



## **Procurement and Contracting Services**

### **Request for Proposals L302404 – Structured Cabling**

**ADDENDUM #1 - The University of Arizona  
Manual of Design and Specification Standards**

**Please mark all proposal submission  
Envelopes with the following information**

**Sealed RFP # L302404  
Due on February 17<sup>th</sup>, 2025, no later than 1:00 PM, MST**

# The following Design Specifications shall be incorporated into RFP L302404 and must be followed by all proposers.

## Section 16700- TELECOMMUNICATIONS

### Part 1 - General

- 1.1 The scope of this project includes providing all material and labor to install a complete telecommunication system. The systems shall include outside cabling, intrabuilding backbone (riser) cables, station wiring, terminations, and termination devices and grounding.
- 1.2 In any case where the specifications or drawings are not perfectly clear to contractors submitting a proposal, it is the responsibility of the contractor to obtain clarification from UITS-Engineering & Field Operations. The drawings are diagrammatic and are not complete in every detail. The contractor shall be responsible for determining how to perform all work included in the scope of the project and shall not make any additional charges for any work or material required for a complete installation. The drawings and specifications are complementary, and what is called for on one shall be binding as if called for by both.
- 1.3 Coordinate size and location of telecommunications rooms with the architect to be in compliance with this document and NEC Article 800.
- 1.4 For projects which require "Blue Light" emergency phones, refer to Section 16705, *Blue Light Phones*.
- 1.5 Refer to project plans and specifications for grounding and power requirements.

### 1.6 General Requirements

- 1.6.1 Codes & License Compliance: The completed installation shall be in compliance with all applicable electrical and fire codes and ordinances, the Williams-Steiger Occupational Safety and Health Act of 1970, and University Standards.
- 1.6.2 Telecommunications contractor must have a current State of Arizona C-67 Low Voltage Communications Systems license (or other State of Arizona equivalent), have **been** registered with the Arizona Corporation Commission for a minimum period of four years, and be a Panduit Certified Installer. Only contractors approved by UITS-Engineering & Field Operations will be permitted to perform telecommunications installation work in University owned facilities.
- 1.6.3 New & Listed Materials: All materials shall be new and shall be listed as being suitable for the purpose by Underwriters Laboratories, Inc. or equivalent testing agency known to and approved by the University.
- 1.6.4 Workmanship: All work shall be executed according to these specifications in a workmanlike manner and shall present a neat mechanical appearance when complete.
- 1.6.5 Quality Assurance: At least one person directly employed by the prime contractor shall be on site daily to monitor the daily activities of workers to ensure the quality of the work performed.
- 1.6.6 Acceptance Inspection: All work must pass functional and workmanship inspections prior to acceptance. The contractor shall make all required corrections, at no additional cost, before the system is put into service.
- 1.6.7 Clean up & Repair: Contractor shall be responsible for clean-up and repair of job site. Damaged false ceilings, pencil or chalk marks, handprints, gouges and tool marks, plaster dust, etc. shall be repaired, cleaned, removed, or painted as required. Penetrated fire barriers shall be resealed in an approved manner.
- 1.6.8 Submittal: Complete materials lists, manufacturer's literature, required drawings, and other required information shall be submitted for approval no less than 10 working days before such materials are required to be ordered for the work. UITS-Engineering & Field Operations must approve submittal prior to starting the installation. Submit through the University Project Manager.

- 1.6.9 Guarantee: Upon completion of the work and acceptance by the University, the contractor shall submit his warranty effective for one year guaranteeing to replace without additional cost to the University any work or material which is found to be defective within the warranty period.
- 1.6.10 Structured Cabling System Warranty: upon request of UITS, contractor shall provide a 15-year Panduit Certification Plus System Warranty covering the performance of the connectivity hardware and cable used in the structured cabling system.
- 1.6.11 As-Built Drawings & Documents: The contractor shall maintain daily up to date specifications and drawings. The contractor shall submit to UITS-Engineering & Field Operations a complete set of As-Built drawings showing the location and identification number of all jacks installed as part of the project. As-Built drawings shall be submitted in AutoCAD and .pdf format. In all new construction projects and major renovation projects, a laminated 24"x36" or 30"x42" copy of the as-builts for each TR shall be provided in the TR by the installation contractor.
- 1.6.12 Changes: No changes shall be made from the work as called for by these specifications and drawings, except by a written change order approved by the University Project Manager and UITS- Engineering & Field Operations.
- 1.6.13 Splicing: All copper cable splicing must be done by a qualified cable splicer, with a minimum of 5 years experience splicing large pair count copper cables. The cable splicer's name and qualifications must be submitted to UITS- Engineering & Field Operations for verification and approval prior to any splicing work. Provide a minimum of 48 hours advance notice to UITS- Engineering & Field Operations prior to performing any splicing to existing campus cabling infrastructure.
- 1.6.14 Grounding for telecommunications systems and equipment shall be provided in accordance with the requirements of the most recent version of the National Electrical Code, and with The University of Arizona DSS Manual Specification Section 16450.
- 1.6.15 Equipment shall be installed in such a manner that it does not impede the spray pattern of fire sprinkler heads.

## 1.7 Telecommunications Room Requirements

- 1.7.1 Install floor tile or seal the concrete floor to avoid dust.
- 1.7.2 The minimum ceiling height is 8 feet, 6 inches. Telecom rooms shall not have lift-out type ceilings.
- 1.7.3 When ceiling distribution systems are used, design the telecom rooms with adequate conduit or openings through beams or other obstructions into the accessible ceiling space.
- 1.7.4 Design doorway opening with a minimum opening of 3 ft. wide and 6 ft. 8 inches high, and doors shall be hinged to open outwards. If not possible increase room size for door swing.
- 1.7.5 Locate the telecom rooms in areas above the threat of flooding.
- 1.7.6 Provide a No. 6 AWG minimum ground wire in each closet. Terminate ground wire to a 6 inch copper buss bar which has provisions for additional ground connections.
- 1.7.7 Design lighting to provide a minimum equivalent of 50 footcandles measured at 1 meter AFF.
- 1.7.8 Telecom rooms shall be equipped with Cat Card swipe access and keyed to the restricted campus telecommunications key plan, accessible only to personnel authorized by UITS.
- 1.7.9 If possible, locate riser closet in the center of the building or within 150 feet of each tenant space. Multiple riser telecom rooms may be required on each floor.
- 1.7.10 In a multi-floor building the telecom rooms shall be aligned vertically. Locate telecom rooms so building structure beams and other trades equipment does not interfere with placing riser sleeves/conduits within six inches from wall.
- 1.7.11 Minimum size for floor (IDF) telecom rooms shall be 9 ft. x 11 ft. Larger sizes may be required for high density applications (more than 300 jacks), or if Distributed Antenna System (DAS) equipment will be utilized. No windows shall be permitted in IDF or BET rooms.
- 1.7.12 Minimum size for main (BET) Building Entrance room shall be 10 ft. x 12 ft. Larger sizes may be required if a large number of telecom rooms are served from the BET, if the BET is

also used as an IDF with more than 300 jacks, or if the BET serves more than one building. No windows shall be permitted in IDF or BET rooms.

- 1.7.13 Line all walls with 3/4 inch, 4 ft. X 8 ft. A-C grade plywood, mounted at 6" AFF. Plywood shall be treated on all sides with at least two coats of fire-resistant paint (white), or shall be fire-rated and painted with standard white paint. The fire-rating label on the plywood shall be left visible.
- 1.7.14 Provide a minimum of (1) 20A/120V duplex receptacle on each wall of each telecommunications room. Above each freestanding equipment rack, provide a minimum of (1) 20A/120V NEMA 5-20R dedicated receptacle. In addition, above four post freestanding racks, provide (2) 30A/208V NEMA L6-30R dedicated receptacles. In telecommunications rooms containing more than 192 station cable terminations, provide an additional 5-20R dedicated receptacle above each freestanding equipment rack. In buildings with emergency generator systems, half of the 120V and half of the 208V receptacles shall be connected to the building's emergency power system.
- 1.7.15 Entrance conduits to the BET from the outside point of connection to campus cable plant shall consist of a minimum of (4) 4 inch conduits. One of the four conduits shall be filled with (4) 1" innerducts.
- 1.7.16 Locate riser sleeves/slots on the immediate left side of the closet. This will enhance the use of wall space from left to right. Riser sleeves/slots shall be aligned vertically from floor to floor. Riser sleeves/slots shall be: (4) 4 inch sleeves or 4 in. by 16 in. slots. Additional sleeves may be required in large buildings. All riser sleeves shall have bushings installed for cable protection. Sleeves shall extend 4 inches AFF.
- 1.7.17 Telecom rooms shall be dedicated to telecommunications equipment and shall not be used as a passageway to other rooms. Energy management systems, fire alarm, sound systems, audio-visual, lighting control systems, and HVAC control systems equipment shall not be located in the telecommunications rooms.
- 1.7.18 Telecom rooms are not to be used for HVAC piping (other than for room-serving equipment located in the room), plumbing piping, fire sprinkler piping, or electrical riser systems.
- 1.7.19 Telecom rooms shall not be used for materials storage or for storage of janitorial equipment.
- 1.7.20 User equipment requiring an attendant, monitoring, or frequent attendance shall not be placed in telecommunications rooms. Fire alarm control panels, energy management panels and other equipment requiring access by trades other than telecommunications shall not be located in telecom rooms. Electrical circuit breaker panels shall not be located in telecom rooms unless the panels are dedicated to the telecom equipment in that room. Servers and other local area network equipment not managed by UITS shall not be located in telecommunications rooms.
- 1.7.21 All telecommunications rooms shall be served by the building HVAC system. Temperature in telecommunications rooms that will house active equipment shall be maintained within the range of 64 to 81 degrees F, at not more than 60% relative humidity. Telecommunications rooms shall have dedicated environmental controls, providing conditioning 24 hours a day, 7 days a week. All fan coils should be located outside of IDF rooms to prevent equipment damage due to water leakage.
- 1.7.22 Telecommunications rooms shall be sized and laid out in such a manner that there is a minimum of 3 ft. clearance in front of all telecommunications equipment, cross connect fields, patch panels, racks, cabinets, etc.

## **Part 2 - Description of Work**

### **2.1 Telecom Room Build-Out:**

- 2.1.1 Vertical cable runs are to be supported at a maximum of 5 ft. centers. Horizontal cable runs are to be supported at a maximum of 3 ft. centers.

- 2.1.2 Horizontal station cable terminations shall be marked with final University room numbers. Obtain entry cable and riser cable pair/strand count information from UITS Engineering & Field Operations.
- 2.1.3 Metal closed loop D-rings (2, 4, and 6 inch as required) shall be installed in quantities sufficient to produce an orderly cable and wire installation for vertical runs of backbone cabling within telecommunications rooms (note that D-rings are not an acceptable means of horizontal cable support). Distributing posts are not acceptable.
- 2.1.4 Cables shall be routed in such a way as to minimize interference with cross connect wiring and future equipment additions. Entrance cable shall be routed to and terminated to the bottom group of termination blocks. Horizontal distribution cables shall be routed to and terminated to the top group of termination blocks.
- 2.1.5 Cable management D-rings, brackets, and horizontal and vertical cable managers shall be installed to maintain an orderly appearance for cable or wires running between backboards, racks or to common equipment.
- 2.1.6 Riser cable splice cases are not considered part of a backboard and shall be located so as not to interfere with backboards or common equipment.
- 2.1.7 All wall mounted equipment shall be securely fastened to the plywood backboard. Suspension by connection to other equipment is not acceptable.
- 2.1.8 Complete telecommunication room layout drawings shall be included as part of the project submittal. Layout shall be designed to allow all four walls of the telecommunications room to be used for mounting telecommunications equipment.
- 2.1.9 Two post equipment racks shall be 7 ft. x 19 in. freestanding, welded steel, flat black. Provide each rack with 7 ft. high, double sided vertical cable managers, black in color, 6" or 10" as indicated in the construction documents. Provide blank filler plates to align with the hinges of the vertical cable managers.
- 2.1.10 Four post equipment racks shall be 7 ft. high, 19" EIA width, 29" depth, black Chatsworth #50120-703.
- 2.1.11 Horizontal cable managers shall be provided in each rack, a minimum of one small cable manager at the top of rack, and one high-capacity cable manager mid-rack.
- 2.1.12 Equipment racks, cable runway and other conductive equipment shall be grounded with a minimum #6 AWG connection to the ground bus in each telecom room. Free standing equipment racks (two post and four post) shall be provided with an equipment rack grounding strip and ESD port. Grounding connections shall be made using two-hole compression lugs.
- 2.1.13 When ceiling distribution systems are used, design the telecom rooms with adequate conduit or openings through beams or other obstructions into the accessible ceiling space.
- 2.1.14 Provide fire stopping for all floor penetrations and all penetrations of fire rated walls/partitions occupied by telecommunications cabling. Fire stopping of existing sleeves/penetrations shall be made using caulk or putty type materials. All new fire-rated sleeves/penetrations shall be made using re-enterable type sleeves. Fire stopping materials shall be UL listed and shall be installed in accordance with the manufacturer's installation requirements.

## 2.2 Entrance Cabling:

- 2.2.1 Copper entrance cabling shall be PE-39, Type ANMW, ASP, filled, direct burial, #24 AWG solid conductor, with REA color code.
- 2.2.2 Splice cases and/or closures shall be provided for copper entrance cabling as required, with prior-approval by submittal required. Provide transition splice to non-filled cable prior to building entrance termination.
- 2.2.3 Copper entrance cabling shall be provided with station protectors installed in accordance with NEC 800 requirements. Protectors shall be 110-in and 110-out, and unless otherwise noted on the construction documents, rack mounted.
- 2.2.4 Ground entrance cable shield to an approved provable ground as close to the entrance as possible in accordance with NEC requirements.

- 2.2.5 Terminal blocks shall be permanently marked with pair count numbers for entry cable terminations.
- 2.2.6 Optical fiber entrance cables shall be singlemode 8.2/125 Micron, 900 Micron buffered, OS2 rated.
- 2.2.7 Optical fiber outside plant cable installed in tunnels, underground conduit, or aerial construction shall be gel-free, double jacket, single armor type.
- 2.2.8 Entrance fiber shall be terminated on a rack mount enclosure with loaded LC adapter panels. All associated hardware shall be provided, including ground clamps, labels, vertical troughs, horizontal troughs, connector panels, blank panels, etc.
- 2.2.9 Optical fiber cable construction: provide indoor/outdoor riser rated cable for building entrance cables that are run to a splice case within 300 ft. of the building entrance. For backbone cables traversing more than 300 ft. of outside duct and/or tunnel pathway or for aerial construction, cable shall be single armor, double jacket. All outside plant optical fiber cables shall be gel-free, with loose tube construction.
- 2.2.10 Minimum strand count for optical fiber entrance cables shall be 24 strands singlemode per building.
- 2.2.11 Ground entrance cable shield to an approved provable ground as close to the entrance as possible in accordance with NEC requirements.
- 2.2.12 All optical fiber cable splicing shall be done using the fusion splice method.
- 2.2.13 All optical fiber connectors shall utilize fusion spliced pigtails or fusion splice-on connectors. Mechanical ("cam") type connectors are not acceptable.

### 2.3 Riser Cabling:

- 2.3.1 Fiber Optic Riser Cable shall be OFNR or OFNP, as required by code based on the installation environment. tight buffered.
- 2.3.2 Multimode riser cable shall be 50 micron, OM4 rated, with LC connectors. Singlemode riser cable shall be OS2 rated, with LC connectors. Connectors shall be fusion splice-on type, or factory terminated fusion splice pigtails.
- 2.3.3 Provide a minimum strand count of 24MM/24SM to each telecom room on the riser.
- 2.3.4 Optical fiber riser cables shall be terminated on a rack mounted enclosure, unless specifically noted otherwise on project plans and specifications. Adapter panels shall be duplex LC type, loaded
- 2.3.5 Multi-pair copper riser cable shall be shielded, type ARMM, 24AWG, solid conductor, Cat. 3 or higher rated, terminated on 110 blocks.

### 2.4 Station Wiring:

- 2.4.1 Provide a quad frame for each outlet, with blank inserts provided for unused openings. HORIZONTAL STATION WIRING MUST BE IN COMPLIANCE WITH ANSI/TIA-568.2-D HORIZONTAL WIRING DISTANCE SPECIFICATIONS. The maximum horizontal cable length shall be 90 meters (295 ft.). This is the cable length from the mechanical termination of the cable in the telecommunications closet to the telecommunications outlet in the work area. The distance maximum includes all wiring that is part of the horizontal wiring. Provide 12 in. of cable slack at the outlet end, plus an additional 10 ft. of slack in the telecommunications room, neatly arranged in a loop.
- 2.4.2 Station wiring and termination equipment shall be rated Category 6A for new construction or in existing facilities where the predominant cabling is Category 6A. Where Category 6, Category 5e or older cable is the predominant cabling, and the scope of the new cabling represents less than 30% of the existing cabling, the new cabling shall be Category 6 rated unless specifically noted otherwise on the drawings/specifications.
- 2.4.3 Station cable shall be 4 pair, solid conductor, REA color code, plenum rated, UL Listed type "CMP" w/FEP insulation. Cable must comply with ANSI/TIA-568.2-D. Cable jacket shall be yellow for Cat. 6A, violet for Cat. 6. Cable outer diameter shall be 0.25 in nominal, or smaller.

- 2.4.4 Station cabling for outdoor installations where the cable is in conduit that is not concrete encased shall be a flooded type cable. Outside station cabling shall be provided with modular protector modules to match the category rating of the cabling.
- 2.4.5 Outlet jack shall be an eight position modular jack meeting the specifications of FCC Regulations Part 68.500. All jacks shall be wired according to the T568B wiring schematic. Cat. 6A jacks shall be yellow in color. Cat. 6 jacks shall be violet in color.
- 2.4.6 Faceplates shall be stainless steel. For Cat. 6A jacks, faceplates shall be sloped, recess, four position. For Cat. 6 jacks, faceplates shall be NEMA style, with ivory quad frames, and ivory blank modules in unpopulated positions.
- 2.4.7 Wall telephone outlets shall be stainless steel phone plates with Cat. 6 keystone jack module.
- 2.4.8 Surface mount jack enclosures shall be used for locations where outlet boxes with faceplates are not feasible.
- 2.4.9 Blank cover plates shall be stainless steel; telephone style plates shall not be used.
- 2.4.10 Patch panels shall be angled, snap-in, populated with modular jacks.
- 2.4.11 Multipair copper riser termination blocks shall be 110 type, Cat. 5e with 5 pair connecting blocks for riser cables and 4 pair for station cables.
- 2.4.12 Station cable must not be spliced. Cable runs are to be direct home runs to the IDF and shall not pass through any other station outlet box. The cable bend radius for station cabling shall not be less than four times the outside diameter of the cable.
- 2.4.13 Install cables in conduit and raceways as specified and supplied and installed by the electrical contractor. All conduits and sleeves shall have insulated bushings installed to protect wire and cables from damage. Installed cables shall not be bundled together.
- 2.4.14 Install and terminate fiber optic cable station cabling where specifically indicated in the project plans and/or specifications.

## 2.5 Wiring Practices:

- 2.5.1 Station cables shall terminate on a rack mounted patch panel, in a single unified field (no separate voice and data fields). Terminations performed in existing locations without patch panels may utilize 110 style terminations only with prior approval by UITS Engineering & Field Operations.
- 2.5.2 Wireless access points in hard ceiling areas shall be mounted to a 4" square outlet box, using the manufacturer's mounting plate best suited to minimize the gap between AP and ceiling.
- 2.5.3 Wireless access points in lift-out ceiling areas shall be mounted to the ceiling grid using the manufacturer's ceiling grid clips best suited for the type of grid (recessed or flush). The access points shall be mounted at grid intersection points. An independent means of support (e.g., seismic support wire) shall be run from the building structure above to each access point. Cables for wireless access points shall be terminated on the station end with a female modular jack (not a male RJ-45 plug) to allow standards-compliant permanent link testing.
- 2.5.4 Cable and wire above ceiling shall be run parallel or perpendicular to the walls. Diagonal runs will not be accepted. Riser cables shall be run parallel to riser system. Do not install cables in close proximity to fixtures or equipment that may cause RFI or EMI. To reduce the effects of EMI, the following minimum distances shall be adhered to:
  - 5" from power lines of 2kVA or less.
  - 18" from high voltage lighting (including fluorescent).
  - 39" from transformers, motors, and power lines of 5kVA or greater
- 2.5.5 Cables and wire shall not be attached to conduit, pipes, ceiling grid/hanger wire, light fixture hangers, HVAC duct work, etc.
- 2.5.6 All horizontal UTP cable shall be pulled by hand. During pulling operation, an adequate number of workers shall be present to allow cable observation at all points of raceway entry and exit, as well as the point at which cable is "paid out" from the box or reel, and around corners.

- 2.5.7 Pull cables in accordance with manufacturer's recommendations and ANSI/IEEE C2 Standards. Manufacturer recommendations shall be part of cable submittal. Recommended pulling tensions and bend radius shall not be exceeded. Any cables bent or kinked to radius less than recommended dimensions are not allowed and shall be replaced at no expense to the owner.
- 2.5.8 Cables that show signs of being bent or kinked beyond recommendations then straightened are also not allowed and shall be replaced at no expense to the owner.
- 2.5.9 Cables that show damage to the jacket in any manner shall be replaced at no expense to the owner.
- 2.5.10 Cable and wire above ceiling shall be suspended from approved hangers as required and be routed as close to upper ceiling as practical. Supports shall be installed at a maximum of 3 ft. centers using metal "J" hooks with a wide base design and beveled edges. "D" rings shall not be installed as a means of horizontal cable support.
- 2.5.11 "J Hooks" and other similar cable support devices shall be attached using corrosion resistant screws, #8 minimum. Drywall screws shall not be used for fastening "J-Hooks".
- 2.5.12 Cables shall not be installed in a manner such that they rest upon ceiling tiles, mechanical equipment, or other systems.

## 2.6 Raceway Requirements:

- 2.6.1 Conduit fill: In new installations, conduit fill shall not exceed 50%. In retrofit installations, conduit fill may exceed 50% provided that the necessary pulling tension does not exceed the cable rating, and that compression of the cable jacket does not occur.
- 2.6.2 All conduits and sleeves must have UL approved insulated end bushings installed prior to installation of cables or station wire.
- 2.6.3 Surface raceway shall be steel or aluminum only.
- 2.6.4 All riser sleeves/conduits and penetrations of fire rated partitions shall be fire stopped using approved methods and materials.
- 2.6.5 All cables shall be installed in compliance with manufacturers pull tension and bend radius specifications.
- 2.6.6 Station cable shall have individual pair twists preserved to point of termination. Cable jacket and inter-pair twists shall be continuous to within ½" of termination. Cables should not be routed in tightly cinched bundles. Avoid over-tensioning or twisting cable during installation.
- 2.6.7 Wall boxes shall be flush mounted, standard metal 4 inch square, deep type, with a single gang plaster ring. Conduit from the wall box shall be concealed and stubbed out above accessible ceiling, to riser closet, or to the telecommunications cable tray. Conduit shall be 1" minimum. Conduit end shall be fitted with a UL approved insulated bushing.
- 2.6.8 Any additional outlets that will not operate over the standard University building telephone/data network shall use a completely separate conduit and wall outlet.

## 2.7 Telecommunications Cable Tray

- 2.7.1 Telecommunications cable trays are for the containment and support of telecommunications cables only. Cable trays shall not be used for the support of electrical power cables and conduits. Cable tray shall be bonded to ground in accordance with electrical code requirements.
- 2.7.2 System shall be designed and installed to allow accessibility for adds, moves, and changes.
- 2.7.3 Wire mesh (basket) type cable tray shall be used outside of telecommunications rooms.
- 2.7.4 Trays may be supported by cantilever brackets, trapeze, or individual rod suspension. Supports shall be installed on five-foot centers maximum. A support shall be placed within two feet on each side of any connection to a fitting. Center hung supports shall be used only with prior approval from UITS Engineering.



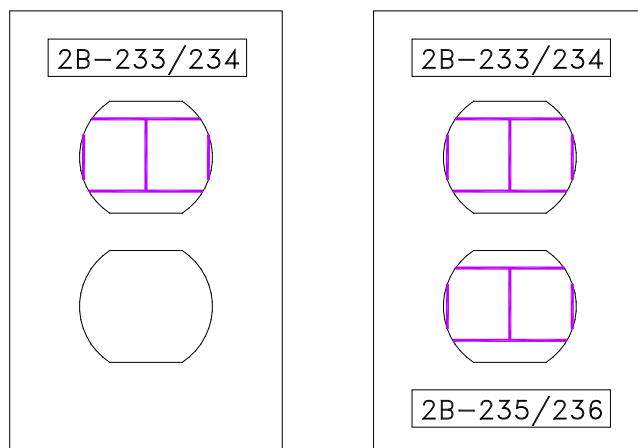
- 2.7.5 The inside of the cable tray shall be free of burrs, sharp edges, and projections that can damage cable insulation.
- 2.7.6 A minimum of 12-inch access headroom shall be provided and maintained above the complete cable tray system. Cable trays must have adequate side access for initial cable installation and for future cable adds, moves, and changes.
- 2.7.7 Cable tray “tees” and 90’s shall have wide radius junctions.
- 2.7.8 Care should be taken to ensure that other building components do not restrict access to the cable tray.
- 2.7.9 Cable tray shall be level and have supports if required to prevent horizontal movement.
- 2.7.10 Provide intersection bend control radius fittings on all 90 degree and ‘Tee’ junctions.
- 2.7.11 System shall be designed and installed to allow compliance with ANSI/TIA-568.2-D horizontal wiring distance standards.

2.8 Fire Stop:

- 2.8.1 Installers shall be certified by the manufacturer of the firestop system(s) utilized, and installation shall be in full compliance with manufacturer’s requirements for the intended application. In new construction, re-enterable type sleeves shall be utilized. For retrofit applications, caulks and sealants shall be listed for the intended application and installed in accordance with the listing requirements.

2.9 Labeling:

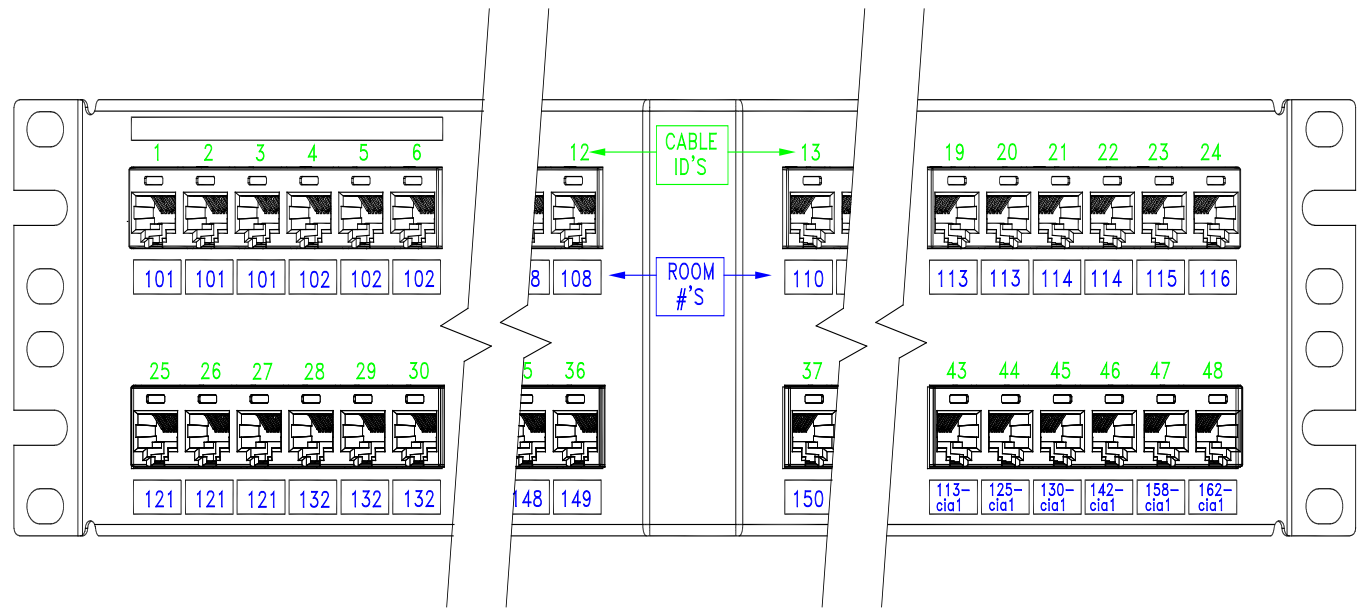
- 2.9.1 All labels shall be machine generated (printer or handheld label machine).
- 2.9.2 All cables shall be permanently identified at both ends.
- 2.9.3 The labeling for outlets shall consist of three components: (1) a unique sequential numeric designation for each jack/cable, (2) an alpha-numeric designation for the telecommunications room serving the outlet, and (3) the final University room number. At the station end, the faceplate of each outlet shall be labeled with the alpha-numeric telecommunications room identifier, plus the sequential numeric jack/cable identifier, as shown on the diagram below. At the telecommunications room end, the patch panel shall be labeled with the final University room number, plus the sequential jack/cable identifier. A label with the sequential jack/cable identifier shall be applied to each end of the station cable within 6 inches of the termination.



DUPLEX OUTLET

QUAD OUTLET

Faceplate Labeling Diagram



### Patch Panel Labeling Diagram

- 2.9.4 Fiber optic riser cables shall be labeled utilizing a unique sequential numeric designation for each strand within a given building. Couplers and coupling panels shall be grouped by type of fiber, adjacent to each other either vertically or horizontally depending on LIU construction, with a designation indicating “SM” for single mode and “MM” for multimode. Each LIU in an IDF shall be labeled with the unique numeric strand designations and labeled with the originating end Equipment/BET Room designation (alpha-numeric identifier). The LIU(s) in the Equipment/BET Rooms shall be labeled with the unique numeric strand designations, plus each group of fibers shall be labeled with the remote end IDF Room designation (alpha-numeric identifier).
- 2.9.5 The sequential numeric designation for optical fiber strands shall be in the range of 1-999 for singlemode, and 1001-1999 for multimode, starting with 1 and 1001 respectively,
- 2.9.6 Prior approval of final labeling scheme must be received from UITS Engineering & Field Operations. Labels shall be applied at the time of cable acceptance testing.

### 2.10 Outside Plant work

#### 2.10.1 Underground Conduit:

- Underground conduit shall be 4” minimum, unless otherwise specified. Conduit shall be heavy-wall, Schedule 40, UL listed for direct burial and concrete encasement.
- Conduit bends shall be sweeps, 12 times the conduit diameter. Bends shall be concrete encased PVC Schedule 40, or rigid galvanized steel double wrapped with 10 mil PVC tape.
- Conduit pole risers shall be rigid galvanized steel from below grade to a minimum of 10’ above grade, mounted to the pole with standoff brackets. Pole riser shall be located in a pole quadrant opposite the traffic side of the pole.
- Conduits shall be installed in continuous sections, with no continuous sections to

- exceed 500 feet without pull points.
- Conduits shall have no more than three 90 degree sweeps (or 270 degrees total bends) between pull points.
- All conduits shall be mandrel tested prior to acceptance by the University. Conduits that do not pass a mandrel test shall be repaired or replaced and re-tested at no cost to the University. Notification of mandrel testing shall be provided to the UITS project manager 24 hours in advance of testing and shall be witnessed by a UITS representative if requested.
- Empty conduits shall be provided with 2500 lb. mule tape with footage markers, secured with at least 4 ft. of slack at each pull point or termination point.
- Underground conduits shall be installed a minimum of 24 inches below grade, separated from other utilities with a minimum of 12" well packed earth, 4" of masonry, or 3" of concrete.
- Provide 6" orange, traceable underground warning tape labeled "Caution- Buried Fiber Optic (or Telephone) Cable Below" above all conduits or duct banks, installed 12" below finished surface.
- Innerducts for use in underground conduits shall be corrugated, PVC, 1" or 1-1/4" as specified.
- Conduits and innerducts shall be sealed at termination points using watertight, corrosion-proof, removable and re-usable duct plugs as manufactured by Jackmoon or equivalent.
- Building entry conduits shall slope downward away from the building and shall be sealed to prevent entry of moisture, rodents, etc.

#### 2.10.2 Maintenance Vaults (Manholes)

- Maintenance vaults shall be dedicated for telecommunications systems use; joint-use with electric or other utilities are not permitted.
- Maintenance vaults shall be pre-cast concrete, with galvanized interior hardware to include entry ladder, pulling eyes, bonding inserts and struts for racking. Pre-cast neck and shaft extensions shall be provided as required to bring the cover to the finished elevation.
- All maintenance vaults shall be provisioned with Neenah Foundry #R-1751-C frame, with solid outer lid and gasketed inner lid with lockbar. Outer lid shall be permanently marked "Communications".
- Manholes for utilization with multiple conduit duct banks shall have a minimum interior size of 8'x10', Utility Vault Co #510-TA or equivalent. With prior approval from UITS, manholes for utilization with less than 4 conduits may be smaller, 4'x4' nominal exterior dimensions, Utility Vault Co. #444-LA or equivalent.
- Conduits shall enter vaults through single duct knockouts, with the space between the conduit and the knockout filled to form a watertight seal.

#### 2.10.3 Handholes

- Handholes are intended for use as pull points only and shall not be used as splice points without prior written permission from UITS Engineering and Field Operations.
- Handholes shall be polymer concrete, with H-20 traffic rated cover.
- Provide handholes with lockable, vandal resistant galvanized steel insert, as manufactured by McCain Inc. or equivalent.
- Joint use of handholes with electric or other utilities is not permitted.

### Part 3 - Products

#### 3.1 Materials List:

All items not specifically covered in these specifications must have the concurrence of the University UITS-Engineering & Field Operations Department before placement or implementation.

Approved Cat. 6A station cables. Cable shall be plenum rated, with yellow jacket, with nominal cable O.D. of 0.250" or less.	BerkTek LANmark-SST Yellow 11140403
	Superior Essex 10Gain XP #6B-246-6B
	Panduit TX6A PUP6AXHD04YL-G
	General Cable GenSpeed Gen5 7151822
	Belden 10GXW13 0041000
Approved Cat. 6 station cables for use in existing buildings with Cat. 6 legacy cabling. Cable shall be plenum rated, with violet jacket	Belden 2413.
	Berk-Tek LanMark1000 10033809.
	Superior Essex DataGain 66-240-7B.
	Panduit TX6000 PUP6004VL-WLPZ.
	General Cable GenSpeed 6000 7131909.
Approved outdoor station cables for below grade use.	Berk-Tek LANmark-10G CAT6A OSP 11094458.
	Mohawk LAN-Trak 6A M59198.
	Superior Essex BBD6A.
Multi-Pair Copper Riser Termination blocks.	Cat. 5e, Panduit #P110B100R4WJY (rack mount).
	Panduit #P110BW series (wall mount for legacy only).
110 style connecting blocks.	Cat.5e: Panduit P110CB4-XY, P110CB5-XY.
Patch panels for station cabling.	24 port Angled, Panduit #CPPLA24WBLY.
	48 port Angled, Panduit #CPPLA48WBLY.
	24 port Flat, Panduit #CPPL24WBLY - Wall Mount.
	48 port Flat, Panduit #CPPL46WBLY - Wall Mount.
Cat. 6A outlets.	Sloped recess stainless steel, Panduit #CFPSL4S.
	Yellow Cat6a Jack, Panduit CJ6X88TGYL jack.
Cat. 6 outlets for use in existing buildings with legacy Cat. 6 cabling.	Stainless faceplates, Legrand/Hubbell #SS8/SS82.
	MIN-COM 106 frame, Panduit CF1064E1Y.
	Electrical Ivory Blank Modules, Panduit CMBEI-X.
	Violet Cat6 Jack, Panduit CJ688TGVL.

Wall telephone outlet.	Stainless steel phone plate for TP Style jacks, Panduit KWPY.
	Yellow Cat 6A Jack Net Key, Panduit NK6X88MYL.
	Purple Cat 6 Jack Net Key, Panduit NK688MVL.
Surface mount jack enclosure.	Blue Light phone jacks, wireless access points, Panduit #CBX2.
Blank cover plate.	Single gang, Pass & Seymour #SS14.
	Double gang, Pass & Seymour #SS24.
Fire Stop.	High capacity sleeves, STI EZ-Path.
	High capacity sleeves, 3M Quick Pass.
	High capacity sleeves, Wiremold FlameStopper.
	Caulks and sealants, STI.
	Caulks and sealants, 3M.
	Caulks and sealants, Nelson.
Cable shield connector.	Shield Connector w/insert shoe, 3M 4460-S.
Bonding & Ground cable/wire.	Green Ground Wire, #6 AWG minimum.
	Bonding Cable - #6 AWG rated flexible braid with eyelets.
Splice case	To be specified by UITS.
Splice case filling compound.	Re-enterable type, 3M 4442.
Heat Shrink Tubing.	Highly Flame Resistant, semi rigid, polyvinylidene fluoride, Kynar.
Cable Ties.	Plenum type where required by code, Panduit hook and loop type.
Wallmount Fiber Optic enclosures: All associated hardware shall be provided, including ground clamp, labels, vertical troughs, horizontal troughs, connector panels, blank panels, etc.	Corning Wall-Mountable Connector Housing.
	Panduit Opticom Wall Mount Fiber Enclosure.
Fiber Optic Connector, LC fusible splice-on type.	Corning FuseLite.
	AFL FuseConnect.
	Panduit Fusion Splice-On Fiber Optic Connectors.
	Belden FX Fusion.

Rack mount optical fiber enclosures for riser cable applications.	Corning CCH Series - loaded LC adapter panels.
	Panduit FCE series - loaded LC adapter panels.
	Note: Adapter panels shall have 6 or 12 duplex adapters, with zirconia ceramic split sleeves, OM3/OM4 or OS2 rated for multimode and singlemode fiber respectively.

Optical fiber riser cable: Riser rated unless a plenum rating is required by code based on the installation environment. Multimode shall be OM4, singlemode OS2.	Corning Cable Systems MIC series.
	Panduit Opti-Core series.
	Commscope Premises Riser Distribution series.

Optical fiber outside plant cable installed in tunnels, duct banks, or aerial construction shall be gel free.	Corning Cable Systems Altos Armor series.
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Optical fiber building entrance cable.	Corning Cable Systems FREEDM series, gel free with interlocking armor.
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Surface raceway.	Wiremold 2400.
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"D" Rings.	Allen Tel GB13A (2 in.), GB13B (4 in.), GB13C (6 in.).
	Note: for use in telecom rooms for vertical cable management only.

Cable hangers.	nVent/Caddy Cat HP J-Hooks.
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Approved wire basket type cable trays.	Cablofil EZTray.
	Eaton Metals Flextray.
	nVent CADDY WBT Performance Cable Tray.

Overhead cable tray for use in telecom rooms.	Panduit Wyr-Grid, 12" minimum width, with 2" minimum height sidewalls provided at 12" intervals along the length of the tray, and waterfalls, Provide intersection bend control radius fittings on all 90 degree and 'Tee' junctions.
	Chatsworth Universal Cable Runway series, 12" minimum width with junction splice kits, end caps, runway mounting plates, waterfalls, and support brackets.

Two post equipment racks.	
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	7 ft. x 19" freestanding welded steel equipment rack, flat black, B-Line #SB-506-084-U-FB.
Vertical cable managers.	7' high, double-sided cable mangers 6" or 10" as indicated on the drawings, black in color, Chatsworth MCS series.
Horizontal cable managers.	High capacity cable managers shall be Panduit #NMF4.
	Standard size cable managers shall be Panduit #NMF2.
	Small cable managers shall be Panduit #NCMHF1.
Blank filler plates for equipment racks.	Panduit #CPAF1BLY, provided one per freestanding equipment rack, aligned with MCS Series vertical cable manager hinges as indicated on the drawings.
Four post equipment racks.	7 ft. high, 19" EIA width, 29" depth, black Chatsworth #50120-703.
Equipment rack grounding strips.	Panduit #RGS134-1Y.
	ESD ports shall be Panduit #RGESD2-1, with #RGE SDWS wrist strap.
Protectors for multi-pair entrance cable.	110-in and 110-out connectors, and unless otherwise noted on the construction documents, shall be rack mounted, Porta Systems 19050-110-110.
	Protector modules shall be 4B1E type.
Modular protectors for station cables.	ITWLinx MC04110 for voice service.
	ITWLinx Cat6LAN for Cat6 data service.
	ITWLinx Cat6ALAN-75 for Cat6a data service.

#### Part 4 - Acceptance Testing

- 4.1 End-to-end testing of all cable pairs, optical fiber strands, and coax cables shall be performed after completion of installation and termination. UTP station wiring shall be in compliance with the ANSI/TIA-568.2-D standard for the level of cable being tested (Cat. 6, Cat. 6A). Labels shall be applied at or before the time acceptance testing is performed.
- 4.2 Cable testing shall be performed with the terminating hardware at both ends inserted into the final patch panel, enclosure, or outlet position. For example, testing of fiber strands from the

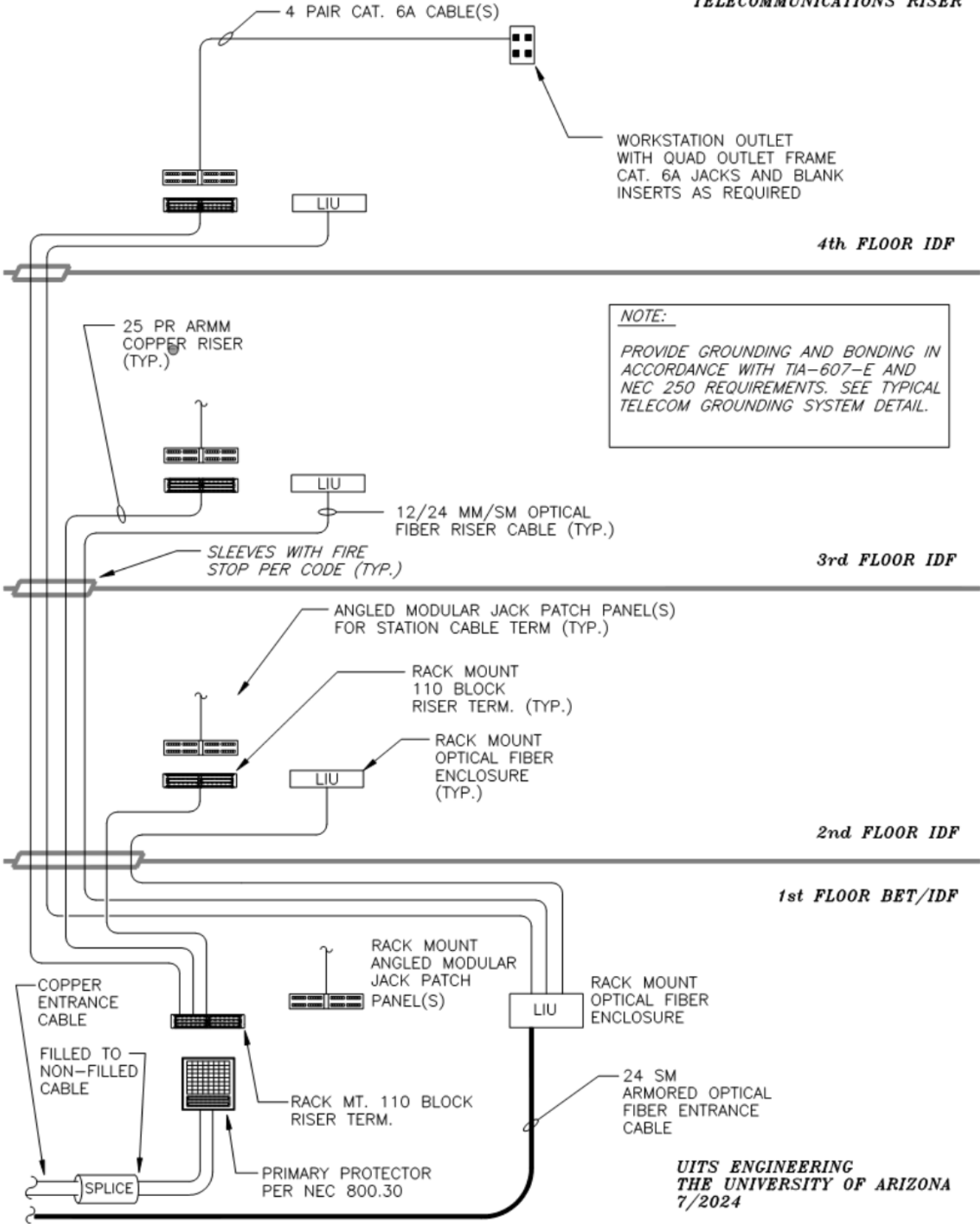
- back of the fiber enclosure prior to inserting the connector into the adapter panel mounted in its final resting place is not acceptable.
- 4.3 Cable testing shall be performed using Fluke Versiv series test equipment.
  - 4.4 Copper station cable tests shall be "Permanent Link" tests, performed with the appropriate test adapters/cords. "Basic Link" and "Channel" tests are not acceptable.
  - 4.5 End-to-end attenuation testing of each optical fiber strand shall be made using an optical power meter and optical light source. Multimode fibers shall be tested at 850 and 1300nm. Singlemode fibers shall be tested at 1310 and 1550nm. Attenuation tests shall be performed in both directions.
  - 4.6 UITS-Engineering & Field Operations must approve test documentation. Documentation shall be submitted in Fluke LinkWare Database electronic format.
  - 4.7 Test result documentation shall indicate the final cable/outlet number assigned to each item tested, as well as identify the project and the telecommunications room serving each item tested. The test result submittal shall be organized by telecommunications room, with the test results in sequential order based on jack id. Test results that are incomplete or that are not organized in sequential order will not be accepted.

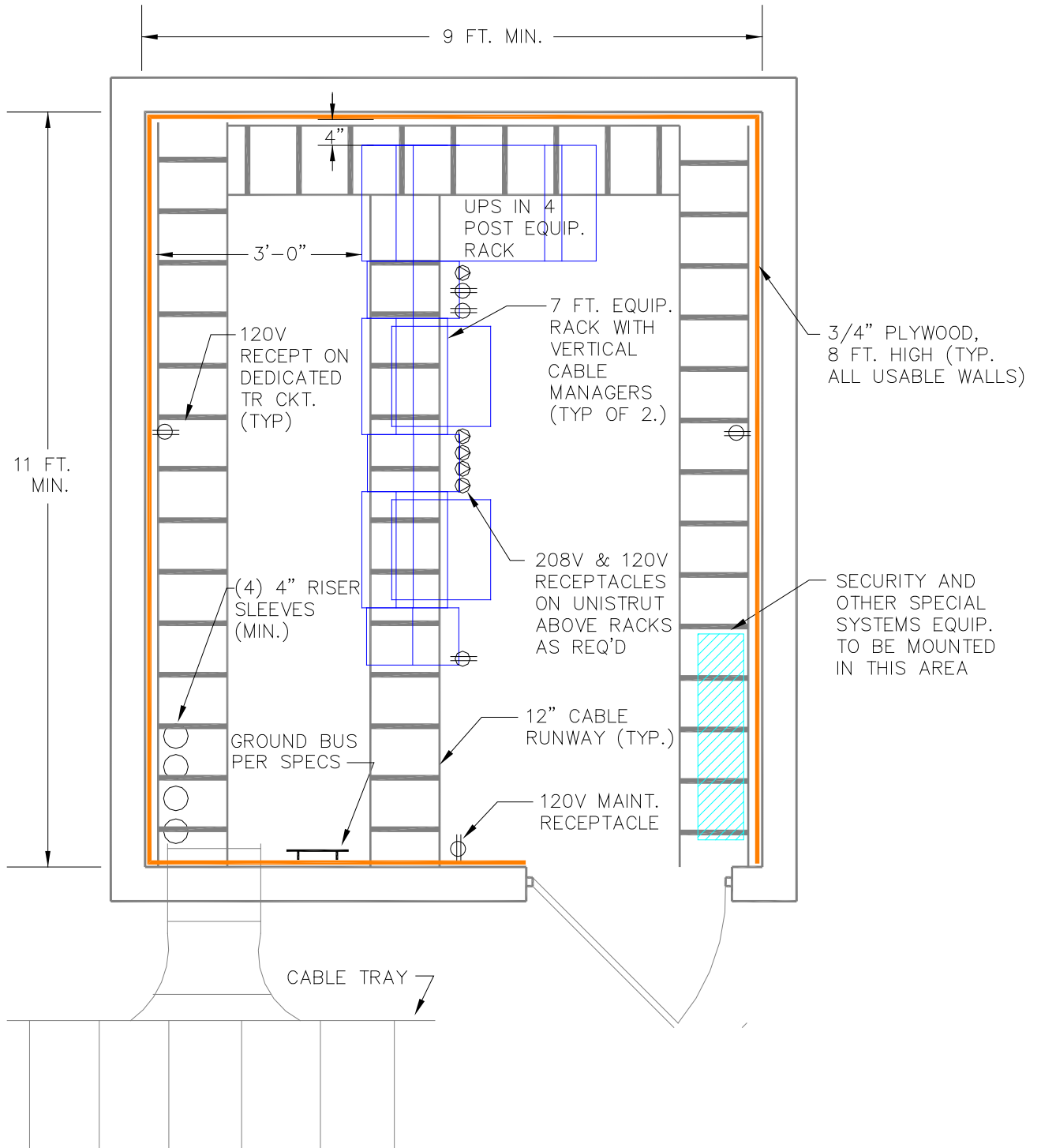
## **Part 5 – Demolition**

- 5.1 All abandoned telecommunications cables within a project's boundaries shall be completely removed back to the termination block, including multi-pair cabling, coaxial Ethernet cabling, and station cabling.
- 5.2 Tele/data outlets shown on demolition drawings to be removed shall be removed completely including outlet and wiring to the originating IDF termination point. Termination labels shall be revised to reflect all changes.



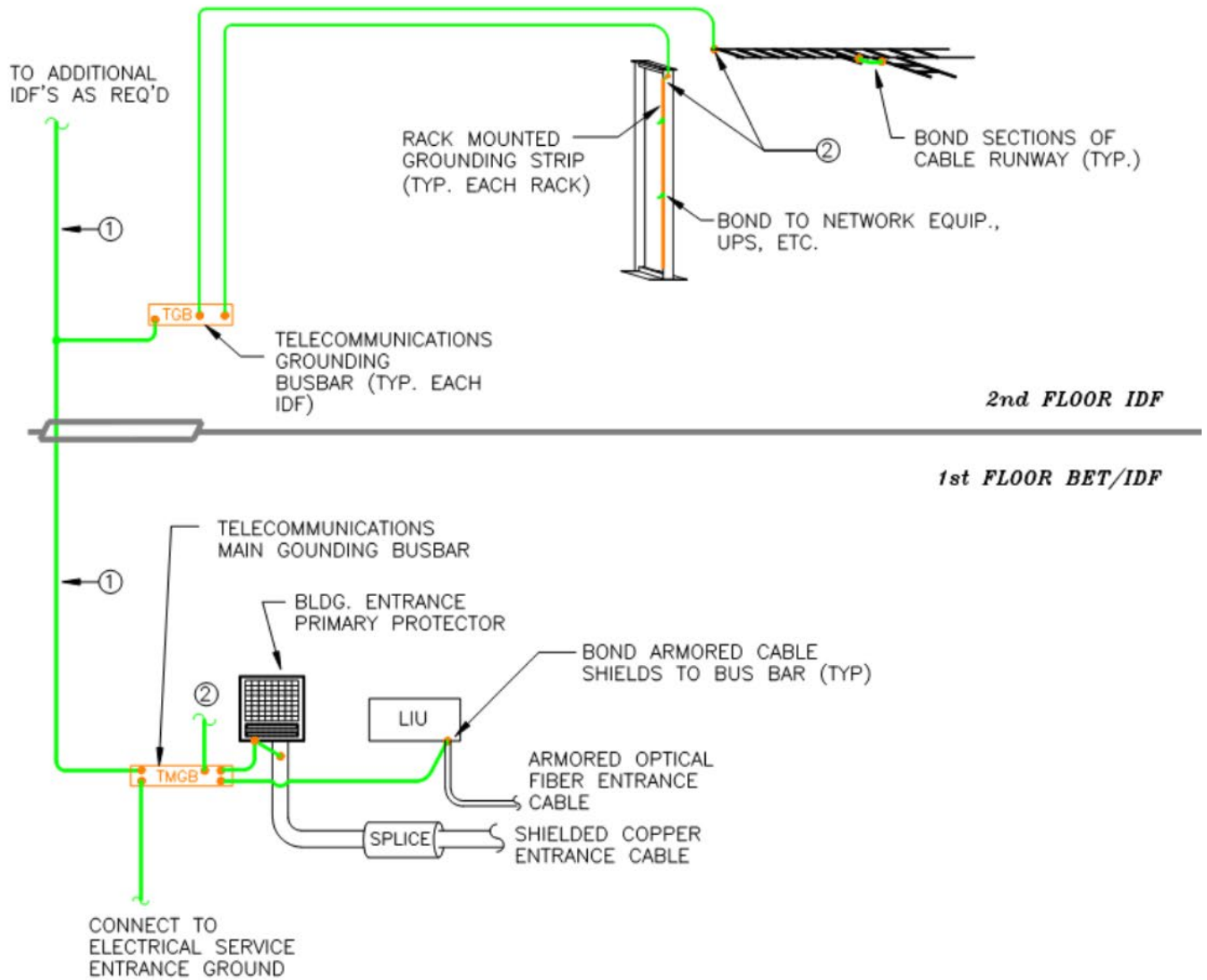
**TELECOMMUNICATIONS RISER**





*TYPICAL TELECOMMUNICATIONS ROOM*

**TELECOMMUNICATIONS GROUNDING SYSTEM**



- KEYNOTES
- ① TELECOMMUNICATIONS BONDING BACKBONE. SIZE PER TIA-607-E; #4 AWG MINIMUM.
- ② BOND TO EQUIPMENT RACKS, CABLE RUNWAY, CABLE TRAY, SHIELDED CABLE, ETC. #6 AWG MINIMUM, TYP. OF ALL IDF'S AND BET

**NOTE:**

GROUNDING AND BONDING SHALL BE IN ACCORDANCE WITH TIA-607-E AND NEC 250 REQUIREMENTS.

**End of addendum, all else remains the same.**