of 8 feet of clearance from the finished floor.

15. A dedicated electrical panel shall be placed in each TR to support telecommunications equipment. The panel shall be rated at 100 Amps, or higher as specified by OIT, to facilitate future growth. The panel may not be shared; it is for the exclusive use of the TR's equipment. Emergency generator power is required for all TRs. Label the panel per campus standard. For TR planning purposes, plan on 60 W/ft^2.
16. A minimum of two dedicated, unswitched 20A, 120-VAC duplex outlets, each on a separate circuit in the dedicated TR power panel, shall be provided for equipment power at heights and locations specified by OIT. These two dedicated circuits shall be installed from above into the equipment racks as directed by OIT. Label all outlets to the campus standard.
17. Convenience duplex outlets, on a separate dedicated unswitched circuit, should be provided at 6' intervals around the room. Install the convenience receptacles 15" AFF or as directed by OIT. Label all outlets to the campus standard.
18. Sleeves or slots through walls and floors shall be fitted with approved re-enterable firestopping.
19. Sample TRs shown below.



20. Building backbone pathways connecting TR's will require a minimum of four (4) Trade Size 4" sleeves/conduits for interconnection, except where cable tray exists. A minimum of two (2) spare conduits must be installed when TR's are not vertically aligned from floor-to-floor to allow for lower fill ratios.
21. Sprinkler heads shall be provided with wire cages to prevent accidental operation. Preaction sprinklers are preferred over wet pipe or dry pipe systems. If wet pipe or dry pipe systems are employed, then drainage troughs shall be provided under the sprinkler heads and pipes to prevent leakage onto the TR equipment. High temperature heads are preferred.
22. The TR is sized to support all low-voltage applications including: building automation systems (BAS); fire, life, and safety systems; overhead paging; electronic security systems; distributed antenna systems (DAS); and other low-voltage systems, as approved

by OIT. OIT shall assign rack space and/or wall space to these systems prior to placement.

D. Equipment Room (ER).

1. ERs are not required or funded for most buildings; contact OIT for need, design requirements, and placement.
2. Generally, each campus requires a minimum of one ER. Buildings may require an ER to house PBXs, servers, disaster recovery rooms, and other computing hardware. The OIT department will specify when an ER is required. ERs shall be exclusively dedicated to telecommunications services or the associated tenant IT systems. ER space must not be shared with electrical services other than those designed and intended for telecommunications. The ER should be centrally located to minimize the size and length of backbone cabling as well as provide easements and pathways for backbone and carrier services required of the room. The room shall not be adjacent to any high-voltage electrical services or water mains. A location should also be selected to allow for movement of large or heavy equipment. Access to cable pathways are required. ER walls should extend to structure and provide a sealed environment for equipment.
3. Consult TIA-942, Telecommunications Infrastructure Standard for Data Centers for ER design and implementation guidance. The university desires that ERs be built within a Tier 2 (redundant components) to Tier 3 (concurrently maintainable) framework. See 27 62 01 – Data Center standard.
4. The ER may also serve as the TEF facility for local exchange carriers (LEC) or competitive local exchange carrier (CLEC) where such a separate facility does not exist. Adjacency to existing carrier entrance facilities is required.
5. Sizing of ER will be calculated using area of service, types of service provided, and projections of growth. OIT will provide space requirements based on these factors. The minimum size of an ER for OIT is 500 ft^2. The size requirement may be smaller for non OIT ERs. Minimum working clearances of 3 feet shall be provided for all scheduled and installed equipment.
6. ERs may require access (raised) flooring to allow for the cable routing from cable vaults to equipment frames and PBX equipment, as specified by OIT. Cable tray, or equivalent, must be provided for cable management under the raised floor, if provided. Finished floor height must be at least 12” from the sub-floor to accommodate the cable management systems. The plenum area may be used for air handling for equipment cooling. All metal parts of the raised floor must be bonded to ground. Floor panels must be covered with high-pressure laminate or a durable, vinyl tile resistant to static electricity.
7. Floor loading capacity shall be sufficient to bear both the distributed and concentrated load of the installed equipment. The ER distributed loading shall be at least 100 lbf/ft^2 and the concentrated loading must be at least 2000 lbf. Distributed floor loading may range as high as 350 lbf/ft^2. Contact OIT for specifics.
8. ER design must conform to vibration requirements specified in TIA/EIA–569.
9. The ER shall be dry and free from the danger of flooding. The ER must not be located where water ingress is possible or probable. No water or drain piping shall be routed through the ER that is not associated with ER equipment. Steam, heat, and any other source of environmental hazard shall be avoided.
10. Water leak detection and alarming required.
11. The floors, walls, and ceilings shall be treated and sealed to eliminate dust.
12. All four walls in the ER shall be covered by 3/4" non-combustible A/C plywood mounted 6” AFF to 8’6” AFF. The A-side (smooth side) of the sheet shall be outward facing. The A/C plywood shall be securely fastened to the wall. Wall finish shall be bright white in color to enhance room lighting.
13. ER location should not be adjacent to any source of EMI. Interference may not exceed 3.0 V/m throughout the usable bandwidth of the communications cabling. Sources of EMI should be kept 3 meters from the ER.
14. ER doors shall be a minimum of 36” wide by 80” high. Due to the nature of the equipment located in the ER, ERs may require at least one oversized door (72” by 90”) to allow large equipment to be moved in or out. Doors shall open outward. ER doors shall be secured with

electronic access locks. All ER doors shall egress into a common hallway or corridor to facilitate equipment placement.

15. ER ceilings shall be a minimum of 8' 6" high, unobstructed; to provide space over the equipment frames for suspended cable trays or racks. ERs shall be free of false or suspended ceilings. Ceiling protrusions (i.e. fire suppression) must be placed to assure a minimum of 8 feet of clearance from the finished floor.
16. ERs require lighting with a uniform intensity of 500 lux (50 foot candles) when measured 1 meter above the finished floor. Indirect lighting is not approved for ERs. Connect lighting fixtures for ERs to separate electrical circuits from those that accommodate the equipment in the room. To avoid blocking or filtering the light, do not place lighting equipment above equipment cabinets, termination frames, or other freestanding equipment. Lighting shall be placed to light the front and rear of the racks. ERs may require emergency lighting as directed by OIT.
17. A dedicated electrical panel shall be placed in each ER to support telecommunications equipment. The panel may be rated at 200 Amps, or as specified by OIT, to facilitate future growth. The panel may not be shared; it is for the exclusive use of the ER's equipment. Emergency generator power is required for the ER. Label the panel per campus standard. UPS are also required, sized to handle a 10-minute outage. For ER planning purposes, assume 200 W/ft^2.
18. Temperature and moisture shall be controlled in all ERs. Typical equipment room requirements are:
    a. Temperature range from 64° F to 75° F (18° C to 24° C).
    b. Relative humidity range from 30% to 55%; humidifiers are required in ERs.
    c. Heat dissipation of up to 30,000 BTUs per hour or higher per cabinet. Consider room cooling, row cooling, or rack cooling topologies to achieve this heat removal. Cold and hot aisles are desired, with row-based cooling vice room CRACs. Temperature sensors shall be configured for alarm reporting and ER cooling units shall be installed on emergency power. Consult OIT for ER cooling requirements.
19. When copper cable services for any ER exceeds 1800 pairs, provide a separate room (cable vault) for cable splices. This room should be sized according to the requirements of the facility and should be located adjacent to the ER with free pathways to terminating equipment and cross-connect fields.
20. The ER should support a three-phased fire detection and suppression system.
    a. An air sampling fire detection system may be required. A very early smoke detection apparatus (VESDA) that sniffs for incipient, ambient smoke particles is desired. Contact OIT for desired vendors of solutions already in use.
    b. An HFC-227ea (FE-227 or FM-200, FM-200 preferred) inert gas fire suppression agent may be required, as directed by OIT.
    c. A preaction water-based fire suppression sprinkler may be requirement. Such sprinkler systems should have rack troughs to prevent accidental water damage to the equipment. The sprinklers should be caged or recessed and have high temperature valve fuse release heads. Equipment power off should be initiated prior to water release to minimize water damage to equipment.
21. Class C (or ABC) hand-held fire extinguishers shall be placed inside the ER. Pull stations shall be placed at all doors. EPO buttons are required at each door. Label all stations to campus standards. EPO buttons and pull stations shall have safe guard features to preclude accidental release.
22. Fire stop penetrations (area around sleeves, drilled core floor openings, and cables) shall be sealed or plugged with an 8-to-1 ratio expandable urethane foam with a 1" thick topping of water plug cement or equivalent. All unused sleeves must be plugged and capped by the GC with approved firestop.

END OF SECTION 27 05 27