Campus IT Infrastructure Standards
Revised March 4, 2023

In order to ensure compliance with these standards, telecommunications designs and plans shall be reviewed for approval by Berkeley Information Technology (bIT) – Campus IT Infrastructure prior to the start of any project. While every effort has been made in the crafting of the Campus IT Infrastructure Standards, it is acknowledged that all field conditions may not be addressed and that questions regarding intent and implementation will arise. Contractors shall review all applicable Campus IT Infrastructure Standards prior to the start of any project. Any questions regarding the accurate implementation of any standard herein shall be delivered, in writing, for final interpretation by bIT - IT Infrastructure. Guidance as a result of interpretation shall be implemented as indicated.

As of January 2022, Campus Information Services and Technology (IST) has been renamed to Berkeley Information Technology (bIT). Design and Project Management (DPM) has been renamed to Communication Infrastructure Design and Build (CIDB).

bIT - IT Infrastructure
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Section 1 - Minimum Coordination Requirements

SCOPE

The purpose of this section is to identify critical coordination required between project designers, contractors, UC Berkeley Capital Projects, Owner's Representative, and Berkeley Information Technology (bIT) - Communications Infrastructure Design and Build (CIDB) unit. The items identified in this section do not denote the entire requirements, but rather minimum basic coordination needed between the parties and IT Infrastructure.

All coordination for a project shall originate through the designated UCB Owner's Representative and/or UC Berkeley Capital Projects in order that all parties are aware of the Campus IT Infrastructure Standards.

All parties are required to read and understand the standards and pose questions to any part of the standards that may not be understood in order to obtain clarification directly from bIT-CIDB for Telecommunications-related issues supported by bIT-CIDB. **bIT-CIDB is to be consulted prior to starting any work related to bIT-CIDB supported Infrastructure and/or Services.**

1 DESIGNER

A designer is considered to be any professional contributing to the formulation of scope and drawings used for the purpose of defining a project's contractual documents used for bidding a project and giving direction to an installation. The designers shall accomplish the following coordination:

A. Coordinate the telecommunication room (TR) requirements between the designing engineer and the architect for the purpose of sizing and locating a TR based on Campus IT Infrastructure Standards as early in the project as possible.

B. Seek approval from bIT-CIDB for all TR size and locations at the time they are defined, and at any time the room size, shape, location, or parameters change.

C. Emergency Phone(s)
   a. Coordinate emergency phones with bIT-CIDB and the University Campus Police Department (UCPD) as early in the project design phase as possible.
   b. Confer with UCPD and bIT-CIDB in the event there is a change in style or type of emergency phone, type or method of communications, etc. Coordinate such items as location and quantity of emergency phones, termination method, signage, pathway requirements, power, and cable requirements.
   c. For elevator phones to be supported by bIT, they must be a bIT-CIDB-approved model.

D. Confer with bIT-CIDB at the beginning of project design to determine if any standards have changed since the publication of the published standards. This includes acceptable products as well as installation practices.

E. Coordinate User Space furniture as early as possible, but prior to pathway design coordination, as it can greatly affect the infrastructure pathways and design coordination between Telecommunications device/outlet locations and associated electrical power.

F. All room numbers must be assigned by Campus Space Management and approved by the Campus Fire Marshal. Ensure that approved room numbers are used prior to completion of design documents as this affects all cable and equipment identification in an adverse manner when changed after approval.

G. Schedule and include regular field visits, agreed on at the onset of the project, for installation review during construction relative to Telecommunications. All scheduled visits relating to Telecommunications shall include bIT-CIDB personnel.

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H. For existing building upgrades, review intended Telecommunications design with bIT-CIDB at midpoint of Design Development and again at midpoint Construction Documents phases to ensure the intended design continues to meet bIT-CIDB needs.

I. bIT-CIDB shall receive a copy of design documents at all phases, but at a minimum 50% and 100% Design Development, as well as 50%, 90%, and 100% Construction Documents, and at any time significant changes affecting Telecommunications are made so that bIT-CIDB has the opportunity to review and approve.

J. The Architect and Owner's Representative shall coordinate intended changes to design with the Telecommunications engineer for the project changes during construction. The Architect, Owner's Representative, and Telecommunications design engineer(s) shall discuss the change with bIT-CIDB if it affects the ability to meet Campus IT Infrastructure Standards.

K. The designer shall plan for and prepare final labelling floor plans when cabling is completed for a project (refer to sketches SK202 and SK202A for style). The designer shall plan for and create the initial spreadsheet for cable labelling according Campus IT Infrastructure Standards for the type of cabling designed for the project.

2 CONTRACTORS

A. Contractor and subcontractor(s) shall read and understand Campus IT Infrastructure Standards prior to bidding a project and shall pose any questions, in writing, for Telecommunications issues that may need clarification for a complete understanding.

B. Request for Information (RFI)
   a. The Contractor and subcontractor(s) shall provide an RFI for any change to the installation according to contract drawings and specifications for Telecommunications related issues and seek approval from bIT-CIDB in writing prior to making a change.

C. Labeling Samples
   a. As part of coordination, the Contractor (to include subcontractor(s)) shall provide sample mockups of all labeling, affixed to segments of the actual product where possible, to bIT-CIDB for approval prior to the actual labeling of the Structured Cabling System (SCS) and its related equipment and pathways (refer to Section 10 Labeling for additional information). The mockups shall be issued to the Owner's Representative, who will inform bIT-CIDB of their existence and provide them to bIT-CIDB for review and written approval.

D. Cable Identification Schedule
   a. The cable schedule shall be created by the design engineer or bIT-CIDB only, using the bIT-CIDB provided, preformatted, electronic Excel spreadsheet.

E. Emergency Phone(s)
   a. Coordinate the completion of emergency phone installations cabling and physical phone placement with bIT-CIDB in order that they can schedule termination and testing of the phones.

F. Schedule completion of TRs with Owner's Representative, Telecommunications design engineer, and bIT-CIDB in preparation of "Room Ready" status.

SECTION 2 – CODES AND STANDARDS

Section 2 - Codes and Standards

SCOPE

This section lists the codes and industry established standards applicable to the telecommunications infrastructure and structured cabling systems for commercial buildings. Not all codes and standards apply to every project. Project type, systems, and products deployed determine applicable codes and standards. ***If a newer version of a referenced code or standard has been released then the latest version shall apply.***

APPLICABLE CODES AND STANDARDS

This section breaks-out the content based on the various subsystems of the telecommunications infrastructure.

1 GENERAL

These codes and standards apply to the telecommunications system as a whole.

A. California Code of Regulations (CCR):
   a. Title 8, “Industrial Relations”, Chapter 3.22, “California Occupational Safety and Health Regulations (CAL/OSHA).”
   b. Title 24, “California Building Standards Code”
      i. Part 1, “California Building Standards Administrative Code.”
      ii. Part 2, “California Building Code” (CBC).
      iii. Part 3, “California Electrical Code” (CEC).
      iv. Part 11, “California Green Building Standards Code” (CALGeen).”

B. National Fire Protection Association (NFPA):
   a. NFPA 70, “National Electrical Code” (NEC).
   b. NFPA 75, “Protection of Information Technology Equipment.”

C. United States Department of Labor (DOL) Occupational Safety and Health Administration (OSHA) Regulations (Standards - 29 CFR):
   i. Part 1910, “Occupational Safety and Health Standards.”
   ii. Part 1926, “Safety and Health Regulations for Construction.”

D. International Code Council:
   i. International Building Code (2019).
   ii. International Fire Code (2019).
   iii. ICC Performance Code (2019).

E. Telecommunications Industry Association (TIA) 568 Series:
   i. ANSI/TIA-568-C.0, “Generic Telecommunications Cabling for Customer Premises.”
   ii. ANSI/TIA-568-C.1, “Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements.”
   iii. ANSI/TIA-568-C.2, “Balanced Twisted Pair Telecommunications Cabling and Components.”
   iv. ANSI/TIA-568-C.3, “Optical Fiber Cabling Components.”

F. ANSI/TIA-569-B, “Commercial Building Standard for Telecommunications Pathways and Spaces.”

G. ANSI/TIA/EIA-598-B, “Optical Fiber Cable Color Coding.”

H. ANSI/TIA-606-B, “Administration Standard for Telecommunications Infrastructure.”

I. ANSI-TIA-607-B, “Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.”

J. ANSI/TIA-758-A, “Customer-Owned Outside Plant Telecommunications Infrastructure Standard”, including the following addenda.”

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K. ANSI/TIA-1005, “Telecommunications Infrastructure Standard for Industrial Premises.”

L. EIA testing standards.

M. Building Industry Consulting Services International (BICSI):
   i. Telecommunications Distribution Methods Manual (TDMM).
   ii. Customer-Owned Outside Plant Design Manual.
   iii. Wireless Design Reference Manual (WDRM).
   iv. Network Design Reference Manual (NDRM).
   v. Information Transport Systems Installation Manual (ITSIM).

2 TELECOMMUNICATION ROOMS

A. NFPA National Fire Protection Association (NFPA) 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

B. ASTM E 84-05 Standard Test Method for Surface Burning Characteristics of Building Materials.

C. American Wood-Preservers' Association (AWPA) Standard C27 Plywood - Fire Retardant Treatment by Pressure Processes.

3 OUTSIDE PLANT (OSP) PATHWAYS

A. American Association of State Highway and Transportation Officials (AASHTO).

B. Federal Specifications (FS):
   i. FS RR-F-621E: Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole.
   ii. FS SS-S-210A: Sealing Compound, Preformed Plastic for Expansion Joints and Pipe Joints.
   iii. FS W-C-1094A: Conduit and Conduit Fittings Plastic, Rigid.

C. American National Standards Institute, Inc. (ANSI):
   i. ANSI C80.1: Rigid Steel Conduit, Zinc-Coated.
   ii. ANSI/TIA/EIA-758: Customer-Owned Outside Plant Telecommunications Cabling Standard.

D. American Standards for Testing and Measurement (ASTM):
   i. ASTM C478: Specification for Precast Reinforced Concrete Manholes Sections.
   ii. ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
   iii. ASTM C858: Standard Practice for Underground Precast Concrete Utility Structures.
   iv. ASTM C923: Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
   v. ASTM C990: Standard Specifications for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

E. Underwriters Laboratories, Inc. (UL) - UL 651: Schedule 40 and 80 Rigid PVC Conduit.

F. Concrete Reinforcing Steel Institute (CRSI).

G. National Electrical Manufacturer Association (NEMA):
   i. NEMA TC 2: Electrical Plastic Tubing and Conduit.
   ii. NEMA TC 3: PVC Fittings for use with Rigid PVC Conduit.
   iii. NEMA TC6: PVC Plastic Utilities Duct (EB and BD Type).

H. A 2005 National Electric Code, Annex B B. NEMA TCB2

I. American Concrete Institute (ACI):
   i. ACI 304: Guide for Measuring, Mixing, Transporting, and Placing Concrete.
   ii. ACI 318: Building Code Requirements for Reinforced Concrete.

4 INSIDE PLANT (ISP) PATHWAYS

A. ASTM International:
   i. ASTM A 123, “Specification for Zinc (Hot Galvanized) Coatings on Iron and Steel.”

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ii. ASTM A 510, “Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.”
iii. ASTM A 580, “Standard Specification for Stainless Steel Wire.”
iv. ASTM A525, “General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process.”
v. ASTM A 580, “Standard Specification for Stainless Steel Wire.”
vi. ASTM A591, “Specifications for Electrodepositing Coatings of Zinc on steel wire or sheets”.
vii. ASTM A 641, “Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.”
viii. ASTM A 653, “Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process.”
ix. ASTM B 633, “Specification for Electrodeposited Coatings of Zinc on Iron and Steel.”
x. ASTM D 769, “Standard Specification for Black Oxide Coatings.”
xi. ASTM D3451, “Standard Guide for Testing Coating Powders and Powder Coatings.”

B. National Electrical Manufacturer Association (NEMA):
i. NEMA VE 1, “Metal Cable Tray Systems.”
ii. NEMA VE 2, “Cable Tray Installation Guidelines.”

C. National Fire Protection Association (NFPA):
i. NFPA 70B, “Recommended Practice for Electrical Equipment Maintenance.”
ii. Underwriters Laboratories (UL).
iii. UL 467, “Grounding and Bonding Equipment.”

5 OUTSIDE PLANT (OSP) BACKBONE CABLING

A. Fiber Optic Cabling
i. National Fire Protection Agency - NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”, 2007.
ii. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
1) UL 1569, “Metal-Clad Cables.”
2) UL 1651, “Optical Fiber Cable”.
3) UL 1666, “Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts.”
iii. Insulated Cable Engineers Association (ICEA):
1) ANSI/ICEA S-87-640-1999, “Fiber Optic Outside Plant Communications Cable.”
2) ANSI/ICEA S-104-696-2001, “Indoor-Outdoor Optical Cable.”
iv. Telcordia - GR-20-CORE, Issue 3, “Generic Requirements for Optical Fiber and Optical Fiber Cable.”

B. Copper Cabling
i. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
1) UL 497, “Protectors for Paired-Conductor Communication Circuits”.
2) UL 497A, “Secondary Protectors for Communications Circuits”.
3) UL 497B, “Protectors for Data Communications and Fire-Alarm Circuits”.
4) UL 497C, “Protectors for Coaxial Communications Circuits”.
5) UL 1863, “Communications-Circuit Accessories”.

b. Insulated Cable Engineers Association (ICEA):
i. ANSI/ICEA S-84-608-2007, “Telecommunications Cable Filled, Polyolefln Insulated, Copper Conductor Technical Requirements”.

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ii. ANSI/ICEA S-85-625-2011, “Telecommunications Cable Aircore, Polyolefln Insulated, Copper Conductor Technical Requirements”.
iii. ANSI/ICEA S-107-704-2012, “Broadband Buried Service Wire, Filled, Polyolefin Insulated, Copper Conductor Technical Requirements”.
c. Telcordia - GR-421-CORE Issue 2, “Generic Requirements for Metallic Telecommunications Cables”.

6 INSIDE PLANT (ISP) BACKBONE CABLING

A. Fiber Optic Cabling
i. National Fire Protection Agency (NFPA):
1) NFPA 255, “Standard Method of Test of Surface Burning Characteristics of Building Materials”, 2006.
2) NFPA 259, “Standard Test Method for Potential Heat of Building Materials”, 2003.
3) NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”, 2007.
ii. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
1) UL 1569, “Metal-Clad Cables”.
2) UL 1651, “Optical Fiber Cable”.
3) UL 1666, “Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts”.
iii. Insulated Cable Engineers Association (ICEA):
1) ANSI/ICEA S-83-596-1994, “Fiber Optic Premises Distribution Cable”.
2) ANSI/ICEA S-87-640-1999, “Fiber Optic Outside Plant Communications Cable”.
3) ANSI/ICEA S-104-696-2001, “Indoor-Outdoor Optical Cable”.
iv. Telcordia:
1) GR-20-CORE, Issue 3, “Generic Requirements for Optical Fiber and Optical Fiber Cable”.
2) GR-409-CORE, Issue 2, “Generic Requirements for Indoor Fiber Optic Cable”.

B. Copper Cabling
i. National Fire Protection Agency (NFPA):
1) NFPA 255, “Standard Method of Test of Surface Burning Characteristics of Building Materials”, 2006.
2) NFPA 259, “Standard Test Method for Potential Heat of Building Materials”, 2003.
3) NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”, 2007.
ii. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
1) UL 444, “Communications Cables”.
2) UL 497, “Protectors for Paired-Conductor Communication Circuits”.
3) UL 497A, “Secondary Protectors for Communications Circuits”.
4) UL 497B, “Protectors for Data Communications and Fire-Alarm Circuits”.
5) UL 497C, “Protectors for Coaxial Communications Circuits”
6) UL 1581, “Reference Standard for Electrical Wires, Cables, .and Flexible Cords”.
7) UL 1666, “Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts”.
8) UL 1863, “Communications-Circuit Accessories”.

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iii. Insulated Cable Engineers Association (ICEA):
iv. ANSI/ICEA S-90-661-2008, “Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems.”
v. ICEA S-102-700-2004, “ICEA Standard For Category 6 Individually Unshielded Twisted Pair Indoor Cables (With Or Without An Overall Shield) For Use In Communications Wiring Systems Technical Requirements.”

C. Telcordia - GR-111, “Generic Requirements for Thermoplastic Insulated Riser Cable”.

7 HORIZONTAL CABLING

A. National Fire Protection Agency (NFPA).
B. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”, 2007.
C. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
i. UL 444, “Communications Cables”.
ii. UL 497, “Protectors for Paired-Conductor Communication Circuits”.
iii. UL 1581, “Reference Standard for Electrical Wires, Cables, and Flexible Cords”.
iv. UL 1666, “Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts”.
v. UL 1863, “Communications-Circuit Accessories”.
D. Insulated Cable Engineers Association (ICEA):
i. ANSI/ICEA S-90-661-2008, “Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cable for Use in General Purpose and LAN Communication Wiring Systems”.
ii. ICEA S-102-700-2004, “ICEA Standard For Category 6 Individually Unshielded Twisted Pair Indoor Cables (With Or Without An Overall Shield) For Use In Communications Wiring Systems Technical Requirements”.
E. Telcordia - GR-111, “Generic Requirements for Thermoplastic Insulated Riser Cable”.

8 TESTING

A. Fiber Optic Cabling
i. TIA/EIA-526-14A (OFSTP-14), “Optical Power Loss Measurements of Installed Multi-Mode Fiber Cable Plant”.
ii. TIA/EIA-526-7 (OFSTP-7), “Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant”.
iii. EIA/TIA-455-77 (FOTP-77), “Procedures to Qualify A Higher-Order Mode Filter For Measurements On Single-Mode Fibers”.
iv. EIA/TIA-455-78A (FOTP-78), “Spectral-Attenuation Cutback Measurement for Single-Mode Optical Fibers”.
v. EIA-455-95 (FOTP-95), “Absolute Optical Power Test for Optical Fibers and Cables”.
vi. EIA-455-171 (FOTP-171), “Attenuation by Substitution Measurement – For Short-Length Multi-Mode Graded-Index And Single-Mode Optical Fiber Cable Assemblies”.
vii. American National Standards Institute (ANSI) Z136.2, “American National Standard for the safe use of optical fiber communication systems utilizing laser diode and LED sources”.
viii. BICSI Telecommunication Distribution Methods Manual (TDMM).

B. Copper Cabling
ANSI/TIA-1152, “Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling”.

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9 GROUNDING AND BONDING

A. NFPA 70, “National Electrical Code”, particularly the following Articles:
   i. Article 250: Grounding.
   ii. Article 770: Optical Fiber Cables and Raceways.
   iii. Article 800: Communications Systems.
   iv. Article 810: Radio and Television Equipment.
   v. Article 820: Community Antenna Television and Radio Distribution Systems.

B. Underwriters Laboratories, Inc. (UL) UL 467: Grounding and Bonding Equipment.

C. Electronic Industries Association/Telecommunication Industry Association - ANSI-TIA-607-B, “Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises”.

D. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   i. IEEE 467, “IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems”.
   ii. IEEE P1100, “IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems”.

SECTION 3 – TELECOMMUNICATIONS ROOMS

Section 3 - Telecommunications Rooms

SCOPE

This section describes the requirements for the telecommunications rooms (TR) within a building. Typically, buildings at the UCB require up to three types of telecom rooms, one Building Distribution Facility (BDF), and possibly one or more Intermediate Distribution Facilities (IDFs), or Riser Closets (RCs). At a minimum, each building will have a BDF room, provided it can serve the entire building.

1 BDF

A. The BDF room acts as the backbone distribution point for the Building. The BDF receives data connectivity services from the Campus and distributes them to each IDF room in a star topology within the building. The BDF receives voice services from either the Campus, or a service provider such as AT&T. Typically the BDF acts as the Entrance Facility for the building. The BDF may also serve telecommunication outlets within a distance of 295 feet (tested length) of the room (refer to sketch SK500 for room layout parameters).

B. The BDF room will house the building's core network equipment installed by bIT-CIDB in support of the building.

C. With proper coordination and approval from bIT-CIDB, the BDF room may house head-end equipment for the building's security systems, such as access control and video surveillance.

2 IDF

A. The IDF rooms serve the telecommunications outlets within their serving area. The IDF rooms receive their backbone connectivity from the building's BDF room in a star topology.

B. The IDF rooms exclusively house the network equipment, installed by bIT-CIDB, for the area they serve (refer to sketch SK500).

C. With proper coordination and approval from bIT-CIDB, the IDF room may house head-end equipment for the building's security systems, such as access control and video surveillance.

D. Wall mount cabinet

3 RC

A. The RCs provide a path for backbone and horizontal cabling (when a TR serves more than one floor). For the most part, RCs transition horizontal cabling from the user space of one floor to the BDF or IDF on the floor below or above.

DESIGN PARAMETERS

This paragraph describes the requirements for TR placement, shape, and sizing.

1 LOCATION

A. The Telecommunications design engineer shall work with the architect to identify the proper location for the TR(s). Once defined, the design team shall obtain approval from bIT-CIDB for the selected location of each TR following the defined location, or when a TR is relocated in the design documents.

B. Locate the TR within 90 meters (295 feet, tested length) of the most-distant telecommunications outlet it serves. This distance includes all cable slack in the routing, rise and fall as the cable routes from the outlet to accessible space and to its termination location within the TR, plus required cable slack at the outlet for possible moves or cable re-termination (4 feet).

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C. It is preferable to have TRs centrally located on a floor where possible and to have a TR serve multiple floors of a building to minimize costs over the life of the building. Additionally, having a TR serve multiple floors minimizes construction costs, cooling costs, primary equipment costs, and equipment power consumption costs.

D. TRs are dedicated to Telecommunications use only. Do not share the TR space with other department's equipment, personnel, storage, janitorial staff or equipment, outside support groups or equipment, or other materials not directly supporting Telecommunications.

E. Avoid common walls with rooms containing electromagnetic interference (EMI) such as, but not limited to, elevators, pump motors, generators, other motors and transformers, X-ray equipment, radio transmitters, induction heating devices, sources of mechanical vibration, power lines, and other potential sources of EMI. Where rooms must be placed near EMI generating equipment, maintain a minimum distance of 4 feet from such equipment. **Under no circumstances shall a transformer be located within a TR**.

F. Provide direct access to TRs from hallways and not through classrooms, offices, mechanical and electrical rooms, or other user or facility spaces. Do not locate other work, storage, equipment, mechanical, or electrical spaces that require passage through the TR for access.

G. In multistory buildings, vertically align the TRs to facilitate riser system between the TRs. If a rated shaft cannot be achieved, then install STI EZ-Path™ firestop devices with 2 hour temperature rating as the riser system. Unless verified by UCB Fire Marshal, assume all riser penetrations require firestopping. STI EZ-Path™ devices are the preferred method unless otherwise noted in the contract documents (refer to sketches SK523 and SK524 for example).

H. Do not share TR allocated spaces with other functions such as, but not limited to, electrical spaces, boiler rooms, washrooms, janitorial closets, and storage rooms. bIT-CIDB may share TRs with the building's security systems and CCTV when properly coordinated through the project's design process.

I. Do not locate the rooms where it may be subject to water or steam infiltration, humidity from nearby water or steam, heat, or any other corrosive atmospheric or environmental conditions, either adjacent or below.

J. Do not locate a TR below water level unless preventive measures against water infiltration are employed. The rooms shall be free of water or drain pipes not directly required in support of the equipment within the room. Provide a drain within the TR if risks of water ingress exist.

K. Do not locate a TR such that a column is within the TR or penetrating within the wall's perimeter.

L. Provide drip pans under any AC related infrastructure that may leak and cause damage to equipment.

2 SIZING

A. Provide one minimum sized TR of 10 feet x 11 feet 8 inches for each user space area up to 10,000 square feet (typical 3 racks). Size and placement requires evaluation for horizontal cabling area served, amount and type of estimated rack-mounted equipment, allowances for wall mounted equipment (such as 110 termination fields, building entry protection blocks, electrical and security panels, etc.), and working clearance in front and rear of the floor and wall mounted equipment of 36 inches (refer to sketch SK500).

For user space service area between 10,001 to 18,000 square feet, size the room to include one additional equipment rack, effectively extending the room to 10 feet by 13 feet 6 inches (typical 4 racks).

For user space service area beyond 18,000 square feet, size the room to include one additional equipment rack, effectively extending the room to 10 feet by 16 feet 8 inches (typical 5 racks).

The dimensions noted above denote inside room clearance requirements.

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B. A TR must be rectangular with no building columns within the perimeter of the room. The door should be on one of the 10 foot walls starting at 12 inches off the corner of the wall.

3 OTHER PARAMETERS

A. TRs should not have windows. If this is unavoidable, windows must be insulated and covered.

B. As needed, insulate each TR for noise suppression due to equipment noise within the TR.

C. Do not locate plumbing or mechanicals within, or passing through, a TR unless they specifically service the space. Do not route plumbing, ducts, roof drains, waste lines, fire riser mains, etc through TRs. Only plumbing lines supporting the cooling units within the room are allowed to enter the room.

D. Do not locate electrical service panels within a TR that serve areas or equipment outside the TR.

ROOM CONFIGURATION & SUPPORT SERVICES

This paragraph describes the specific BDF and IDF room requirements by discipline.

1 ARCHITECTURAL

A. Floor
Sealed concrete is the preferred flooring. Anti-static tiles are not required.

B. Ceiling. Open to structure above. If insulation is required for energy efficiency, install insulation sandwiched between the deck above and a gypsum hard cap ceiling directly beneath the insulation. If drop ceiling is installed, insulation is required. Minimum ceiling height is 10 feet.

C. Walls
Install full height walls to the structure above and seal all gaps. Paint walls with a low-gloss white (or other light color, as approved by bIT-CIDB) paint and install plywood as follows:

i. Mount ¾ inch fire retardant knot free, AC grade plywood sheets with stamp on A side, from 6 inches above finished floor to a minimum of 8 feet 6 inches above finished floor. Install an additional 2 feet of plywood starting at 8 feet 6 inches if cable management equipment is braced by the wall above 8 feet 6 inch wall line.

ii. Mount plywood to the wall such that it is capable of supporting 50-pounds per linear foot of wall space. Install plywood as follows:

1) Plumb, level, true, and straight with no distortions. Shim as required using concealed shims.

2) Trim the plywood around electrical and telecommunications outlets.

3) Install plywood with the A side out, with fire rated stamp on A side. Mask the fire rated stamp before painting.

iii. Paint plywood backboards with two coats of low-gloss white paint, or to match existing wall color.

iv. Counter sink plywood mounting fasteners so they are flush with wood surface.

D. Door
At minimum, install a 3 feet 6 inches solid door without a window. Door shall swing outward from the TR.

E. Signage
Install a sign outside each telecom space identifying its UCB assigned room number.

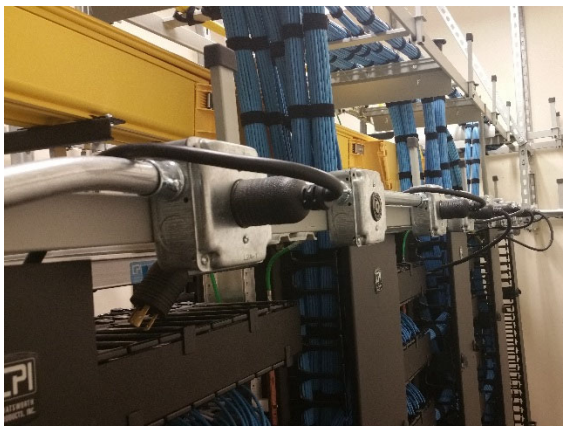
2 RISER CONDUITS

Locate riser conduits at the corners of the TR when possible, typically behind the entry door. Consider door location before placing riser conduits/EZ-Paths near a door corner of the TR. Consider structural beams when locating riser conduits/EZ-Path.

SECTION 3 – TELECOMMUNICATIONS ROOMS

3 ELECTRICAL

A. Equipment Service
Locate two 20A 120v power circuits terminated in an L5-20R (See Product List for Power Distribution Unit (PDU) details) above each equipment rack. Mount the circuit boxes to side of overhead level-1 cable runway; face circuits toward rear circulation aisle. Wire the power circuits with 30A rated wire for future upgrade of the receptacle and breaker without the need to rewire the circuits. Ensure that the electrical circuit boxes do not impede free operation of the vertical wire manager doors.



B. If a PBX UPS is required, bIT will specify a 5-20R or a 5-30R at bottom of vertical wire manager.

C. If security is housed in the TR, install a 20A quad receptacle at the wall area servicing the security equipment.

D. Electrical distribution panels serving a TR shall be located in the TR.

E. Convenience Outlets
Place convenience outlets every 6 feet along the walls, with a minimum of one per wall. Locate these outlets at 12 inches above finished floor so as not to impact wall mounted equipment.

F. bIT-CIDB may specify the installation of Starline Track Bus System™ for larger TRs, or those that are expected to have changing power requirements.

G. If a generator is available, confer with bIT-CIDB to determine if any equipment power receptacle requires emergency backup power.

4 LIGHTING

A. Provide 50 foot-candles of illumination on the vertical surfaces of the wall and rack mounted equipment.

B. Install shine down type fixtures with cage over bulbs. Align fixtures with circulation aisles and locate above and to the side of overhead cable management (refer to sketch SK503). Maintain a minimum 12 inch clearance from the top of the upper most cable tray.

C. Install one fixture within room with a battery-operated ballast (or connection to the building's emergency generator, if available), locate emergency fixture closest to the door.

5 BONDING AND GROUNDING

Refer to Section 11 – Bonding and Grounding for additional information.

6 MECHANICAL/HVAC

A. Install split system (e.g., Mitsubishi Mr. Slim), based on an output of 6,500 BTUs per equipment rack. Cooling system shall operate 24/7 365 days per year, be controlled from within the TR, and maintain a temperature between 64 °F to 75 °F.

SECTION 3 – TELECOMMUNICATIONS ROOMS

B. The humidity range should be 30% to 55% relative humidity. Maintain positive air pressure within the room with one air change minimum per hour.

C. If not installing a split system for cooling, hang all mechanical equipment from the ceiling. Do not wall mount equipment unless located a minimum distance of 12 inches above the overhead cable runway. Mount equipment as high as possible so as not to interfere with horizontal sleeves and cable management within the room. Place equipment so that it may be easily accessed for service after full room build-out is complete.

D. Cooling unit shall receive its power from the room's electrical panel.

E. Provide an independent thermostat control located within the room, and configure it as its own dedicated zone. Do not share this zone with other building user or facilities rooms.

F. Do not place HVAC unit or piping directly above active equipment, whether wall or rack mounted. If this is unavoidable, install drip pan.

7 SECURITY

A. Provide secure door hardware for each TR, allowing the doors to be locked and keyed separately from non-TR doors. Do not use electronic mortise locks.

B. bIT-CIDB's preference, listed in order, for TR access control is:

i. Card access managed by University of California Police Department (UCPD).
ii. Cyber Key™.
iii. T-Key.

8 FIRE PROTECTION

A. Provide ordinary temperature sprinkler heads. Locate sprinkler heads at least 24 inches above the top of the overhead cable management and provide cages to protect heads from accidental activation.

B. Provide smoke detection as required by code (NFP 75). Note: Campus Fire Marshal shall determine applicable code.

TELECOMMUNICATION ROOM REQUIREMENTS

This paragraph describes the specific component requirements for telecommunication within TRs. RCs are described at the end as its own paragraph.

1 EQUIPMENT RACK BAY

Typical size and configuration of equipment rack bay is 7 feet high 19 inch wide open 2-channel equipment racks and double-sided deep vertical cable managers with doors. Quantity of racks and size of cable managers is dependent on cable and patch cords counts. Unless otherwise coordinated with bIT-CIDB, the minimum size room noted above will house one rack-bay configured as follows:

A. Three equipment racks.

B. Two 10 inch wide vertical cable managers installed between the racks.

C. Two 6 inch wide vertical cable managers installed at ends of rack-bay.

D. The cable manager doors must be able to swing open and closed freely.

SECTION 3 – TELECOMMUNICATIONS ROOMS

2 OVERHEAD CABLE MANAGEMENT

The TRs may require three overhead cable management systems to support the various types of cabling, backbone, horizontal, and patch cords. The three levels of cable management breakdown as follows:

A. Level 3 – Upper Level
   i. Locate this level of cable support at minimum 8 feet 6 inches above finished floor. Use this level for the routing and support of horizontal station cabling, backbone copper and fiber cables.
   ii. Install at minimum 18 inch wide cable runway supported from deck above. Install 7 inch retaining post every 36 inches on center and at corners with end cap protectors. Generally this is only required in the BDF.

B. Level 2 – Middle Level
   i. Locate this level of cable support at minimum 7 feet 6 inches above finished floor. Use this level for the routing of fiber patch cords only. Typically, this level is reserved for bIT-CIDB use only.
   ii. Install a 4 inch by 4 inch yellow fiber trough. Route the section above each rack-bay with a downspout into the vertical cable managers between the racks. Align the downspout with the rear of the vertical management section (refer to sketch SK502). Generally this is only required in the BDF.

C. Level 1 – Lower Level
   i. Locate this level of cable support at minimum 7 feet above finished floor. Use this level for the routing of copper patch cords between equipment racks, and between equipment racks and wall fields. Typically, this level is reserved for bIT-CIDB use only (refer to sketch SK501).
   ii. Install at minimum 18 inch wide cable runway supported by the equipment rack-bays and braced to the wall at each end. Route the runway centered above each rack-bay within the TR, and along the wall containing horizontal and copper backbone terminations. Offset the section along the wall above the terminations field 6 inches from the wall. Do not use triangular support brackets for this level of runway, instead use a cantilever type bracket to maximize wall space available for systems and cable terminations. Install 7 inch retaining post every 36 inches on center and at corners with end cap protectors.

D. Consult with bIT-CIDB prior to design to determine requirement specific to each TR.

3 WALL MOUNTED 110 FIELD

If the TRs require horizontal and/or backbone copper voice terminations, install according to the following guidelines:

SECTION 3 – TELECOMMUNICATIONS ROOMS

A. Most new builds will require 900 pair 110 towers and cable managers. However, for Tenant Improvements and smaller jobs 300 pair blocks may suffice. Choose block size to accommodate for actual count of cables being installed plus room for 20% growth. At a minimum 300 pair field termination tower should be used. Purchase the kit to include the tower and 110 blocks. The vertical manager needs to be purchased separately. See the parts list.

B. Connecting Blocks
   i. For installations where backbone terminations are required, provide 5-pair copper termination style C5 clips.
   ii. For installations where horizontal copper terminations are required, install 4-pair field termination style C4 clips.

C. 110 Tower and Cable Manager Installation
   i. Mount the 900-pair towers starting at 18 inches above the finished floor, aligned horizontally and spaced together with approximately one quarter inch between 110 style block tower and adjacent vertical managers (refer to sketches SK507 and SK507A).
   ii. Mount the 300 pair towers starting at a height (if possible) such that if it had to grow to a 900 pair tower down the wall it would end at 18" AFF.

RISER CLOSET REQUIREMENTS

This paragraph describes the specific component requirements for telecom Riser Closets. Riser closets are small in size (minimum 6 feet by 6 feet) and will not hold any electronic equipment or cable terminations. These closets provide a transition and pull-point for cables between floors.

1 ARCHITECTURAL

A. Floor
Sealed concrete.

B. Ceiling
Open to structure above. If insulation is required for energy efficiency, install insulation sandwiched between the deck above and a gypsum hard cap ceiling directly beneath the insulation.

C. Walls
   i. Provide full height walls to the structure above, and seal. Paint walls with a low-gloss white paint (or other light color, as approved by bIT-CIDB) and install plywood as follows:
      1) Mount ¾ inch fire retardant knot free, AC grade plywood sheets, with fire rated stamp on A side, from 6 inches above finished floor to the underside of the deck above. Install plywood with the A side out. Mask the fire rated stamp before painting. Typically, plywood is only required on the back wall of a riser closet. Install plywood on riser closet side walls where required to support cable management apparatus.
      2) Mount plywood to the wall such that it is capable of supporting 50-pounds per linear foot of wall space. Install plywood plumb, level, true, and straight with no distortions. Shim as required using concealed shims. Trim the plywood around electrical and telecommunications outlets. Install plywood with the A side out.
      3) Countersink plywood mounting fasteners so they are flush with wood surface.

D. Door
At minimum, provide a 3 foot solid door without windows. Swing the door outward from the closet.

E. Signage
Install a sign outside each TR space identifying its UCB assigned room number.

SECTION 3 – TELECOMMUNICATIONS ROOMS

2 ELECTRICAL

Install one 15 amp convenience outlet on one of the short walls such that the vertical cable management within the rooms does not block access to it.

3 LIGHTING

Locate one fixture on the same wall as the door(s) to provide 50 foot-candles of illumination. Provide a cage over the fixture/bulb.

4 GROUNDING & BONDING

Bond the cable management components to the busbar in the nearest TR (TR may be on the floor above or below). Refer to Section 11 Bonding and Grounding for additional information.

5 MECHANICAL

No cooling required.

6 SECURITY

Provide door hardware for room allowing the doors to be securely locked and keyed separately from doors of non-telecommunication spaces. Do not use electronic mortise locks. bIT-CIDB's preference for Riser Closet access control is a T-Key.

SECTION 3 – TELECOMMUNICATIONS ROOMS

SKETCHES

Refer to the sketches as listed in this paragraph for further requirements applicable to this section. These sketches depict component configuration requirements within telecom rooms.

SK500 – Telecom Room Floor Plan, Three Equipment Racks

SK501 – Telecom Room Overhead Plan, Level-1 Cable Management

SK502 – Telecom Room Overhead Plan, Level-2 Cable Management

SK503 – Telecom Room Overhead Plan, Level-3 Cable Management

SK504 – Telecom Room Elevation Rack-Bay BDF

SK504A – Telecom Room Elevation Rack-Bay IDF

SK505 – Equipment Rack Anchoring with Gusset Kit

SK506 – PDU Mounting within Vertical Cable Manager

SK507 – Wall Elevation (Voice and Data on Wall Field)

SK507A – Wall Elevation (Voice Only on Wall Field)

SK508 – 110 Wall Field (Voice and Data on Wall Field)

SK508A – 110 Wall Field (Voice Only on Wall Field)

SK509 – Cable Runway to Wall Bracing

SK510 – Cable Runway to Rack-Bay Bracing

SK511 – Cable Runway with Retaining Posts

SK512 – Rack Horizontal Routing

SK513 – MDF (BDF) Elevation Standard Design and Voice Feeder Terminations

SK514 – IDF (TR) Elevation Standard Design and Voice Feeder Terminations

SK800 – TR Grounding Busbar and Labeling

SK801 – Conduit Bonding

SK802 – Riser Conduit Bonding

SK804 – Cable Runway Bonding

SK805 – 110 Wall Field Bonding

SK807 – Rack-Bay Bonding

SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS

Section 4 - Outside Plant (OSP) Pathways

SCOPE

The Outside Plant (OSP) pathways connect the building to the campus underground communications pathway infrastructure, and facilitate the placement of the backbone cabling. bIT-CIDB has developed an extensive underground conduit system for communications referred to as Inter-building Communications Conduit System (ICCS).

The typical ICCS duct bank consist of fifteen 4 inch conduits in a 3x5 pattern and encased in steel reinforced concrete between vaults spaced no more than 300 feet apart and with no more than four 45 degree bends. Ninety degree bends are not used, as they increase the friction when pulling cabling through the duct bank sections and subjects fiber optic cable to excessive micro-bends, especially in an "S" configuration. For this reason, only multiple 45 degree bends are allowed, with no more than a maximum 180 degrees total radius bends between vaults/pull boxes.

Typically, each building requires a minimum of two 4 inch conduits to support the various telecommunications cables. Some buildings, based on function and/or other requirements, may require redundant entry facilities. These facilities stub into the Building Distribution Facility (BDF), or Entrance Facility (EF), depending on the project.

Larger buildings requiring more conduit feeds in or out may require up to twelve 4 inch conduits. Confer with bIT-CIDB at the beginning of a project to determine the total quantity of conduits required. Consider the ability to place vaults/pull boxes and their location on the premises. Coordinate vault and pull box placement with the Civil Engineer for the project, if available.

DESIGN PARAMETERS

1 DUCT BANKS

A. Install Schedule 40 (with concrete encasement). If there is a special case that requires Schedule 80 (without concrete encasement) PVC type conduit (refer to sketch SK703 for connection to vault), discuss with bIT-CIDB prior to installation.

SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS

In cases where the ICCS conduit bank runs parallel to a 4KV or higher voltage distribution system for more than ten (10) feet, any ICCS conduit with less than a four (4) foot separation from the high voltage conduit system must be Galvanized Rigid Steel (GRS), and grounded in at least one of the attached Communications Vaults (CV).

B. Install galvanized rigid steel (GRS) from 5 feet outside building line and into the EF or BDF, whichever is applicable for the Project. Install (2) 45 degree, or (1) 72 inch bend at the point the conduit turns up into the building's telecommunication room (TR), stopping between 3 and 4 inches above the finished floor of the TR. If OSP cable is to be run more than 40 feet into the building from the perimeter wall it needs to be installed in intermediate or rigid conduit.

C. Install fiberglass conduits when communication duct bank crosses or parallels steam pipes with less than 3 feet of separation. Fiberglass conduits should be used 5 feet either side of the crossing, and/or 5 feet beyond the end of the paralleling with steam.

D. Install Link-Seal® assembly when duct bank is going through building or vault walls. If pre-manufactured Term-A-Duct™ are used in vaults, Link-Seal® assembly is not required.

E. Provide a pull-point after every (4) 45-degree bends or 250 feet of conduit run containing one or more bends.

F. Provide a pull-point for any straight run of conduit at least every 300 feet.

G. Install 3 inch wide, metal impregnated, warning tape above telecommunication conduit(s) the length of the trench. Telecommunication and electrical conduits may share the same trench where both travel the same route, but with a minimum of 12 inch separation of packed earth, or 3 inch separation within a concrete encased duct bank.

H. For concrete encased duct bank(s), install #4 rebar around the duct bank every 24 inches on center and along each corner and along center line of each side at the perimeter of the encasement, leaving no caps. Overlap ends of rebar a minimum of 2 inches at all ends and wrap with wire to secure in place. All intersections of perpendicular rebar and overlaps must be affixed to each other with wire to prevent movement when concrete is poured. The concrete shall have a 28 day strength of 4,000 psi and a slump of no more than three (3) inches when placed.

SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS

I. Conduits shall enter and exit a vault/pull box from opposite ends of the short sides of the vault/pull box, entering in two banks of conduits toward the outer edges of the vault/pull box sides and no closer than 12 inches to the edge of the long walls of the vault/pull box (refer to sketch SK700).

J. Conduits shall make a minimum 8 foot radius sweep, using factory bends only, when changing direction where possible to minimize the friction when pulling cable. Conduits shall not sweep in opposite directions within a distance of twenty feet of each other and no more than a 90 degree bend. Note: this is mid run, and is different to item B above.

K. If a duct bank is not encased in concrete, install a minimum 3 inch concrete on the inside bend to prevent burn-through when pulling cable.

L. Provide a minimum 24 inches of ground cover over the duct bank. Install a metal impregnated detectable marker tape at 18 inches above the duct bank along the centerline of the duct bank through its entire length.

M. Install 4 inch conduits in duct banks spaced 3 inches apart to all sides using support separators designed for the purpose of maintaining consistent spacing between conduits along the entire pathway. See photo above.

N. Seal all joints prior to pouring any slurry or concrete encasement to prevent moisture from penetrating over the length of the duct bank.

O. Install pull ropes in each conduit. Pull rope between pull points must be unidirectional, such as DuPont™ Kevlar® Pulling Tape with up to 1,250 lbs. of tensile strength. Install additional 10 feet of pull rope slack at each pull point, coiling the slack within the end of the conduit, just behind the duct plug.

P. Duct Bank Testing

i. It is recommended that the Contractor perform interim testing before backfilling, to reduce the need of excavating an entire section of duct bank upon a failed test.

ii. After backfilling, but before any finished surfacing begins, the Contractor shall pull a 3-5/8 inch diameter and 12-1/14 inch long solid mandrel supplied by the Inspector through all conduits. The mandrel shall pass through all bends.

iii. If the mandrel fails to pass through the duct being tested, either the duct is obstructed or misaligned, or the curve has too small a radius. The Contractor shall either unblock the duct without damaging the conduit (pay special attention to fiberglass conduit as it is more easily damaged) or remove and repair the impassable section at the Contractor's expense.

iv. After backfilling, but before any finished surfacing begins, all conduits shall be pressure tested. One end of the duct shall be plugged with an expandable rubber plug attached to a chain that is attached to the communications vault pulling ring. An expandable rubber test plug shall be inserted on the opposite end of the duct. The duct shall be pressurized slowly to 4 PSI with air and the test section stabilized.

v. Time-pressure drop method: This testing method is from ASTM Standards Designation, F1417-92 and should be followed for safety and testing procedures. Disconnect the air supply and decrease the pressure to *3.5* psi before starting the test. Determine the time required for the pressure to drop from 3.5 to 2.5 psi and compare this interval to the required time to decide if the rate of air loss is within the allowable time. Minimum holding times required by the pipe diameter are shown on the table below:

SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS

Pipe Diameter	100ft	200ft	250ft	300ft	350ft	400ft	450ft	597ft
4in.	3:45	3:45	3:45	3:45	3:45	3:45	3:45	3:45

vi. All testing shall be witnessed by the University's Representative and the Contractor. Unwitnessed tests shall not be honored by the University.

As a guideline, the following capacities should be provided:

Total Building Area	Number of 4 in. Conduits
Less than 50,000 ASF	2
50,000 - 100,000 ASF	4
100,000 - 300,000 ASF	8
300,000 - 500,000 ASF	9
500,000 - 700,000 ASF	10
More than 700,000 ASF	12

2 INNERDUCT

A. Innerduct is primarily used for routing fiber optic cabling within a 4 inch conduit in order to maximize the use of the conduit. Typically, a 4 inch conduit will have four 1 inch innerduct of different colors, and at minimum one of the conduits must be fully populated with innerduct. bIT-CIDB standard colors are Blue, Black, White, and Orange (refer to sketch SK702).

B. Innerduct must be continuous and ribbed inside with smooth outside with low friction surface internally, containing no welds or joints. Material shall be extruded high-density polyethylene (HDPE) resin in accordance to the requirements of ASTM D3350 Type III.

C. Each innerduct shall contain a pre-installed mule tape with footage marker and pull tension rating of 1,250 pounds tensile strength.

D. Within a 4 inch conduit, install four different colored innerduct, consisting of white, orange, blue, and black. Colors must remain consistent throughout the duct bank system. Also, the colors must maintain the same orientation/sequence/position relative to the other inner ducts in the duct plugs.

SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS

E. Spare innerduct may be used within an existing campus duct bank segment if available. If the last innerduct in a 4 inch conduit is utilized, the project needs to place (4) new 1 inch innerduct in an adjacent empty conduit for future cabling so there is always spare innerduct through the campus duct bank system.

F. In cases where a project may have existing cabling in a conduit, but innerduct was not installed and used, fabric type innerduct (such as MaxCell™ fabric multi-cell pathway with a minimum of three cells) may be used in lieu of hard innerduct to provide sub-ducting for additional cabling with a minimum of three cells, each with a different color identifier and pull string.

3 VAULTS

A. Install vaults 6 feet by 8 feet in plan view, and 7 feet deep minimum, with a pre-manufactured base. Anything smaller is referred to in this documentation as a pull box (refer to sketch SK700 as example). Install a Jensen precast vault #K612AT7 with a wall thickness of 6 inches and 6 inch by 36 inch intercept knockout.

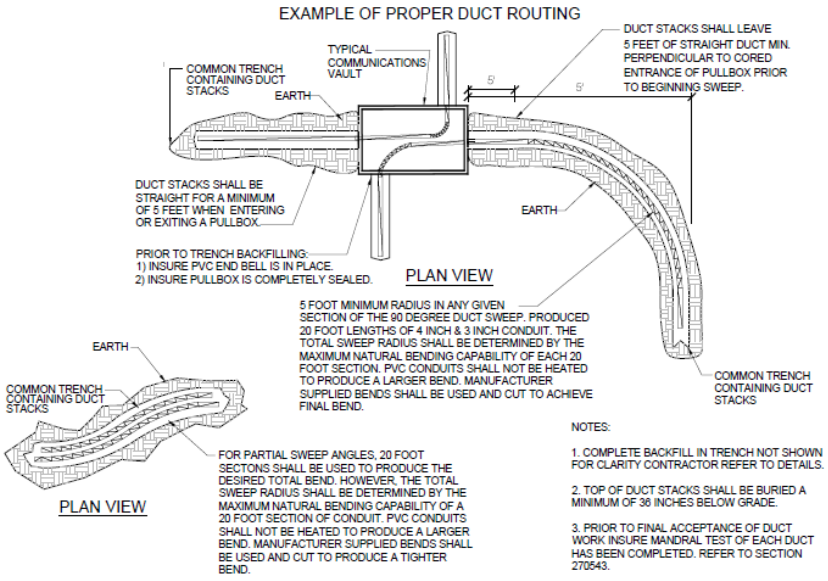
B. The shorter sides are typically used for main conduit bank penetrations for the normal flow of cable routing. The longer sides are used for feeder conduit branching off the main bank.

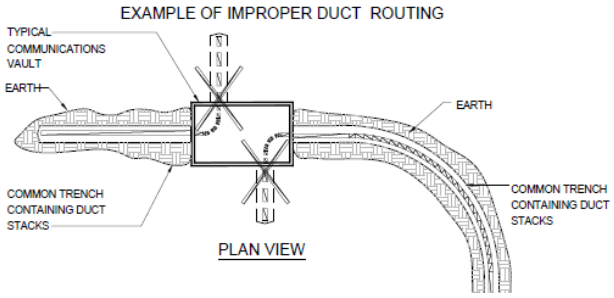
C. Locate conduits branching off on the longer side near the edges of the vault wall for proper cable management and to keep cabling out of the central area of the vault. Cables routing through the long wall must exit the vault/pull box at the opposite end of the vault than where it enters.

D. Locate conduits branching off on the long side walls at the farthest point from the direction of the cable run from a Zone Distribution Facility (ZDF) to the target building.

Communications Duct Sweep and Approach at Vault

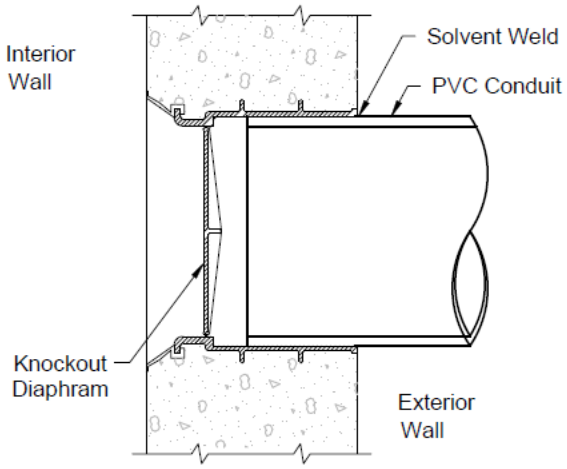
SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS





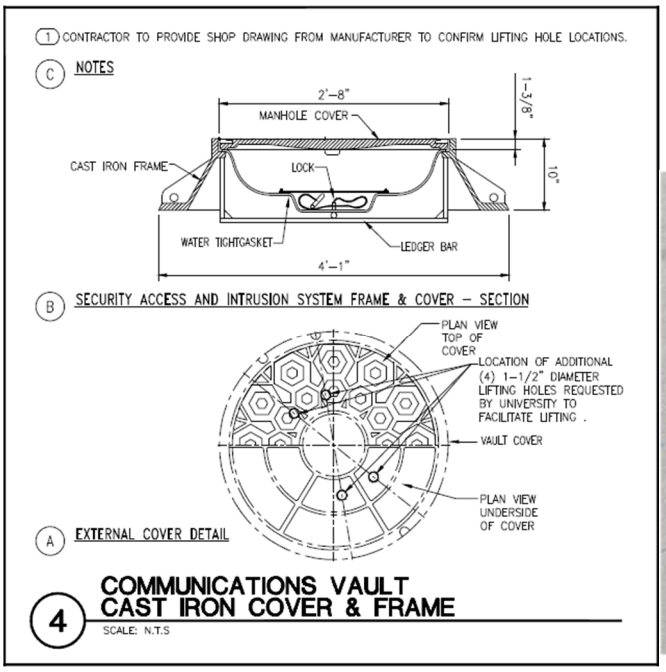
SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS

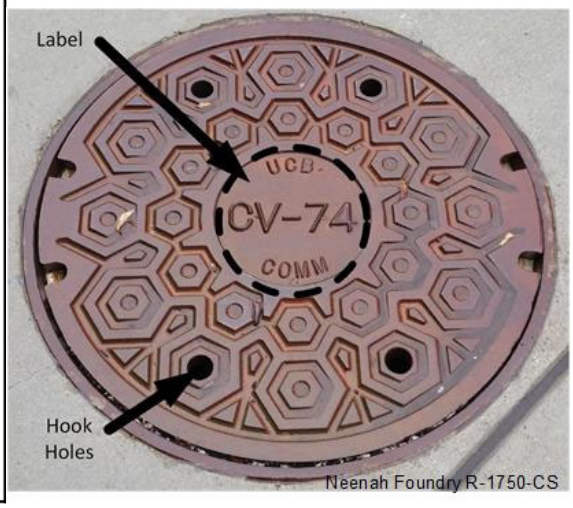
Bell End Entry Fitting



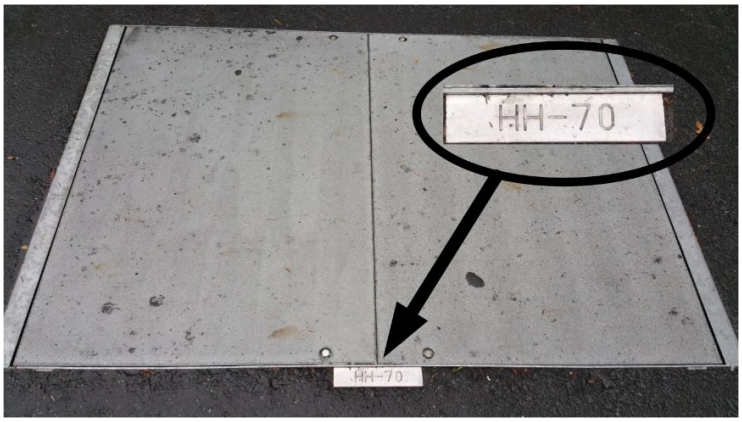
TYPICAL INSTALLATION OF BELL END ENTRY FITTING AT UNDERGROUND COMMUNICATIONS STRUCTURE. WATERTIGHT COMMUNICATIONS DUCT FOR UNDERGROUND UTILITY CONDUIT.

E. Access to vaults consist of a minimum 36 inch circular lid, identified as communications by bIT-CIDB's labeling standards. Any vault/pull box within a potential traffic area must contain a traffic rated lid. Install LockDown Security Device™.





SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS



F. Do not locate vaults beneath roadways, especially public roadways.

G. Where vaults must be located at a higher elevation than the penetration point of a building, the vaults must contain a sump hole with pump that drains directly to the areas nearest storm drainage system. The vault must also have power to operate the vault's pump. The pump must be protected by a cast iron grate.

In the event a drain cannot be tied directly to the storm drain system, install second drainage conduit routed downstream to a vault containing a pump to minimize the build-up of water within the vault.

For vaults not in use, whose base is located below the water table, install a drain cap to prevent groundwater infiltration.

H. Install P-3200 series channel precast in the sidewalls of the vault along the long sides (entire length of the vault wall up to 18 inches from edges) in three rows two feet apart, centered vertically on the wall for the purpose of racking cables and cable slack. Install minimum 18 inch standoff rack units.

I. Install 120V power to each vault requiring a pump. Confer with bIT-CIDB for vaults requiring power for miscellaneous use such as lighting. In this case, install GFI receptacles with weather covers affixed to the underside of the vault ceiling. Install a hook for the hanging of a portable light.

J. Install a removable rung ladder from the center access of the vault to the floor, resting the weight of the ladder and occupants at the floor. Top of ladder must affix to an anchoring system while in use, but removable to allow for cable pulling within the vault.

K. Install pull-eyes at the floor and at the wall for the purpose of pulling cable. Pull-eye must be pre-cast into the vaults floor and both end walls.

L. Install white for interior, black for exterior, epoxy based paint for water proofing of vault/pull box surfaces. bIT-CIDB does not allow Latex based paint.

M. Penetrations into a sidewall must be flush with the interior wall. Any new penetration must be cleanly bored and sealed at the exterior with epoxy filler or Room Temperature Vulcanizing (RTV) along with Link-Seal® Assembly.

INSTALLATION PARAMETERS

The following installation parameters are general and do not cover unique project requirements, as these situations must be discussed and reviewed with bIT-CIDB personnel prior to design work for the issues.

1 CABLE ROUTING

A. Install "J" style rack supports for support of service loops of cabling, affixed to the vertical racking member using the proper mounting bolts and washers designed for the function and properly sized.

SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS

B. All fiber optic cabling must route through innerduct between vaults, with 30 feet of fiber optic cable slack in each vault/pull box, supported at the sidewall such that service loop remains in place until manually removed or repositioned. Wrap the slack on opposite sides of the loop using VELCRO® style wrap, encircling the cable at least twice.

C. All copper cable routing within a single conduit is dependent on cable size. Install multi-cell fabric innerduct, such as MaxCell™, for copper backbone cable in 100 pairs or less to allow for maximum use of a duct bank conduit.

D. All cables shall route through the short end, from a Zone Distribution Facility (ZDF), and exit the opposite end against the same side wall when possible. Cable should immediately travel to the sidewall racking system at the level it enters the vault/pull box, providing additional rack supports for their support as required. Multiple cables may rest on the same rack support arm side-by-side only and not resting closer than 2 inches from the end of the racking arm.

E. Affix the cable to the sidewall racking system using VELCRO® style material for easy removal. Plastic ties may be used provided they do not deform the cable sheath.

2 PREPARATION

A. Survey the entire cable pathway to make sure all components are in place and have been inspected and approved prior to scheduling any cable installation. Survey receiving telecommunications rooms to ensure termination equipment exists and meets termination requirements according to Campus IT Infrastructure Standards. Install additional equipment as required to support all new cable terminations.

B. Schedule and notify bIT-CIDB and design team at least 5 business days in advance of when cabling will commence between locations. Coordinate and schedule termination of cables with bIT-CIDB prior to installing cable, making sure telecommunications rooms have been inspected and accepted by bIT-CIDB and are “Room Ready”.

C. Room Ready means: the room’s equipment has been placed, inspected, and approved, and there is finished power and lighting available within the room, and there are no obstructions that can interfere with the proper pulling and termination of the cabling.

3 CABLE PULLING

A. Do not exceed the pulling tension suggested by the manufacturer for the specific cable installed. In general machine pulling is not allowed on campus, However, if allowed, due to special circumstances, the installer must use a tension break-away tool so as not to exceed the recommended maximum pulling tension published by the manufacturer.

B. When pulling cable, the cable shall not rest on a fixed object so as not to cause damage to the cable and/or sheathing. When pulling cable, do not exceed bend radius and pulling tension identified in the manufacturer’s published guidelines. Maintain a minimum bend radius of 20 times the cable diameter when pulling cable and 10 times the cable diameter after installation.

4 CABLE ROUTING THROUGH EXISTING VAULT AND DUCT BANKS

A. When routing cabling through existing OSP conduit pathways, survey the existing route to ensure available conduits exist for pulling of new cabling through the entire route. Follow all OSHA safety guidelines for entering a vault or pull box. If a vault within the routing does not contain available empty conduit pathway, to include one spare, contact bIT-CIDB immediately to determine how to route the new cabling.

B. Always contact bIT-CIDB in advance of planning a new cable route for OSP to ensure any available empty conduits are not already planned for utilization for a different project. Reserve any new pathways with bIT-CIDB to ensure they remain available for the project.

SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS

C. When determining cable routing, select the first empty conduit starting from the lowest right available conduit. If an empty conduit exists, ensure there is at least one other empty conduit for future cable pulling.

D. When routing fiber optic backbone cabling, determine if there is an available empty innerduct before utilizing an empty conduit. If there is an empty innerduct, but it is the last available innerduct, then install four new innerduct for future fiber optic cabling in that segment of duct bank. Before using the last spare conduit, confer with bIT-CIDB to alert them of the issue and to determine action to be taken before proceeding with infrastructure cabling design for the project. Fiber and copper cabling shall not be placed in the same conduit.

5 LABELING

All OSP pathway related components must be labeled per Campus IT Infrastructure Standards. Conduits are labelled at both entry and exit points, and vault/pull boxes are labelled on the covers. bIT-CIDB will provide unique identification numbers for new installations and labelling scheme at beginning of each specific project.

SECTION 4 – OUTSIDE PLANT (OSP) PATHWAYS

SKETCHES:

Refer to the sketches as listed in this paragraph for further requirements applicable to this section. These sketches depict component configuration requirements for Outside Plant pathways.

SK700 – Vault Detail

SK701 – Vault Grounding

SK702 – Quad Duct Plug

SK703 – Vault Stub-out For Future Pickup

SK704 – Vault Lid Lockdown Security Plate

SECTION 5 – INSIDE PLANT (ISP) PATHWAYS

Section 5 - Inside Plant (ISP) Pathways

SCOPE

This section describes the requirements for cable pathways within the building. These pathways breakdown into two subsystems, backbone (also described as risers) and user space (also described as horizontal). The riser pathways carry the backbone cables routing between telecom rooms (TR). The user space pathways carry the horizontal cabling from the serving TR to the communications outlets.

The horizontal pathways in the user space may carry the backbone cables in addition to the horizontal cabling. In these instances, the horizontal pathway sizes must account for the extra backbone cabling.

DESIGN PARAMETERS

1 BACKBONE PATHWAYS (RISER)

A. The inside plant backbone pathways connect the Building Distribution Facility (BDF) to each of the Intermediate Distribution Facility (IDF) rooms in a star topology, and facilitate the placement of the backbone cabling.

B. With TRs stacked, install EZ-PATH® SERIES 44 fire rated systems from the BDF room and through each of the IDF rooms within the stack. Quantity to be determined based on planned and future growth (refer to sketches SK523 and SK524).

C. Install additional EZ-Path® devices as required to accommodate other low voltage cabling such as audiovisual, security, coaxial, and horizontal cabling transferring between floors. Maintain one empty spare riser sleeve when calculating riser cable volume.

D. For cables routing more than 3 feet vertically up a wall, install cable management affixed to the wall and support cabling to the cable management vertically every 18 inches using VELCRO® style wraps. Use of nylon wire ties is prohibited, as they tend to deform cable jacket and can have a negative effect on the cable performance.

2 USER SPACE PATHWAYS (HORIZONTAL)

A. The user space pathways, intended for primary pathway support of horizontal cables, generally originate outside the TR and route through the user space. These pathways may also support other Telecommunications low voltage systems cables. However, designers and contractors must obtain prior written approval from bIT-CIDB before placing non-telecommunications cables within the horizontal pathways (refer to sketches SK101 and SK102). Alarm cables are expressly prohibited.

B. Typically, user space pathways are composed of cable tray and conduit and further breakdown into the following components:

a. Primary Horizontal Pathways

1) Install cable tray to within 30 feet of any outlet where possible. Route the cable tray through the main building corridors above the accessible ceiling no higher than 12 inches above the suspended ceiling, leaving 24 inches of side access every 20 feet unobstructed. Avoid running cable trays or pull points over classrooms, offices, labs, meeting rooms, whenever possible. Coordinate with bIT for any exceptions. Install vertical support from the structure above at ends and every 4 feet on center throughout the cable tray routing.

2) An accessible ceiling is unobstructed 24/7. If the ceiling is a hard lid ceiling, access panels must be provided every 15-20'. The panels will be supported by a grid that allows one individual to remove and replace as many times as needed by one individual. These panels cannot be too heavy for one individual, or require special tools.

SECTION 5 – INSIDE PLANT (ISP) PATHWAYS

3) Transition the pathway to large capacity conduits when routing over hard lid and other non-accessible ceiling types, always matching conduit capacity to tray capacity.
4) If total number of cables, including projected future growth, is 40 or less, the use of alternate cable hangers may be considered, subject to bIT-CIDB approval.

C. Secondary Pathways
   a. Secondary pathways are defined as a cable pathway support system between the primary pathway and the outlet. At minimum, install cable hangers above accessible ceiling.
   b. Use only Cat5e rated cable hangers with cable retaining devices. Do not allow cabling to rest on non-telecommunication objects. Install a cable hanger on each side of a non-telecommunication object to keep cabling supported only by cable hangers. Route cables under other objects when possible, but maintain a minimum height of 6 inches above the finished ceiling grid and maximum 24 inches.
   c. Space cable hangers no further than 5 feet on center along the entire hanger path. Last cable hanger must be within 18 inches of the conduit/surface raceway/hole in top of plate. The last hanger shall contain the slack cable loop.
   d. Cable hangers shall not contain greater than 40 cables. Take into consideration current and future anticipated growth of 20%.
   e. Cable hangers must be independently supported. Do not use ceiling hangers. Existing threaded rod or Unistrut may be used.

INSTALLATION PARAMETERS

1 CABLE TRAY/BASKET TRAY

A. Install a cable tray, or basket tray, system consisting of straight sections, field or pre-manufactured bends based on type of tray, splice connectors, support components, and other accessories all by the same manufacturer. Install in accordance with manufacturer's instructions and recognized industry practices, and ensure that the installed system complies with requirements of the NEC and applicable portions of NFPA 70B, NEMA VE-2 "Cable Tray Installation Guidelines" and NECA's "Standards of Installation" pertaining to general electrical installation practices.

B. For basket tray, use cutting tool recommended by the manufacturer to ensure there are no sharp edges of any kind in, or around, the tray.

C. Install supports at intervals up to 5 feet on center, at turns and end points. Use dual support hangers, trapeze hangers, or wall brackets. Supports should consist of threaded rod with appropriate hardware (nuts, washers, lock-washer, etc.), construction channel, and attachment brackets.

D. Install cable trays, or basket tray, parallel or at right angles to the centerlines of columns and beams.

E. Install supports using a structurally-approved anchoring system approved by a state licensed structural engineer.

F. Do not support cable tray, or basket tray, from ductwork, piping, or other equipment hangers.

G. Remove all sharp edges from cable tray or basket tray to prevent damage to cable sheath and injury to personnel maintaining cables and pathways.

H. Seismically brace the cable tray, or basket tray, following construction regulations relative to the project's seismic zone. Provide and install for seismic joints were applicable, supporting a minimum 3 feet of cable slack at the seismic joint.

I. Installation Clearances:

SECTION 5 – INSIDE PLANT (ISP) PATHWAYS

a. Provide for top access clearance of 12 inches minimum for structures running parallel to the cable/basket tray. Structures running perpendicular, and less than 6 feet in width may cross above or below the cable/basket tray at no less than 6 inches.
b. Provide side access clearance of 24 inches minimum for structures running parallel to the cable/basket tray.
c. Provide a minimum of 6 inches clearance from fluorescent light fixtures, or other EMI sources.
d. Provide a minimum of 4 feet of clearance from any motor or transformer.
e. For structures running parallel to the cable tray provide a minimum of 12 inches of clearance from any flue, hot water, steam line, or other heat producing source, 3 inches minimum for structures crossing perpendicular to the cable tray. For areas not having an air exchange equal to one hour provide a minimum clearance distance of 24 inches.

J. Pathway shall not be installed in areas where ambient temperature is above 85 degree Fahrenheit.

K. Provide a minimum 12 inch bend radius on all changes in cable direction. For field manufactured bends, such as those for basket tray, install radius shields at each bend/corner of “T” type intersections and cross intersections.

L. Install blind end caps where cable/basket tray does not terminate at a wall.

M. Bonding and Grounding:
a. Refer to Section 11 – Bonding and Grounding for additional information on Bonding and Grounding.

N. Install manufactured cable drop-outs at locations where cables transition between two different heights of cable tray, or other pathway types, in excess of 6 inches.

2 PRIMARY PATHWAY CONDUITS

A. Run conduit in groups/banks in the most direct route possible, but parallel to building lines, and at elevations that avoid unnecessary offsets. Do not route conduit through areas in which flammable material may be stored, or near heat sources such as boilers, incinerators, hot water lines, or steam lines.

B. Install new conduit free from dents or deformations.

C. No bends greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes (contains no continuous section longer than 100 feet). bIT-CIDB does not allow the use of condulets (hard 90’s) within pathways. If a sweeping 90 is not possible bIT will consider the use of SmartLB (see parts list).

SECTION 5 – INSIDE PLANT (ISP) PATHWAYS

D. Ream conduit ends to eliminate sharp edges, burrs, etc. Install bushings on conduit ends that provide rounded surfaces so as not to deform cable jackets in any manner.

E. Bond one end of the primary pathway conduit run to the nearest electrical panel's grounding system, or grounded cable/basket tray within the user space. Multiple conduit banks may be bonded at one end in series to either an electrical panel's grounding system or grounded cable/basket tray.

3 CABLE HANGERS (RATED FOR CAT5E OR ABOVE)

A. Install a cable hanger system, consisting of hangers, drop wires, straps, threaded rod, and other required accessories, from primary pathways to outlet rough-in. Install in accordance with manufacturer's instructions and with recognized industry practices, to ensure that the installed system complies with requirements of the NEC, and applicable portions of NFPA 70B and NECA's "Standards of Installation" pertaining to general electrical installation practices.

B. Install dedicated supports at a maximum of 5 foot intervals. At minimum, supports consist of #12 drop wire, or one-quarter inch threaded rod, depending on the cable hanger's or strap's requirement. Support wire, or rod using components appropriate for the purpose.

C. Do not share support (wire/rod) with other trades. Do not support the hanger on ceiling grid support wires.

D. Do not support the hanger from ductwork, piping, or other equipment hangers.

E. Install hangers in a manner such that other building infrastructure does not block access to the cable(s).

F. Install cable hangers a minimum of 6 inches above finished ceiling, and no more than 24 inches above accessible ceilings.

G. Install a cable hanger within 18 inches of any conduit pathway transition, such as into an outlet conduit stub.

H. Powder-actuated tools may be used to install hangers. Follow all safety requirements and use appropriate anchor for structure.

I. Installation Clearances:
   a. Cables shall not rest upon any other structure not intended for the direct support of the cable(s).
   b. Provide minimum clearance of 6 inches from any EMI sources.
   c. Provide minimum clearance of 4 feet from any motor or transformer.
   d. Provide minimum clearance of 12 inches from flue, hot water, steam line or other heat producing source.

J. Close cable hanger loop, retainer, or latch after cable installation or removal.

SECTION 5 – INSIDE PLANT (ISP) PATHWAYS

4 OUTLET ROUGH-IN

A. Install boxes plumb, square, and matched in height to corresponding electrical outlet. Adjust locations and heights as required to suit coordination requirements. Outlets must be within 16 inches of corresponding electrical outlet.

B. Install one 5 inch square by 2-7/8 inch deep double-gang box with single gang ring for the outlet box.

C. Install one 1 inch conduit from the accessible ceiling space, or the primary pathway, to outlet box (for maximum of 6 cables).

D. Do not daisy-chain outlet boxes.

E. Install boxes flush with walls, ceilings, and floors.

F. Do not remove fabricated knock-outs without using the opening for a conduit connector. Do not create any additional opening to the back box.

G. Framed Walls, both Fire Rated and Non-Rated
   a. Do not install outlet boxes back-to-back (outlet boxes facing opposite sides of a wall). At framed walls not fire rated, install boxes with at least 6 inches of separation. At fire rated framed walls, install boxes a minimum of 24 inches apart, or on the opposite side of a framing stud separation, or as dictated by code.
   b. For fire rated walls, install fire rated putty pads on outside of outlet box.

H. Ceilings
   a. Install boxes, supports (such as T-bar support bracket), and ring such that the finished condition is flush with ceiling finishes or as required by condition. At non-accessible ceilings, continue the outlet conduit to an accessible location nearest the outlet.

I. Surface Mount Raceways
   a. Minimum requirement to outlet is Panduit LD10. Raceway should be run in corners and wall edges. Do not run down from ceiling to outlet in the middle of the wall if possible. All fittings should be CAT5 rated. If project requires larger size pathway, consult with bIT-CIDB. See photo below.
   b. LD10 must be anchored with Red Head “E-ZAncor” self-drilling dry wall anchors (or equivalent). Do not install the included screws into the anchor. The flange of the anchor will hold the LD10 in place. Use TripleGrip heavy duty anchors for other surfaces (such as lathe and plaster). Use of “dry wall” screws to mount surface raceways to dry wall is expressly prohibited, unless screwing into a stud. Use common sense when securing raceway. Typically on a 10’ stick, 3 anchors would be required—one within 6” of each end, and one in the middle. On very short sections, only one or two may be required.

SECTION 5 – INSIDE PLANT (ISP) PATHWAYS

SKETCHES

Refer to the sketches as listed in this paragraph for further requirements applicable to this section. These sketches depict component configuration requirements telecommunications pathways.

SK100 – Basket Style Cable Tray Trapeze Support and Clearances

SK101 – Basket Tray to EZ-Path (parallel)

SK102 – Basket Tray to EZ-Path (perpendicular)

SK600 – Horizontal Cable Routing Through Full-height Partitions

SK601 – Horizontal Cable Routing Through Low Profile Partitions

SECTION 6 – OUTSIDE PLANT (OSP) BACKBONE CABLING

Section 6 - Outside Plant (OSP) Backbone Cabling

SCOPE

The Outside Plant (OSP) backbone cabling connects buildings to at least one of the campus Zone Distribution Facilities (ZDF) for voice and data services.

For campus distribution, the cabling will route within the OSP duct bank pathways as identified in OSP Pathways Section 4. The backbone cabling will support voice, data, and other low voltage communications and is comprised of multi-strand fiber optic and multi-pair copper cabling. The cost for extending backbone cabling into new buildings is borne by the project.

For **Confined Space Entry**, follow the procedures outlined in the EHS (Environmental Health and Safety) website, https://ehs.berkeley.edu/publications/confined-space-entry-program

Note this form needs to be filled out and posted at the worksite. Take a photo of the completed form and email to cns-projects@berkeley.edu.

https://ehs.berkeley.edu/sites/default/files/cseevalform.pdf

DESIGN PARAMETERS

Verify with bIT-CIDB that the quantity of OSP copper pairs, fiber strands, and cable types meet the project's backbone needs.

1 COPPER SPLICE ENCLOSURES AND ACCESSORIES

A. Install building entrance type splice enclosures. Install indoor splice enclosures suitable for installation within a telecommunications room (TR) or Entrance Facility (EF) for the splicing of OSP and Inside Plant (ISP) cabling. Either butt-splice or through-splice configurations are acceptable, with either solid sleeve or slip sleeve. Install a re-entry type of splice case for future maintenance or modifications.

B. The splice case end caps must allow for multiple 100 pair copper cables exiting the enclosure for 100 pair tie cables between the splice case and the Building Entrance Protector (BEP). Locate the enclosure within a maximum of 50 feet from the point the OSP cable exits the entrance conduit, but always as close to the entrance conduit as possible.

C. Install BEPs in 100 pair units, unless otherwise requested, and wall mounted near the entrance conduits. The quantity of BEPs is based on the size of the incoming service cable pairs. Size the enclosure for the size of the incoming service cable and splice bundles housed within the enclosure (refer to sketches SK507 and SK507A for placement).

D. Encapsulant – For splice cases within OSP vaults or pull boxes, install encapsulant suited for keeping out moisture or other contaminants, but allows for re-entry for maintenance.

E. Install 25 pair splice modules for copper voice terminations within an enclosure in quantities according to the incoming OSP copper multi-pair cable(s).

F. For the BEP, install a 26 AWG gauge 100-pair tie cable as a fusible link between the BEP and incoming copper multi-pair cable.

SECTION 6 – OUTSIDE PLANT (OSP) BACKBONE CABLING

G. Cable transition (OSP to ISP) in TR shall accept mixed solid wire gauges (26-19 AWG). Modules shall accept mixed insulation types (PIC, PVC, or pulp/paper insulated conductors) up to maximum insulation outside diameters of 0.70 inches.

2 BUILDING ENTRANCE PROTECTORS (BEP)

A. All buildings connected to the University campus must have lightning protection at the entrance where the multi-pair copper enters the building.

B. Install the quantity of BEPs based on the total quantity of pairs coming into the building. Wall mount the BEP adjacent to the voice backbone 110 style termination field, as close as practical, but no farther than 25 feet from the farthest 110-backfield termination block.

C. For the protector modules within the BEP, install gas discharge tube protector module.

3 MULTI-PAIR COPPER TIE CABLE

Install a 100 pair copper multi-pair copper cable between a BEP and the voice backfield for each 100 pair of incoming backbone multi-pair copper. The tie cable should be comprised of copper conductors two gauge thinner wire than the wire used for cross connects and the incoming OSP copper wire, allowing for a failure in the actual BEP such that the wire melts the same as a fuse wire before the cross connect wire. Example: if the OSP wire is AWG #24, then the tie cable wire should be AWG #26 gauge.

4 COPPER BACKFIELD TERMINATION EQUIPMENT

A. Install 5-pair field terminated 110 blocks for the termination of the backbone tie cable(s) between the BEP and the 110 style backfield. Refer to Section 3 Telecommunication Rooms and sketch Series 500 for additional information and sketches for general room layout of a Building Distribution Facility, (BDF), Intermediate Distribution Facility (IDF), or Entrance Facility (EF).

B. Confer with bIT-CIDB for the placement of the copper backbone field within the room's 110 style termination blocks, leaving a minimum of 10% additional spare capacity for future growth for each 100-pair.

5 FIBER OPTIC BACKBONE CABLE

A. Confer with bIT-CIDB for the quantity and types of fiber optic strands required for the specific Project. Install a minimum 24 strand Single-Mode fiber optic cable containing water blocking barrier and suitable for an OSP environment within an in-ground duct bank and vault/pull box.

B. Review fiber optic cabling type and size with bIT-CIDB based on building functional communications requirements.
   a. Fiber parameters:
      i. Corning Cable Systems, SMF 8.3/125.
      ii. Non-buffer, except at breakout kit.
      iii. Mode field diameter equal to 8.8 μm, ±0.5 μm.
      iv. Cladding diameter equal to 125μm, ±1.0 μm.
      v. Core/Cladding concentricity equal to ≤ 0.8 μm.
      vi. Minimum tensile strength equal to 100,000 psi.
      vii. Fiber strength – 110 kpsi minimum.
      viii. Color code – EIA/TIA 568, color coding for fiber optic cables.
      ix. Cable jacket marking must be legible and shall contain the following information:
         1) Manufacture's name.
         2) Manufacturer's part number.
         3) Manufacturer's date.
      x. Fiber count and type (for example, 12F SM for 12 strands of Single-Mode).

SECTION 6 – OUTSIDE PLANT (OSP) BACKBONE CABLING

xi. Sequential foot markings.
xii. Minimum performance specifications as follows:
1) Maximum attenuation: 0.4 dB/Km @ 1310 nm.
0.3 dB/Km @ 1550 nm.

C. If requested, provide a mock up sample consisting of a 100 foot section of 2-strand Single-Mode fiber optic cable terminated in the connectors specified. Perform both the attenuation and OTDR testing (Section 9 – General Testing Information) specified and provide a sample loss budget and sample test printouts for review prior to any termination and testing of fiber optic cabling at the site.

D. Have fiber optic cabling delivered to the job site on reels, wrapped to protect the cabling from outside contaminates and damage. The reels must contain the manufactures OTDR traces and power meter attenuation data upon delivery and unpacking witnessed by the Owner's Representative. Test one fiber strand from each buffer tube at the time of delivery to ensure the fiber cabling has not sustained damage during shipment or in the manufacturing process.

E. Install, breakout, fusion splice, or direct terminate and test fiber optic cabling. First contact bIT-CIDB for the type of termination preferred for the Project.

F. Single-Mode Installations: Install rack-mounted fiber optic termination panel fully loaded with LC Single-Mode couplers. Install a rack-mounted splice shelf for fusion splicing of the Single-Mode strands with pigtails.

6 COPPER BACKBONE CABLE

A. Install a minimum of one twisted multi-pair copper OSP cable, ARMM type, containing a minimum of 100 pairs. Terminate the cable on wall-mounted 110 block Building Entrance Protector (BEP) inside the EF, or BDF room, whichever is applicable for the project. Review cable type and pair count with bIT-CIDB.

B. Install gel-filled multi-pair cable with sub-sets of 25-pair, color codes to industry standards and sized for the project. Cable(s) must be designed for OSP conditions in an underground duct bank environment.

INSTALLATION PARAMETERS

1 FIBER OPTIC CABLE TERMINATION AND INSTALLATION

A. Place all optical fiber OSP cabling within innerduct.

B. For loose tube fiber optic cables:
a. After dressing the cable to its final destination, remove sheath to a point that allows the strands to be placed in break out kits and terminate in a neat and uniform fashion. Terminate fiber optic cable in compliance with the manufacturer's published instructions.
b. Clamp cable sheaths to the outside of fiber termination shelf using an outside plant cable clamp. Install a cable clamp from the same manufacturer as the fiber optic cable, designed by the manufacturer for the specific purpose.
c. Install the cable and clamp according to the manufacturer's published guidelines.

2 SERVICE LOOPS

Route fiber optic cabling along perimeter walls and install 30 foot service loop in each vault/pull box along the OSP pathways between origin and destination. Place fiber cable loops on sidewall racking system using "J" style rack members attached to strut channel.

SECTION 6 – OUTSIDE PLANT (OSP) BACKBONE CABLING

3 MUTLI-PAIR COPPER BACKBONE

A. Route cable between origin and destination, providing splice enclosures as needed, every 900 to 1,000 feet, depending on the length of the run between termination points.

B. For backbone runs of 100-pair copper cable, route cable within multi-cell fabric pathways within duct bank conduits to maximize the use of each conduit.

4 CABLE INSTALLATION

A. Use a break-away tool when pulling backbone cables, ensuring not to exceed manufacturers pulling tension requirements or recommendations.

B. Replace any cable with a damaged sheath.

LABELING

1 INSTALLATION

A. Install machine-generated fiber identification tags on the buffered fibers on the back side of the termination panels.

B. Install machine-generated two sided fiber identification cards on the front panel of the termination panels.

C. Install stainless steel engraved cable identification tags on cable sheaths at vaults, pull boxes, service loops, Conduits, and fiber termination panels.

D. Refer to Section 9 – General Testing Information for additional information on labeling standards.

TESTING

1 GENERAL

A. With a power meter and light source test for attenuation to create a dB loss schedule of Single-Mode fiber OSP cable strands.

B. With an Optical Time Domain Reflectometer (OTDR) create traces of Single-Mode fiber optic OSP cable strands.

SECTION 6 – OUTSIDE PLANT (OSP) BACKBONE CABLING

C. Refer to Section 9C – Testing Backbone Inside Plant (ISP) and Outside Plant (OSP) for detailed information on testing and submission of test results.

SECTION 7 – INSIDE PLANT (ISP) BACKBONE CABLING

Section 7 - Inside Plant (ISP) Backbone Cabling

SCOPE

The Inside Plant (ISP) backbone cabling connects the Building Distribution Facility (BDF) to each Intermediate Distribution Facility (IDF) or telecommunication room (TR) in a star topology. The cables route within the backbone pathways as described in Section 5 - Inside Plant (ISP) Pathways. The backbone cabling will support voice, data, and other low voltage communications cabling. The ISP cables are comprised of multi-strand fiber optic and multi-pair copper cables.

The ISP backbone cabling, for the purpose of design and installation, refers to both horizontally and vertically routed cable installations within a building. ISP cable does not travel through any underground pathways where environmental conditions can impact the cable.

DESIGN PARAMETERS

1 FIBER OPTIC BACKBONE CABLE

A. Verify with bIT-CIDB the quantity of Single-Mode strands needed between the building's BDF and each IDF room. Install one Single-Mode fiber optic cable to each IDF.

B. All fiber optic cabling must be delivered to the job site on reels, wrapped to protect the cabling from outside contaminates and damage during shipping. The reels must contain the manufactures Optical Time Domain Reflectometer (OTDR) traces and power meter attenuation data upon delivery and unpacking witnessed by the Owner's Representative.

C. Install fiber optic plenum rated armored cables, building distribution type (for example, Material Identification Code (MIC/DX) type), containing a minimum of 24 strands of Single-Mode, terminated using LC style connectors into a rack-mounted fiber patch panel at each end.

D. Fiber optic patch panels shall be an enclosed housing for protecting, storing and organizing the termination of fiber cable(s) and fiber strands. Install means to strain relieve and support the specified cables. Install facilities to store fiber slack, fiber splices, and patch cord management.

E. Install passive physical equipment and apparatus used in terminating, interconnection, and cross-connecting fiber optic cabling in fiber optic patch panels. Equipment shall possess a minimum fire resistant rating of UL94V-1, and shall conform to existing Occupational Safety & Health Administration (OSHA) health and safety laws.

F. Install rack-mounted fiber optic patch panels.

G. Install cable(s) suitable for indoor installation, between floors in vertical riser system and communications pathways through overhead ceiling space, such as cable tray or conduit.

H. The fiber optic cable shall meet flame rating of NEC (Article 770) rated as OFCP and UL listed as such.

I. Terminate the Single-Mode cabling on panels with pre-manufactured pig-tails, fusion spliced.

2 CABLE CHARACTERISTICS:

A. Ensure transmission performance that is not significantly affected by environmental fluctuations, installation, or aging.

B. Materials shall not contain hydrogen in quantities that will increase light attenuation.

C. Each fiber shall be completely covered with a "primary coating" (acrylate material). Coating diameter = 250 μm, ±5 μm.

SECTION 7 – INSIDE PLANT (ISP) BACKBONE CABLING

D. Each coated fiber shall be fully covered with a material extruded over and directly onto the coating – referred to as the tight buffer. Tight buffer diameter = 900 μm, ±5 μm. Material = Poly Vinyl Chloride (PVC), or Equal flame retardant thermoplastic.

E. Buffered strands shall be individually color-coded to meet the requirements of ANSI/TIA/EIA-598-A-1995. (Also, ref. ANSI/ICEA S-83-596-1994, and EIA-230).

F. The cable shall have an internal strength element such as aramid yarn (e.g., Kevlar).

G. The fiber optic cable shall have a seamless inner jacket (material = PVC, or Equal) applied to and completely covering the internal components (fiber strands, strength element, other).

H. For armored fiber optic cable, the cable shall have an interlocking metallic or plastic armor applied spirally and longitudinally to and completely covering the cable.

I. The cable shall have a seamless plenum-rated outer jacket (material = PVC, or Equal) applied to and completely covering the armor. The cable shall have a minimum tensile strength of 150-lb rated load.

3 COPPER BACKBONE CABLE

A. Copper backbone cabling shall consist of a minimum 25 pair Category 3 unshielded twisted pairs (UTP) cable. Cable pair color shall follow industry standards for color coding and consist of 24 AWG strands of copper. Each strand must have a PVC insulation coating and contain a cable sheath of plenum rating for horizontal and vertical runs. Cable run between floors must be contained in conduit or fire rated penetrations such as EZ-PATH™ meeting local fire codes for the type of penetration.

B. Install armored type cabling for cabling that passes through an exposed area where there is a potential for damage.

4 COPPER BACKFIELD TERMINATION EQUIPMENT

A. Install 5-pair field terminated 110 style blocks for the termination of backbone multi-pair copper cable. Refer to Section 3 – Telecommunication Rooms for additional information and sketches for general room layout of a BDF, IDF, TR, or Entrance Facility (EF).

B. Confer with bIT-CIDB for the placement of the copper backbone backfield within the room's 110 style termination towers, leaving a minimum of 20% additional spare capacity for future growth in 100-pair increments.

INSTALLATION PARAMETERS

1 GENERAL

All cables must contain a continuous sheath and be homogeneous in nature. Splices are not permitted.

2 ROUTING

A. Do not support or attach cables to piping or structures not specifically designed and intended for the support of telecommunications backbone cabling while routing vertically or horizontally.

B. When routing horizontally, utilize the overhead cable tray/runway designed for support of communications cabling. Keep backbone cabling, when routing in cable tray/runway, to the side and separate from other types of low voltage cabling.

C. When routing within a TR and exposed vertically more than 18 inches, utilize the wall mounted vertical cable runway, supporting the cable at the runway every 18 inches using VELCRO® style wrap. If routing vertically in a non-rated riser space, support cable using Millipede™ plenum rated reusable wraps.

SECTION 7 – INSIDE PLANT (ISP) BACKBONE CABLING

D. For managing cabling horizontally or vertically on a wall that is not supported by runway, install open access style “D-Rings”.

3 CABLE DROP-OUTS

Install cable drop-outs for cabling that transitions more than 6 inches to a different level of support, or when transitioning over the side of the cable tray/runway. Install drop-outs from the same manufacturer of the cable tray/runway that the cable is supported from. Install a graduated bend radius equal to or greater than that specified by the manufacturer’s guidelines. Install the drop-outs properly so they remain in place over the life of the supporting tray/runway.

4 COPPER BACKBONE TERMINATION

A. Route copper backbone into 110 style tower(s) from the top and terminate on 5-pair field terminated blocks assigned by bIT-CIDB for building backbone voice field in industry standard 25-pair groups ordered by color code of each pair. Use only a proper 110 style termination tool for terminations. Pairs must remain twisted within one half inch of the actual termination point.

B. At each bend in the cable, maintain a bend radius according to manufacturer’s published guidelines for the cable type installed.

C. Install grounding for any armored CAT3 cable at the originating end of the cable at the TR (refer to Section 11– Bonding and Grounding for additional information).

SECTION 8 – HORIZONTAL CABLING GENERAL REQUIREMENTS

Section 8 - Horizontal Cabling General Requirements

SCOPE

This section describes the general design and installation requirements for the horizontal (outlet) cable segment of the telecommunications structured cabling system. The horizontal cabling segment provides the connectivity for voice and data from the serving telecom room (TR), either a Building Distribution Facility (BDF) or an Intermediate Distribution Facility (IDF), to the user space (US) work area.

This section further breaks-down into sub-sections addressing different cable types and criteria for selecting the horizontal cable appropriate for the project.

The University has transitioned from landing all voice and data station cabling on wall-mounted 110 blocks to landing voice on 110 blocks and data on rack-mounted patch panels for new construction and other projects, as deemed appropriate by bIT-CIDB. This has caused some confusion, so always check with bIT-CIDB before proceeding if there is any doubt.

DESIGN PARAMETERS

The basic types of horizontal cable are unshielded twisted pair (UTP) Category 5e (Cat5e) and discontinuous foil construction unshielded twisted pair Category 6A cabling. Building function and user bandwidth requirements dictate the type and configuration of horizontal cabling. Cat5e is intended for all voice and 1 Gbs data. Cat6A may be specified for 10 Gbs connections and other high bandwidth applications.

1 CABLE TYPE DETERMINATION

bIT-CIDB has deployed the following configurations.

a. Data = UTP Cat5e plenum rated cabling terminated on patch panels or wall-mounted Cat5e rated 110 style blocks.
b. Data = For 6A solution, check with bIT-CIDB before doing any work. New buildings and upgrades to existing buildings will utilize the Panduit solution. (Panduit or General cable may be used). For current Siemon installations, ask bIT-CIDB for guidance.
c. Wireless Access Points (WAPs) use bIT specified Cat6A solution.
d. Voice = UTP Cat5e plenum-rated cabling terminated on wall mounted Cat5e rated 110 style blocks.
e. Security Cameras use bIT specified Cat6A solution

2 CAT5E HORIZONTAL CABLING

bIT-CIDB uses an unshielded twisted pair (UTP) Cat5e plenum-rated 4-pair cable with 24 AWG solid copper conductors.

A. All cables shall be plenum-rated, suitable for indoor installation, in an air-plenum environment.
B. Each and every cable run shall be a continuous single cable. Splices are not permitted. If a consolidation point is necessary, consult with bIT-CIDB (e.g.: transitioning from OSP to ISP plenum rated).
C. The cable shall contain four twisted pairs. Each twisted pair shall consist of two conductors insulated with a flame retardant thermoplastic material. All twisted pairs shall be individually color coded to industry standards (ANSI/ICEA Publication S-80-576, and EIA-230). All conductors shall be 24 AWG solid copper.

SECTION 8 – HORIZONTAL CABLING GENERAL REQUIREMENTS

D. The cable sheath shall be unshielded, and shall be covered with a seamless overall outer jacket consisting of a flame-retardant material, such as low-smoke polyvinyl chloride (LS-PVC).

E. The cable shall be NEC rated as CMP, and UL listed as such.

F. The electrical performance of the overall cable & twisted pairs shall comply with ANSI/TIA/EIA-568-A requirements for Category 5e UTP cabling.

G. Cabling shall have foot markers the entire length of the cable spaced one foot on center maximum.

H. See Product Listing for acceptable cables types and part numbers.

I. CAT5E TERMINATION

i. Station Outlet

1. Termination at station outlet must use Panduit Mini Com 5e jacks and face plates.
2. Terminate voice and data cabling per T568A wiring pattern.
3. Install a **white** 8-position modular **connector for voice** at the user station, regardless of cable or component manufacturer.
4. Install a **blue** 8-position modular **connector for data** at the user station, regardless of cable or component manufacturer.
5.
6. Flush Mount Outlets – Standard Faceplates
    a. Standard workstation faceplates shall have 4 ports.
    b. Faceplates shall include all required accessories, such as, blank inserts, labels and label windows.
    c. Color: Bright White

ii. TRs

1. Data
    a. At Building Distribution Facility (BDF) and Intermediate Distribution Facility (IDF) TR(s), terminate the Cat5e data cables on wall-mounted 110 style termination blocks farthest from the backbone voice termination, organized into 300-pair or 900-pair towers, providing additional 110 blocks as required.
    b. Install vertical wire manager towers in between 300/900-pair 110 block tower(s) and at each end of the termination field for cross-connect wire management.
    (or)
    c. Install Panduit 2RU 48 port discrete-port rack-mounted Cat5e patch panels.
    d. Install Panduit 2RU horizontal cable managers capable of supporting, organizing and patching between the horizontal termination field and network equipment or the equipment termination field.
    e. Always get bIT-CIDB approval when determining whether to use 110 blocks or patch panels for Cat5e data termination.
2. Voice
    a. At the BDF/IDF, terminate the Cat5e voice cables on wall-mounted 4-pair field terminated Cat5e rated 110 style termination blocks adjacent to the voice backbone field and organized into 300-pair or 900-pair towers,

SECTION 8 – HORIZONTAL CABLING GENERAL REQUIREMENTS

whichever is existing, providing additional 110 blocks as required, leaving 20% future growth.

b. Install vertical wire manager towers in between 300/900-pair 110 block tower(s) and at each end of the termination field for cross-connect wire management.

3. See product list for acceptable part numbers.

J. CAT6A HORIZONTAL CABLING

Provide Panduit unshielded twisted pair (DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP) Cat6A plenum rated cable. (see product list for acceptable part numbers):

Meet or exceed requirements to support 10GBASE-T.

K. DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP CAT6A TERMINATION

i. Station Outlet

1. Terminate data cabling per T568A wiring pattern.
2. Install **yellow modular connectors** (jacks) for termination of 4-pair DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP cables that are compatible with the cables used and compliant with ANSI/TIA-568-C.2.
3. Each jack shall meet or exceed TIA/EIA-568-C.2 and ISO/IEC 11801 requirements for DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A cabling. Wire modular connectors as T568A DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP CAT6A termination.

ii. TR's

1. At Building Distribution Facility (BDF) and Intermediate Distribution Facility (IDF), Panduit DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A cables shall terminate on Panduit Cat6A rated patch panels. (see product list for acceptable part numbers)
2. Flat 2RU patch panels shall support 48-ports, be completely metallic, and suitable for shielded modular connectors.
3. Bond to rack mounted busbar following Panduit published guidelines.
4. See product list for acceptable part numbers.

L. OUTLET/FACEPLATE DEPLOYMENT

Final user requirements and equipment layout determine the outlet configuration and cable quantity per faceplate. As a guide for the outlets configuration, bIT-CIDB recommends the following, each with a complement of three cables unless otherwise noted.

i. Standard Offices: two outlets.

ii. Large Offices: three outlets.

iii. Cubicle: one outlet.

iv. Small Conference Rooms: two outlets.

v. Large Conference Rooms: three outlets, one floor outlet beneath the conference table and two additional outlets to support audiovisual equipment.

vi. Copy/Fax Rooms: One outlet minimum.

vii. Classrooms: One outlet per presenter location and as required to support audiovisual equipment. If ETS has an A/V cabinet in the classroom, the default is to provide (4) data jacks in the cabinet. Typically, student desks do not receive hard-wired data connections.

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viii. Labs: One outlet per presenter location and as required to support audiovisual and lab specific equipment.

ix. Building Support Rooms: one outlet.

x. Building Systems: one to two cables per control panel (e.g. elevators, fire alarm, security, dashboards, etc.).

xi. Wireless: one outlet with one Cat5e cable per location as identified on the predictive wireless survey, which must be performed or approved by bIT-CIDB.

M. OUTLET/FACEPLATE CONFIGURATION

i. Each standard telecom outlet receives a complement of three cables (unless otherwise specified), with two cables dedicated to data and one cable dedicated to voice, terminated in a T568A configuration at the outlet and TR. Non-standard quantities of voice and data cables are allowed based on customer specification. Confirm port locations for Data and Voice cables with bIT-CIDB prior to installation.

ii. bIT-CIDB's standard for cable jacket color is BLUE for data and WHITE for voice. Subject to bIT-CIDB approval, contractor may use all blue or all white cabling for voice and data.

iii. Data cables are terminated at the outlet on ports 1 and 2 of the faceplate. The first voice cable is always placed in the bottom left port of the faceplate (port 3). If a second voice cable is required, it is placed in the bottom right position (port 4).

N. PATCH CORDS

bIT-CIDB typically provides and installs patch cords required in the TR. Depending on the project scope a contractor may be asked to include provision, placement, and labelling of patch cords in the TR. Users must provide and install patch cords for outlet locations. Patch cables should be compatible with horizontal cable solution provided (see product list for acceptable part numbers).

INSTALLATION PARAMETERS

1 GENERAL

A. Cables shall be of the same type and manufacturer. Route cables with a continuous sheath. Splices are not permitted.

B. Maintain a minimum bend radius equal to published requirements of the manufacturer of the cabling. In the absence of published guidelines, provide a minimum of 6 inch bend radius during and after installation.

C. Maintain manufacturer's published guidelines for pulling tension.

D. Place cables without kinks, twists, or impact damage to the sheath, as such cabling is considered damaged according to Campus IT Infrastructure Standards. Replace cable if damaged during installation.

E. Install a pull string along with cables when routing through conduit. Tie off ends of pull string in accessible ceiling space to prevent the string from falling into the conduit, or becoming inaccessible.

F. Install a pull string in any empty telecommunication, security, or audiovisual conduit.

G. Install a pull string in any empty telecommunication, security, or audiovisual cable trays.

SECTION 8 – HORIZONTAL CABLING GENERAL REQUIREMENTS

2 ROUTING

A. Maintain maximum tested cable length of 90 meters (295 feet) from the termination in the BDF/IDF/TR to the termination at the user's outlet faceplate.

B. When routing horizontally within a TR, utilize the overhead cable runway system as described in Section 2 – Codes and Standards. Utilize the wall mounted vertical cable runway and support cables every other ladder rung using VELCRO® style wraps.

C. Place and suspend cables in a manner to protect them from physical interference or damage.

D. Route cables 6 or more inches from sources of electromagnetic interference (EMI) and 4 or more feet from any motor or transformer.

E. When routing cables in areas without cable tray or conduit, support cables utilizing cable hangers intended for Cat5e or higher communication cables. Route these cables under building infrastructure such as ducts, pipes, conduits, etc., to provide cable accessibility in the future. Do not route cables over building infrastructure if possible. Do not route telecommunications cabling such that it obstructs access to service points for mechanical, electrical, plumbing, (MEP) utilities and access hatches, panels, valves, smoke and fire alarms, etc. Place hangers every 4 feet.

F. Do not tie cables to building infrastructure components such as, pipes, ducts, support wire and rods, conduits, wall studs, etc.

G. Route cables parallel with natural building lines at 90-degree angles, allowing for mandatory bending radius. Do not route through a work space if a corridor borders at least one wall of the work space/room.

H. Provide 4 feet minimum sheathed cable slack loop at the work space end of the cable route. Place slack within accessible space above the ceiling and within 18 inches of the transition into the outlet pathway conduit.

I. Place a plenum rated cable tie (VELCRO® style or Millepede) at the bottom of the slack loop to keep cable units together.

J. When exiting the cable/basket tray in the user space, exit over the top of the tray, not through the tray. Lightly secure the cable(s) to the cable/basket tray's edge using an approved plenum rated VELCRO® style cable wrap.

K. Modular Furniture Feed Point
   i. Single gang faceplate with 1.406 inch pass through hole for cables.
   ii. Color: Bright White
   iii. Wrap cable bundle in spiral wrap for cable protection.

WI-FI WIRELESS ACCESS POINT (WAP) CONNECTIONS

Each new building or remodel project will likely require outlets deployed throughout the building for bIT-CIDB to activate UCB's wireless network. Typically, the Project (CP and Department managed projects for new construction and TI's) provides and installs the cabling, outlets, patch cords, wall-mount housings and WAP's. bIT-Communication and Network Support (CNS) configures the Wi-Fi access points (refer to Section 12 – Wireless Access Points for additional information).

For routine TelCat requests or bIT-initiated Wi-Fi upgrades, bIT-CIDB incurs these material and labor costs to install.

SECURITY CAMERAS

Typically, each camera requires a Cat5e data cable for connection to the campus network via a 1Gbs POE Ethernet port. All camera locations and connectivity must be coordinated with UCPD.

SECTION 8 – HORIZONTAL CABLING GENERAL REQUIREMENTS

BUILDING SYSTEMS CONNECTIONS

1 FIRE ALARM PANEL

Terminate the cable connections for the fire alarm control panel on a surface-mounted outlet box with one jack for each required cable. Determine the size of the biscuit block box based on the quantity of cables required for the system. bIT-CIDB does not accept hard-wired connections directly to the panel's connection points unless over-ruled by the Inspector of Record (IOR). Place the outlet box inside the panel or in an adjacent secure box that is directly connected to the fire alarm panel with a conduit sized to easily allow the insertion of a manufacturer terminated patch cord (based on the quantity of cables).

2 ELEVATOR CONTROL PANEL

Terminate the cable connection(s) for the elevator control panel(s) on a surface-mounted outlet box with one jack per required cable. Determine the size of the box based on the quantity of cables required for the system. bIT-CIDB does not accept hard-wired connections to any elevators control system unless over-ruled by the IOR. Place the outlet box inside the cabinet for elevator panel or in an adjacent secure box that is directly connected to the elevator control panel with a conduit sized to easily allow the insertion of a manufacturer terminated patch cord (based on the quantity of cables).

3 SECURITY SYSTEMS CONTROL PANEL

For wall mounted equipment, terminate the cable connection(s) for the security control panel(s) on a surface-mounted outlet box with one jack per cable. bIT-CIDB does not accept hard-wired connections. Place the outlet box inside the security cabinet or inside the cable management gutter channel dedicated to the security system. This typically applies to the security access control and alarms monitoring system panels.

4 LIGHTING CONTROL PANEL

Terminate the cable connection for the lighting control panel on a surface-mounted outlet box with one jack per cable, or install a wall outlet with the standard rough-in. Determine the size of the box based on the quantity of cables required for the system. bIT-CIDB does not accept hard-wired connections. Locate the outlet adjacent to the lighting control panel.

5 EMERGENCY PHONES

A. For each emergency phone where the pathway may be underground or below slab, install and terminate OSP-rated Cat5e 4 pair UTP cable(s) on a surface-mounted outlet box with one jack per cable. Place the outlet box inside the connection box for communications within the base of the emergency phone so that the connection is easily accessible. All outdoor emergency phones will have one voice and one data cable. All indoor emergency phones will have one voice cable.

B. bIT-CIDB will install the final connection, ensure dial tone is active, program, and test each phone. bIT must purchase any emergency phones in order to get manufacturer support for defective equipment, post-installation and transfer of responsibility. Projects or departments must open RITMs in the Telecom Catalog to order the equipment.

C. bIT-CIDB does not design, install or maintain any electrical service to emergency phones.

D. bIT must purchase any emergency phones in order to get manufacturer support for defective equipment, post-installation and transfer of responsibility. Departments must open RITMs in the Telecom Catalog to order the equipment.

SECTION 8 – HORIZONTAL CABLING GENERAL REQUIREMENTS

E. Pedestal Phones
   a. See photo below with Part Number PLC-8A-LED-D | Square Column w/ Dual Light & Dual Panels. Consult with bIT for proper mounting instructions on concrete base. Separate conduit runs will be required for power and low voltage. Outdoor rated cable shall be used.

PLC-8A-LED-D | Square Column w/ Dual Light & Dual Panels

SECTION 8 – HORIZONTAL CABLING GENERAL REQUIREMENTS

F. Wall Mount Phones
   a. See photos below for two types of wall mount:
      i. Mini (R733M-924M) and
      ii. Larger wall mount (WALL UNIT W/ SECURITY PHONE & LIGHT | PLW-6). Consult with bIT and UCPD to determine which model is required for each specific locations.

WALL UNIT W/ SECURITY PHONE & LIGHT | PLW-6. This represents the larger wall mount. PLW-6 is the item number for the housing. Consult with bIT to order the phone that goes inside this column.

WALL UNIT W/ SECURITY PHONE & LIGHT. R733M-924M

G. Elevator Phones

In order for bIT to support the phone equipment as well as the dial tone, Ramtel phones must be used and bIT must place the order. If any other type of phone is used, or bIT does not order the phone directly, bIT will only support dial tone to the elevator room. As there are many variations on elevator cab configuration, the exact Ramtel part number can only be determined based on the elevator design and in consultation with the bIT Emergency Phone Technician.

MODEL 833-OEM

ONE BUTTON
AUTO DIAL
NO FRONT PANEL

MODEL 833

ONE BUTTON
STAINLESS STEEL
PANEL

SECTION 8 – HORIZONTAL CABLING GENERAL REQUIREMENTS

SKETCHES

Refer to the sketches as listed in this paragraph for further requirements applicable to this section. These sketches depict component configuration requirements for the horizontal cabling segment.

SK103 – Wall Phone Clearances

SK200 – Faceplate, Four-port Labeling

SK204 – Horizontal Cable Labeling

SK805 110 Tower Bonding

SK900 - Wall-mounted Emergency Phone Enclosure Wall Installation Cut-Out Info

SK901 – Wall-mounted Emergency Phone

SK902 – Emergency Phone Base

SECTION 9 - GENERAL TESTING INFORMATION

Section 9 - General Testing Information

SCOPE

This section covers general information for cable testing requirements for both Inside Plant (ISP) and Outside Plant (OSP) cabling. Each cabling component requires testing based on industry established testing standards and processes.

It is highly recommended that the designer and contractor contact bIT-CIDB directly at the beginning of a project for confirmation on the type and performance requirements meeting Campus IT Infrastructure Standards.

PRE-TEST REQUIREMENTS

This paragraph describes requirements that must be accomplished prior to commencement of any cable testing process for the project's Structured Cabling System (SCS). This pertains to fiber optic cables, as well as copper multi-pair cables either within a building, or between buildings under the support of bIT-CIDB.

1 PREPARATION

A. Adhere to bIT-CIDB instructions for test equipment setup.

B. Provide bIT-CIDB with manufacturer's certification and/or test results for bulk cable prior to installation. Specifically, OTDR on real test results will be required for all fiber cables.

C. bIT-CIDB recommends contractor performs pre-installation cable testing on fiber optic cabling only.

D. Prior to any testing of fiber optic cabling, the contractor shall notify bIT-CIDB by emailing a scheduled date and time for testing, five business days, prior to a scheduled test session. The contractor shall contact bIT-CIDB three business days prior to the scheduled testing to determine if bIT-CIDB personnel wishes to be present for the beginning of a test session.

E. Ensure labeling is complete for the cable type being tested.

F. Provide certificate of calibration on all test equipment prior to testing. Annual calibration is required.

G. For OTDR testing, allow the tester to warm up and stabilize per equipment manufacturer instructions.

H. Test results must be made available in the current LinkWare™ or LinkWare Live™ version.

I. Confirm with bIT-CIDB and UC Berkeley Capital Projects in writing that the tester being used is capable of performing each test required by bIT-CIDB for the cable type being tested.

J. Submit ten test results to bIT-CIDB for the cable type being tested prior to continuing with the complete test sequence to ensure the results meet all of bIT-CIDB's requirements.

K. Obtain proper test cords specifically intended for the cable type being tested. Provide 300m launch and receive cables for Single-Mode fiber passive link testing. Provide 100 m launch and receive cables for multi-mode fibers. Verify test cords and judye s meet manufacturer requirements prior to beginning any test sequence, include pretest sample for bIT-CIDB and UC Berkeley Capital Projects.

L. For copper backbone cabling, fill out spreadsheet for each cable and estimate the expected cable length to compare to the actual test results, identifying cable origin and destination.

SECTION 9A - TESTING BACKBONE INSIDE PLANT (ISP) AND OUTSIDE PLANT (OSP) FIBER

Section 9A - Testing Backbone Inside Plant (ISP) and Outside Plant (OSP) Fiber

SCOPE

This section covers the testing requirements for Inside Plant (ISP) and Outside Plant (OSP) Fiber cabling, a subset of the telecommunications Structured Cabling System (SCS). Each cabling component requires testing based on industry established testing standards and processes established by bIT-CIDB group.

BACKBONE FIBER OPTIC CABLING – ISP/OSP

This paragraph describes the testing requirements and process for ISP and OSP fiber optic cabling between Telecommunication Rooms (TRs) as well as between buildings.

1 GENERAL REQUIREMENTS

A. REFERENCES
   i. TIA/EIA-526-7 (“OFSTP-7”) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant.
   ii. TIA-526-14-B Optical Power Loss Measurements of Installed Multi-Mode Fiber Cabling Plant.
   iii. TIA/EIA-455-171 Attenuation By Substitution Measurement – For Short-Length Multi-Mode Graded-Index And Single-Mode Optical Fiber Cable Assemblies (a.k.a., FOTP-171).
   iv. BICSI Telecommunication Distribution Methods Manual.

2 DEFINITIONS

A. “Adapter” (associated with fiber connectivity): Shall mean a connecting device joining 2 fiber connectors, either like or unlike.
B. “Connect”: Shall mean install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
C. “Cord”: Shall mean a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper.”
D. “OTDR”: Shall mean Optical Time Domain Reflectometer.
E. “Passive Link Segment”: Shall mean the cable, connectors, couplings, and splices between two fiber optic termination units.
F. “System Cord”: Shall mean the cord used in the operating electrical or optical circuit.
G. “Test Cord”: Shall mean the cord certified for use in testing, as described in this section.

3 SUBMITTALS

A. Submittal Requirements at Start of Construction:
   i. Testing Procedures Submittal, describing step-by-step procedures used by the field technicians.
   ii. Product Submittal, including cut sheets of testing equipment to be used (note all software/ firmware versions as applicable).
   iii. Tester Calibration Certificates for both OTDR and Power Meter Light Source.
B. Submittal Requirements at Closeout:
   a. Record Documents

SECTION 9A - TESTING BACKBONE INSIDE PLANT (ISP) AND OUTSIDE PLANT (OSP) FIBER

i. Submit one soft copy of test reports from a Fluke tester, of both OTDR and Power Meter and Light Source tests in bi-directional and dual wavelength manner, including all tested parameters. List each cable by bIT-CIDB cable ID, origin, and destination.
ii. Submit copies of test reports in CD format of both OTDR and Power Meter and Light Source tests in bi-directional and dual wavelength manner digital photos of connector end face of each fiber strand, including all tested parameters. List each cable by bIT-CIDB cable ID, origin, and destination.

Submit one hard copy of warranty certificate from the manufacturer and the Contractor.

b. Format – Soft Copy:
i. "Burn" onto one CD-ROM test report files as native data format (for example, an *.FLW file from a Fluke tester).
ii. Include onto CD-ROM 'Viewer' software necessary to view, sort, filter, and print individual and summary test results from test results native format.
iii. Clearly label the CD-ROM with the following information:
- Client Name.
- Project Name and Address.
- CD-ROM Name (e.g., "Test Reports for Backbone Cabling System").
- Cable ID Number provided by bIT-CIDB.
- Date of Submittal – date format: <month> <day>, <year> (e.g., "January 1, 2010").
- Contractor Name.

4 QUALITY ASSURANCE

Under no circumstances shall any cable's and/or conductor's test results be substituted for another's. If a single instance of falsification is confirmed, the Contractor is liable for a complete retest of the cabling system at no additional cost to the Owner. This includes retaining the services of a neutral party to observe all retesting.

5 WARRANTY

Warrant the validity of the test results.

6 PRODUCTS

A. FIBER OPTIC LIGHT SOURCE
i. Connection interfaces shall be factory installed.
ii. Output shall be continuous wavelengths.
iii. The light sources may contain internal lenses, pigtails, and modal conditioners, provided they meet the launch conditions as described in "Post-Installation" Passive Link Attenuation Testing Procedures.
iv. LASER-based light source for Single-Mode fiber testing shall have a:
1) Center wavelength of 1310nm and 1550nm.
2) Spectral width (FWHM) of 5nm at 1310nm and 5nm at 1550nm.
3) Minimum output power level of 3dBm.
v. Equipment:
1) Corning Cable Systems.

SECTION 9A - TESTING BACKBONE INSIDE PLANT (ISP) AND OUTSIDE PLANT (OSP) FIBER

2) OS-404RXD; dual wavelength (1310 / 1550) light source for Single-Mode.

vi. Fluke Networks

1) CetiFiber Pro Optical Loss Test Set.

vii. Agilent Technologies' WireScope 350 test set

1) 450-2020 Fiber SmartProbe testing adapter, Single-Mode 1300nm.

2) ScopeData management software (version 5.20).

a) Laser Precision.

b) 5150 test set.

B. FIBER OPTIC POWER METER

i. Power meter for both Multi-Mode and Single-Mode testing shall be capable of measuring relative or absolute power (or both), and must be independent of modal distributions.

ii. Power meter used shall have a:

1) Dynamic range of 0dBm to -40dBm, minimum.

2) Accuracy of ±0.2dB.

iii. Power meter shall be factory calibrated.

iv. Equipment:

1) Corning Cable Systems.

a) OTS-410R power meter.

2) Fluke Networks

(1) CetiFiber Pro Optical Loss Test Set.

3) Agilent Technologies' WireScope 350 test set

a) 450-2020 Fiber SmartProbe testing adapter, Single-Mode 1300nm.

b) ScopeData management software (version 5.20).

4) Laser Precision.

v. 5025 test set.

C. FIBER OPTIC OTDR

i. Single-Mode Source Module:

Wavelength	Dynamic Range	Attenuation Deadzone	Reflective Deadzone	Loss Resolution	Distance Accuracy
1310nm	40dB	6.0mt	3.5mt	0.001dB	0.1mt
1550nm	28dB	12.0mt	3.5mt	0.001dB	0.1mt

ii. Equipment

1) Optifiber Pro OTDR

2) CetiFiber Pro Optical Loss Test Set with OTDR module

D. FIBER OPTIC TEST CORDS

a. Single-Mode Fiber Optic Test Cord

i. Single-Mode test cords shall comply with TIA-526-14A, 3.1.3.

ii. The fiber of the Single-Mode test cord(s) shall have the mode field diameter nominally equal to that of the Single-Mode fiber optic passive link.

SECTION 9A - TESTING BACKBONE INSIDE PLANT (ISP) AND OUTSIDE PLANT (OSP) FIBER

iii. Connectors of the test cords shall be compatible (the same type) with the connector types of the light source and the power meter, and with the cabling plant.
iv. The connectors shall exhibit ≤ 0.5dB loss per connection @ both 1310nm and 1550nm, as measured per FOTP-171 D3. The connectors shall inhibit Fresnel reflections (i.e., have a "PC" finish).
v. Test cord length for Optical Power Loss testing: 1m - 5m.

E. FIBER OPTIC LAUNCH AND RECEIVE CABLES
a. Single-Mode Fiber Optic OTDR Launch Cables
i. The fiber of the Single-Mode launch and receive cable(s) shall have the mode field diameter nominally equal to that of the Single-Mode fiber optic passive link.
ii. Connectors of the launch and receive cables shall be compatible (the same type) with the connector types of the OTDR, and with the cabling plant.
iii. The connectors shall exhibit ≤ 0.3dB loss per connection @ both 1310nm and 1550nm, as measured per FOTP-171 D3. The connectors shall inhibit Fresnel reflections (i.e., have a "PC" finish).
iv. The launch and receive cable length shall be greater than 300 meters.
v. Equipment: Fluke # SMC-9-SCST

7 EXECUTION

A. FIELD QUALITY CONTROL
a. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day's testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.
b. Ensure test equipment and test cords are clean and undamaged during testing activities. Per the Engineer's discretion, halt testing activity and clean testing equipment, test cords, and related apparatus.
c. Permanently record test results.

B. OPTICAL POWER LOSS TESTING REQUIREMENTS AND PROCEDURES
a. Precautions
i. Adhere to the precautions described in TIA-526-14A, 5.1.
ii. Adhere to the equipment manufacturer's instructions during all testing.
iii. Prior to any testing activity or any measurements taken:
1) Ensure the test equipment is at room temperature – approximately 72 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set until the test equipment reaches room temp).
2) Power on the light source and power meter for at least 5 minutes prior to obtaining measurements.
3) Clean all connectors and adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.
b. Do not power off the light source or the power meter during testing activity.
c. Do not remove Test Cord #1 from the light source at any time (unless the testing is complete or the equipment is being put away for the evening).
d. Do not bend the test cords smaller than 20 times the cord diameter (this may induce loss into the cord reducing the accuracy of the measurement).

SECTION 9A - TESTING BACKBONE INSIDE PLANT (ISP) AND OUTSIDE PLANT (OSP) FIBER

C. Test Cords Performance Verification
   a. Connect Test Cord #1 to the light source and to the power meter.
   b. Set this value into the power meter as the reference power (Pref).
   c. Disconnect Test Cord #1 from the power meter. Do not disconnect Test Cord #1 from the light source.
   d. Connect the 'open' end of Test Cord #1 to an adapter (of matching connector type). Connect one end of Test Cord #2 to that adapter and the other end of Test Cord #2 to the power meter.
   e. The value displayed on the power meter represents the test cord #2 connection loss.
   f. Flip the ends of Test Cord #2 so that the end connected to the power meter is now connected to the adapter (attached to test cord #1), and the end connected to the adapter is now connected to the power meter.
   g. The value displayed on the power meter represents the test cord #2 connection loss on the opposite end.
   h. Both connection loss measurements must be less than or equal to the value found in Table 7.1 Replace cord if measure losses exceed table values.

Table 7.1: Acceptable Test Cord Connection Attenuation

	SC or LC Connection	LC or other Mini-Connector
Single-Mode	0.30 dB Max	0.30 dB Max

   i. Repeat this test procedure from the beginning reversing the test cords in order to verify the performance of test cord #1.

D. Test Equipment Set Up
   a. Follow the test equipment manufacturer's initial adjustment and set up instructions.
   b. Set the power meter to Relative Power Measurement Mode.
   c. Set the meter to display power levels in dBm.
   d. Set the light source and power meter to the same wavelength.

E. Single-Mode Passive Link Insertion Loss Testing Procedures
   a. Only use test jumpers that comply with the requirements TIA-526-7, 3.1.3.
   b. Test Method:
      i. For 'permanent' links, perform the optical power loss testing of Single-Mode fibers according to TIA-526-7 test method A.1 "One Jumper-Cable Measurement".

F. Acceptable Measurement Values
   a. Remove and replace any cabling links failing to meet the criteria described in this specification at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.
   b. The general insertion loss equation for any link segment is as follows:
      i. Insertion loss = <cable loss> + <connection loss> + <splice loss> + <CPR adjustment>.
      ii. Note: A connection is defined as the joint made by two mating fibers terminated with remateable connectors (e.g., SC, LC, etc.).
   c. Single-Mode Attenuation Coefficients
      i. Cable Loss = Cable Length (km) x (0.50 dB/km @ 1310-nm or 0.50 dB/km @ 1550-nm).
      ii. Connection Loss = 0.3 dB x # of connections.
      iii. Splice Loss = # of splices x 0.1 dB for fusion splice or 0.15 dB for mechanical splice.
      iv. CPR Adjustment = Not applicable for Single-Mode.

SECTION 9A - TESTING BACKBONE INSIDE PLANT (ISP) AND OUTSIDE PLANT (OSP) FIBER

G. Record Documents Details:
   a. Permanently record all test results.
   b. Submit test results in a format acceptable to the Owner, or Owner's Representative, or Engineer before system acceptance.
   c. Cable and fiber identifiers of the test reports shall match the identifiers as labeled in the field – i.e., use the same ID on the cable label/fiber port label as what is entered into the stored test result in the power meter.
   d. Measurements shall carry a precision through one significant decimal place, minimum.
   e. Passive Link Insertion Loss Testing: Each test report shall contain the following information (not necessarily in this order):
      i. Project name.
      ii. Cable identifier, fiber number, and fiber type (e.g., "Single-Mode").
      iii. Operator (company and name).
      iv. Date measurements were obtained.
      v. Measurement direction.
      vi. Wavelength.
      vii. Loss measurement.
      viii. Test equipment model and serial number(s).
   f. Measurements shall carry a precision through one significant decimal place, minimum.

8 CHARACTERIZATION TESTING REQUIREMENTS AND PROCEDURES

A. Safety: Use test equipment containing a laser or LED in accordance with ANSI Z136.2.

B. Precautions
   a. Adhere to the equipment manufacturer's instructions during testing.
   b. Prior to testing activity or measurements taken, complete the following activities:
      i. Ensure the test equipment is at room temperature – approximately 72 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set until the test equipment reaches room temp).
      ii. Turn the light source and power meter power on for at least 5 minutes prior to obtaining measurements.
      iii. Clean test/launch cords' and system cords' connectors and the cabling system adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.
   c. Do not power off OTDR's light source during testing activity.
   d. Do not remove launch cord from the OTDR's light source at any time (unless the testing is complete or the equipment is being put away for the evening, or during trouble shooting).
   e. Do not bend the launch cord smaller than 20 times the cord diameter during testing activities (this may induce loss into the cord reducing the accuracy of the measurement).

C. Characterization Testing Procedures
   a. Equipment settings / measurement parameters:
      i. Index of Refraction: match cable-under-test fiber parameters; default settings as follows:
         1) Single-Mode
            a) Corning SMF-28e+ 1.4670 @ 1310nm 1.4677 @ 1550nm
            b) CommScope TeraSPEED 1.466 @ 1310nm 1.467 @ 1550nm
      ii. Pulse Width: Single-Mode: 50 ns

SECTION 9A - TESTING BACKBONE INSIDE PLANT (ISP) AND OUTSIDE PLANT (OSP) FIBER

1) Single-Mode
   a) 10 ns for cable lengths up to 2,000 meters.
   b) 50 ns for cable lengths between 2,000 meters and 10,000 meters.

iii. Backscatter
   1) Single-Mode: -74dB @ 1310nm and 1550nm.

iv. Event Threshold: 0.05dB.
v. Reflection Threshold: Single-Mode: -35dB.
vi. Fiber Break/End-Of-Fiber: 3dB.

b. Set the distance units (i.e., the “X” axis of the graph) to feet.
c. Waveform: The waveform shall be real-time and normal density.
d. Obtain measurements using ‘launch’ and 'receive' cords connected to the test instrument and the cable-under-test.

D. Record Test Measurements:
   a. Permanently record all test data per strand, including the following (minimum):
      i. Project name.
      ii. Contractor name.
      iii. Testing technician’s name.
      iv. Date measurements were obtained.
      v. Cable identifier, strand number, and fiber type (e.g., “Multi-Mode”).
      vi. Wavelength.
      vii. Measurement direction.
      viii. Full data set.
      ix. Curve.
      x. Test equipment model and serial number(s).
   b. Measurements shall carry a precision through one significant decimal place, minimum.

9 TESTING FORMS

A. Fiber Optic Test Instrument Data Sheet.
B. Fiber Optic Reference Power Measurement Method Form.
C. Fiber Optic Relative Power Measurement Method Form.

SECTION 9B - TESTING HORIZONTAL ISP

Section 9B - Testing Horizontal ISP

SCOPE

This section covers the testing requirements for Inside Plant (ISP) cabling subset of the telecommunications Structured Cabling System (SCS). Each cabling component requires testing based on industry established testing standards and processes established by Berkeley IT (bIT) -CIDB group.

HORIZONTAL CABLING – CAT5E

This paragraph describes the testing requirements and process for the Cat5e horizontal cabling segment. This pertains to horizontal data and voice cables for this category. The test to be performed is Cat5e Permanent Link.

1 GENERAL REQUIREMENTS

A. Adhere to the equipment manufacturer's instructions during all testing.

B. Permanently record test results and provide them in an electronic report to bIT-CIDB. Provide memory card, thumb drive, or email attachment (in LinkWare native format) to bIT-CIDB after testing for test results download to Campus IT Infrastructure's cabling database. LinkWare Live may also be used. Test results may be uploaded to LinkWare Live from the Fluke Versiv platform. Consult with bIT-CIDB before using LinkWare Live.

C. Cable identifiers of the test reports must match the identifiers as labeled in the field. Use the same ID on the tester and test report as it appears on the cable label and cable termination.

D. Contractor is responsible for keeping a backup copy of all test results until bIT-CIDB has signed off on them.

E. Testing may require use of Fluke Permanent Link Adapter (DTX-PLA001) and 110 Adapter (T568A).

2 TEST EQUIPMENT SET UP

A. Calibrate the test set per the manufacturer's instructions.

B. Enter the actual cable to be tested (manufacturer and part number), not just a generic Cat5e.

C. Work with bIT-CIDB to setup tester, and verify any procedures, naming conventions, etc. PRIOR to beginning any testing.

3 ACCEPTABLE TEST RESULT MEASUREMENTS

A. Perform Cat5e Link test.

B. Overall Test Results:

a. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.

b. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.

c. Remove and replace any cabling links failing to meet the criteria described in this section.

C. Wire Map: Provide continuous pairs and terminate all of the cabling link correctly at both ends. No exceptions accepted.

D. Length: Ninety (90) meters, 295 feet tested, is the maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration, including test cords.

E. Insertion Loss: The acceptable insertion loss measurements for any Cat5e cabling link is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

SECTION 9B - TESTING HORIZONTAL ISP

F. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss for any Cat5e cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

G. Power Sum NEXT Loss: The acceptable power sum PS-NEXT loss for any Cat5e cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

H. Worst Pair-to-Pair ELFEXT and FEXT Loss: The acceptable worst pair-to-pair ELFEXT and loss for any Cat5e cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

I. Power Sum ELFEXT and FEXT Loss: The acceptable PS-ELFEXT and loss for any Cat5e cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

J. Return Loss: The acceptable return loss measurements for any Cat5e cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

K. Propagation Delay and Delay Skew: The acceptable propagation delay and delay skew measurements for any Cat5e cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

HORIZONTAL CABLING – DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP CAT6A

This paragraph describes the testing requirements and process for the DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A horizontal cabling segment. This pertains to horizontal data cables for this category. The test to be performed is Cat6A Permanent Link.

1 GENERAL REQUIREMENTS

A. Adhere to the equipment manufacturer's instructions during all testing.

B. Permanently record test results and provide them in an electronic report to bIT-CIDB. Provide memory card, thumb drive, or email attachment (in LinkWare native format) to bIT-CIDB after testing for test results download to Campus IT Infrastructure's cabling database. LinkWare Live may also be used. Please coordinate with bIT-CIDB ahead of time.

C. Contractor is responsible for keeping a backup copy of all test results until bIT-CIDB has signed off on them.

D. Cable identifiers of the test reports must match the identifiers as labeled in the field. Use the same ID on the tester and test report as it appears on the cable label and cable termination. Provide data for all cables for the installation at the time of submittal.

2 TEST EQUIPMENT SET UP

A. Calibrate the test set per the manufacturer's instructions.

B. Enter the actual cable to be tested (manufacturer and part number), not just a generic Cat6A DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP.

C. Work with bIT-CIDB to setup tester, and verify any procedures, naming conventions, etc. PRIOR to beginning any testing.

3 ACCEPTABLE TEST RESULT MEASUREMENTS

A. Perform Cat6A Link test for DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP

B. Overall Test Results:

a. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.

b. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.

c. Remove and replace any cabling links failing to meet the criteria described in this section.

C. Wire Map: Provide continuous pairs and terminate the entire cabling link correctly at both ends. No exceptions accepted.

SECTION 9B - TESTING HORIZONTAL ISP

D. Length: Ninety (90) meters, 295 feet tested, is the maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration, including test cords.

E. Insertion Loss: The acceptable insertion loss measurements for any DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A cabling link is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

F. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss for any DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

G. Power Sum NEXT Loss: The acceptable power sum PS-NEXT loss for any DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

H. Worst Pair-to-Pair ELFEXT and FEXT Loss: The acceptable worst pair-to-pair ELFEXT and loss for any DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

I. Power Sum ELFEXT and FEXT Loss: The acceptable PS-ELFEXT and loss for any DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

J. Return Loss: The acceptable return loss measurements for any DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

K. Propagation Delay and Delay Skew: The acceptable propagation delay and delay skew measurements for any DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3

SECTION 9C – TESTING BACKBONE INSIDE PLANT (ISP) AND OUTSIDE PLANT (OSP) COPPER

Section 9C - Testing Backbone Inside Plant (ISP) and Outside Plant (OSP) Copper

SCOPE

This section covers the testing requirements for Inside Plant (ISP) and Outside Plant (OSP) copper cabling, a subset of the telecommunications Structured Cabling System (SCS). Each cabling component requires testing based on industry established testing standards and processes established by bIT-CIDB group.

BACKBONE COPPER CABLING

This paragraph describes the testing requirement and process for copper backbone cabling. This pertains to Category 3 (CAT3) multi-pair cables between or within buildings.

1 GENERAL REQUIREMENTS

A. Adhere to the equipment manufacturer's instructions during all testing.

B. Permanently record test results and provide them in an electronic report to bIT-CIDB.

C. Identifiers recorded in the test and reports must match the identifiers existing on the cable labels in the field for the project.

D. Use the same ID on the tester and test report as it appears on the cable labels and termination.

2 TESTING PROCEDURES

A. Test continuity and wire map for 100% of cable pairs.

B. To properly test the length of each CAT3 cable, test a minimum 2% of pairs of each cable. Perform the test on pairs from different 25-pair binder groups.

3 ACCEPTABLE TEST RESULT MEASUREMENTS

A. Overall:
   a. Wire map testing consists of continuity, opens, shorts, crossed pairs, and split pairs.
   b. Any reconfiguration of a link component required as a result of a test Fail, must be re-tested for conformance.

B. Length
   a. Wire Map: Terminate all pairs correctly at both ends of the cable run and test continuity on 100% of pairs. No exceptions accepted.
   b. Attenuation: The acceptable attenuation measurements for any CAT3 cabling link is no greater than that listed in ANSI/EIA-568-C.2, 6.3 and as adjusted to length measurement of the cable.
   c. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss is no greater than that listed in ANSI/EIA-568-C.2, 6.3 for CAT3 cabling.

4 TEST REPORT INFORMATION

A. Provide the following fields of information on each test report (not necessarily in this order):
   a. Project name.
   b. Cable identifier, pair number(s).
   c. Date measurement were obtained.
   d. Operator (company and name).
   e. Test equipment model and serial number(s).
   f. Measurement results.

SECTION 9C – TESTING BACKBONE INSIDE PLANT (ISP) AND OUTSIDE PLANT (OSP) COPPER

Test Report template can be obtained from bIT-CIDB.

Project Name / Number / Other:	PRJ00XXXXX										Cable Label:	Cable Ori - Des XXX pair

University of California, Berkeley

						Measured	Measured	Calculated	Calculated			
Pair No.	**Continuity end-end (Yes/No)**	**Short (Yes/No)**	**Pair Reversal (Yes/No)**	**Cross Pairs (Yes/No)**	**Split Pairs (Yes/No)**	**Loop Resistance (Ohms)**	**dB Loss at 1 KHz (dB)**	**dB Loss at 8 KHz (dB)**	**dB Loss at 256 KHz (dB)**	**Transposition (Yes/No)**	**Ground [Protector panel fuse] (Yes/No/NA)**	**Test/Observation Comments:** [If pair fails record distance at fail point, in Ft]
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												

SECTION 10 - LABELING

Section 10 - Labeling

SCOPE

This section describes the scope of work related to the identification and labeling methodology of the various components that form part of the telecommunications infrastructure and Structured Cabling System (SCS) and pathway systems.

Components addressed in this section include, but are not limited to, equipment racks and cabinets, termination components, patch panels and plates, conduit and junction boxes, housings, and fiber, copper and bonding conductors and busbar.

DESIGN PARAMETERS

Labels utilized for the purpose of identifying the various components listed in the Installation Parameters section below shall be machine-manufactured and machine-printed with permanent indelible ink. Labels shall match the hardware identification dimensions specified by the manufacturers. Attention to the font size is required in order to provide readable font sizes while maintaining the specified label size. Handwritten labels are not acceptable except for temporary identification purposes.

Products that are part of the systems included in the standards are expected to be Restriction of Hazardous Substances (RoHS) compliant where applicable.

Manufacturers are required to be International Organization for Standardization (ISO) 9001:2008 compliant.

1 COMPONENTS INCLUDED

Label the components listed below as described in the Installation Parameters section:

A. Copper / Fiber / Bonding Conductors.
B. Conduits.
C. Junction Boxes/Vaults.
D. Fiber Optic Patch Panels.
E. Horizontal Patch Panels / Housings.
F. Horizontal Cable Outlet Housings / Faceplates.
G. 110 Style Termination Blocks.
H. Equipment Racks / Equipment Cabinets.
I. Firestop Systems.

INSTALLATION PARAMETERS

1 INDOOR COMPONENTS

A. Copper / Fiber / Bonding Conductors

Label cable sheaths. Labels shall be machine printed, wrap around, self-laminating, and made of a polyester material. For horizontal distribution cables, position label within 1 inch of the termination. For backbone distribution, position label within 12 inches from the entrance, or exit to terminations, junction boxes, and wall or floor sleeves.

B. Conduits

SECTION 10 - LABELING

Label each section of conduit with labels positioned on the outside, unobstructed and easily readable. The labels shall be machine-generated, self-laminating, made of a polyester material. The labels shall identify the origin and destination of the corresponding section.

C. Junction Boxes/Vaults
   a. Each box is to be labeled with a Marker Plate, attached with mechanical fasteners, positioned on the outside cover or door panel, unobstructed and easily readable.
   b. Install non-adhesive marker plate, labeled using a thermal transfer method capable of withstanding harsh environments and exposure to solvents. The labels shall identify the building location or ID corresponding to the project's labeling scheme.

D. Fiber Interconnect Center (FIC)

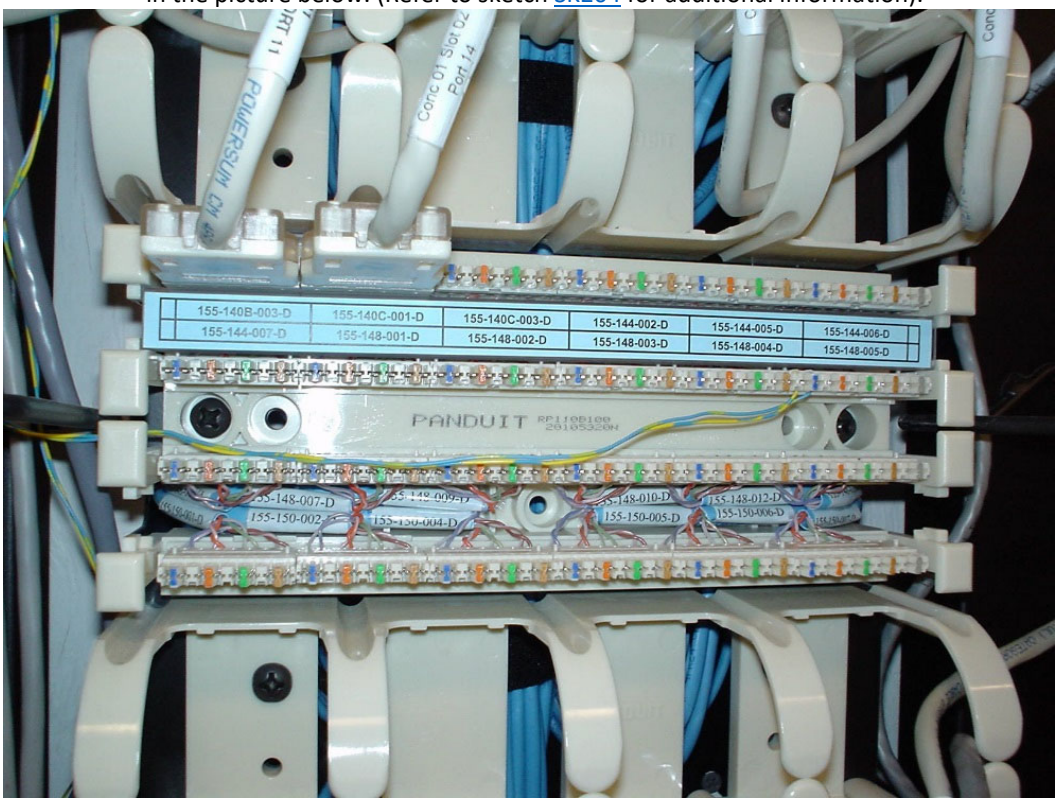
Label each fiber interconnect center (FIC—aka fiber panel) and fiber port. Confer with bIT-CIDB in advance of labeling to obtain the format and proper label information.

E. Horizontal Copper Patch Panels
   a. Label each horizontal panel on the front and rear top left corners using 3/8 inch lettering, starting with "01" (refer to sketch SK204).
   b. Install machine-generated labels made of a polyester material.

F. Horizontal Cable and Faceplates
   a. Label each terminated cable with a wrap label behind the faceplate. Label each faceplate utilizing the manufacturer-provided installation window (refer to sketch SK200).
   b. Install machine-generated labels made of a polyester material.
   c. All cable ID's must be visible through faceplate label window.

SECTION 10 - LABELING

G. 110 Style Termination Blocks
   1. Label the front rows of each 110 style termination block.
   2. Install machine-generated labels made of a polyester material. The labels shall follow BICSI or project-specific standards for the color selection of the block designation strip.
      a. Place labeling on cables so they are visible from the front of the 110 style block as shown in the picture below. (Refer to sketch SK204 for additional information).



H. Equipment Racks / Cabinets
   a. Label each rack and equipment cabinet on the top front and rear horizontal bar utilizing a decal strip holder system. Install adhesive-backed reflective labels consisting of individual letters and numbers. The labels shall identify the cabinet location or ID corresponding to the project's labeling scheme.
   b. The rack nearest the wall shall be designated as the first rack in the numbering scheme. Confirm with bIT-CIDB for the actual label ID (refer to sketch SK203).

SECTION 10 - LABELING

Rack Label Bracket

I. Firestop Systems

Each through penetration or joint firestop system in fire-rated construction is to be labeled on both sides of the penetration utilizing adhesive-backed labels. The labels shall be bright red to allow for easy Identification of fire-rated systems and provide required information to facilitate firestop maintenance, repair, and inspection.

EQUIPMENT LABELING SCHEMES

Equipment labeling differs between the type of equipment located in the TR or at the workstation outlet.

1 PATCH PANELS:

A. Labeled with a 2-digit number starting at 01 in each TR on a 3/8 inch white label placed on the top left corner of the front and rear of the patch panel (refer to sketch SK204) e.g., 01, 02...

B. Each port labeled 1-48. (Factory stamped labeling is fine).

C. There will be no other labeling on the Patch panels.

2 110 BLOCKS:

A. Machine printed Desi Strips™ showing Cable ID's specified in the project. Starting at 01 in each TR (refer to sketches SK204, SK205, and SK206).

B. Machine printed block numbers showing the block number on the block tab. Also machine printed block numbers both ends of the Desi Strip™ (refer to sketch SK205).

C. Each 100 pair 110 block will be labeled with a machine printed 2-digit number starting at 01 in each TR on a 3/8 inch white label similar to a patch panel (refer to sketch SK205).

D. All 110 blocks in a TR will be labeled sequentially regardless of voice or data usage.

3 OUTLETS:

A. Physical cable ID label (does not include building ID) machine printed and applied under plastic viewing window (refer to sketch SK200).

CABLE LABELING SCHEMES

The following is the current labeling scheme for data and voice:

1 GENERAL:

A. Full cable ID label. Label must be legible without having to disturb cables when Desi Strip is removed.

B. Full cable ID label within 6 inches of jack.

2 NEW CABLING

A. Data or Voice Category 5e

a. Label Nomenclature

BUILDING - TR – Pnn-mm - PURPOSE

BUILDING: Is the standard short designator for the building, as acquired from bIT-CIDB.

The building recorded in the cable id is the station location of the cable. If the TR that feeds the cable is in a different building, use the building code of the Station Room where the cable outlet is.

TR: Is the TR Room number where the cable Originates.

SECTION 10 - LABELING

Pnn-mm: Is a numerical value representing the sequence# on the Patch Panel.

P: Is the letter indicating the cable is at a Patch Panel.

nn: Is the two digit Patch Panel Identifier within the TR.

mm: Is the two digit Patch Panel Port Number for the cable.

Bnn-mm: *Is a numerical value representing the sequence# on the 110 block.*

B: Is the letter indicating the cable is at a 110 block.

nn: Is the two digit block Identifier within the TR.

mm: Is the two digit Port Number on the 110 block for the cable.

PURPOSE: Indicates whether the cable is a Data (D), Voice (V), or Universal (U) cable. A Universal cable is Cat6A, and can be either D or V on a Patch Panel.

PATCH PANEL EXAMPLE

HAASN-N552A-P01-01-D

HAASN-552A-P01-01-V

HAASN-552A-P01-01-U

110 BLOCK EXAMPLE

EVANS 260A-B01-01-V

EVANS-260A-B02-01-D

NOTE: Voice 110 blocks will all be numbered so that the sequence number will go from 01-24 and then repeat 01-24 for the next block. This is a change from the January 2014 standard where the voice sequence numbers continued down the 110 block field from 001 to the end (xxx).

Older cabling can be seen in a variety of formats. Here are some examples of what may be seen in an existing TR. Regardless of existing cable id format, the above describes the current format and should be used for all new cabling. For a full explanation of older cabling, email cns-projects@berkeley.edu.

EVANS-260A-367-001-D

EVANS-260A-367-01F01-D

EVANS-260A-367-002-V

EVANS-260A-001-D

EVANS-2601-1D

OUTSIDE PLANT (OSP) COMPONENTS

1 COPPER / FIBER CABLES

Label cable sheaths with marker plates attached with mechanical fasteners or nylon cable ties, positioned within 12 inches of the entrance or exit to terminations, junction boxes, and access vaults. Install non-adhesive marker plates, labeled using a thermal transfer method, capable of withstanding harsh environments and exposure to solvents. The preferred method of labeling OSP cables is using metallic tags

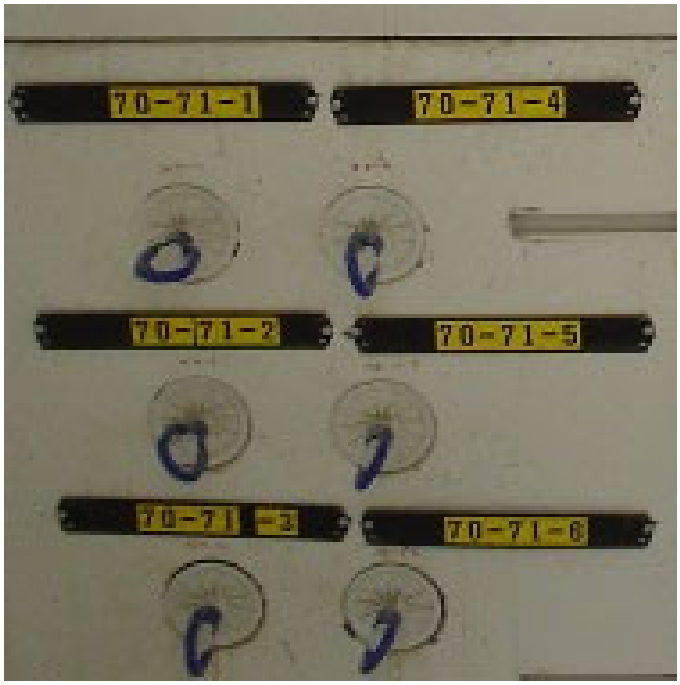
SECTION 10 - LABELING

with permanent etching done by the manufacturer as shown below. Label must identify cable number, type (with fiber or pair count), “To” and “From” building and room number.

2 CONDUIT

Label each section of conduit with marker plates attached with mechanical fasteners positioned on the inside of the corresponding junction box or vault, unobstructed and easily readable. Install non-adhesive marker plates, labeled using a thermal transfer method, capable of withstanding harsh environments and exposure to solvents. The labels shall identify the origin and destination of the corresponding section (refer to sketch SK207).

SECTION 10 - LABELING

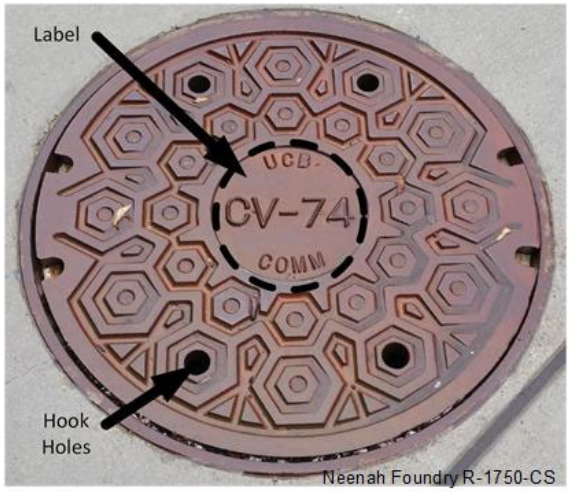


3 VAULT

A. Confer with bIT-CIDB for each vault provided on the project to obtain the exact vault ID required.

B. The designing engineer shall provide a schedule on the drawing set, or within the specifications for each vault identification and type approved by bIT-CIDB.

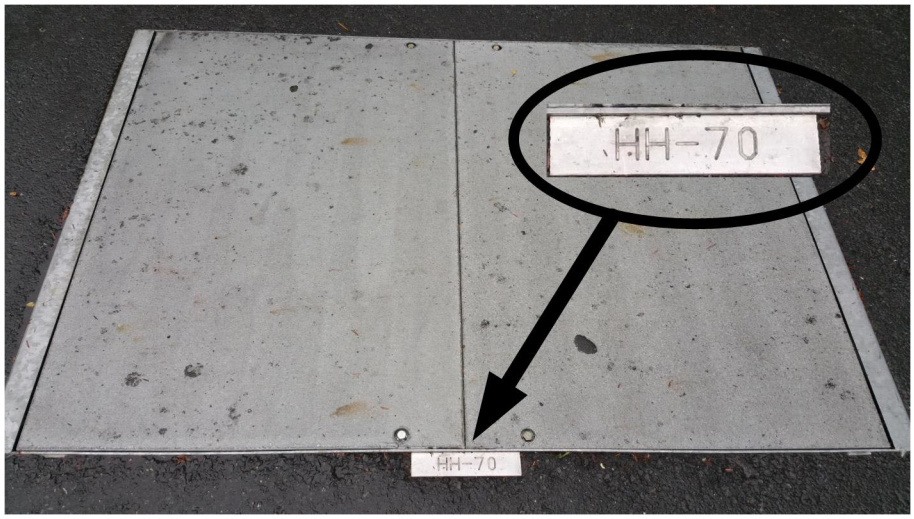
C. The Contractor shall order each vault lid according to the type specified and with the identification label embedded on the lid by the manufacturer according to the vault schedule.



4 JUNCTION BOXES

A. Label each box with a marker plate attached with mechanical fasteners, positioned on the outside cover or door panel, unobstructed and easily readable.

SECTION 10 - LABELING



B. Install non-adhesive marker plate, labeled using a thermal transfer method, capable of withstanding harsh environments and exposure to solvents. The labels shall identify the facility location or ID corresponding to the project's labeling scheme.

SKETCHES

Refer to the sketches as listed in this paragraph for further requirements applicable to this section. These sketches depict component configuration requirements for labeling.

SK103 – Wall Phone Clearances
SK200 – Standard Faceplate 4-port with Labels
SK201 – Room Naming Conventions
SK202 – Example Floorplan Labeling
SK202A – Example Floorplan Labeling
SK203 – Equipment Rack Labeling
SK204 – Patch Panel and 110 Field Labeling
SK205 – Labeling for Voice and Data 110 Blocks
SK206 – Scenarios 110 Block Labeling
SK207 – OSP Vault Conduit Labeling

SECTION 11 – BONDING AND GROUNDING

Section 11 - Bonding and Grounding

SCOPE

This section describes the scope of work related to the bonding of the various components that form part of the telecommunications infrastructure and Structured Cabling System (SCS) and pathway systems.

Bonding components addressed in this section include, but are not limited to, cables, equipment racks and cabinets, termination equipment, patch panels, conduit, runway, etc.

DESIGN PARAMETERS

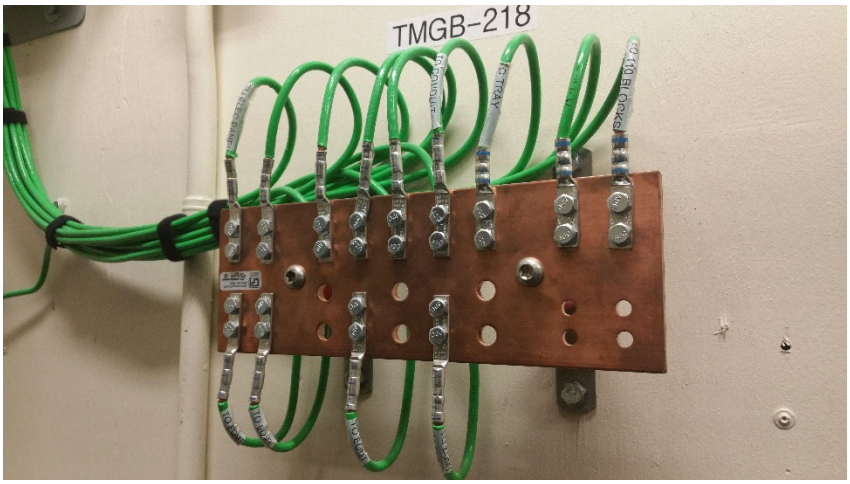
1 GENERAL

A. All bonding details are diagrammatic in nature, but provide the important installation criteria for each piece of equipment generally found in a basic telecommunication room (TR). Additional equipment may exist within a TR, however the installer should follow the manufacturer's published guidelines and notify bIT-CIDB any time the manufacturer guidelines differ from the details shown on the contract documents (to include sketches) for clarification prior to completing the installation.

2 BONDING COMPONENTS

A. The Communications Grounding Backbone system contains grounding two-hole busbars, grounding conductors, bonding conductors, and connecting devices (including but not limited to pressure connectors, lugs, clamps, or exothermic welds). These components provide a low impedance path to ground for stray voltages or spurious signals present on telecommunications media and equipment.

B. Telecommunication Main Ground Bus (TMGB) or Primary Bonding Bar (PBB) is typically located in the Entrance Facility (EF) room. The EF may be included in the Building Distribution Facility (BDF). Regardless of named location, the TMGB has a connection to the following:
   a. Main Building Reference Ground Bus (MBRGB), typically located in the main electrical room.
   b. Overhead and vertical cable support within a TR, by way of a Telecommunication Bonding Conductor (TBC).
   c. Ground bushings installed on each entrance conduit within the EF/BDF by way of a TBC.
   d. Dedicated power panels within the EF/BDF serving telecommunication equipment, by way of a TBC.
   e. Each Telecommunication Bonding Backbone (TBB) or Backbone Bonding Conductor (BBC) riser.



SECTION 11 – BONDING AND GROUNDING

C. TBBs originate in EF/BDF and route to the BDF (if separate for the EF) and each Intermediate Distribution Facility (IDF) with a connection to each Telecommunication Grounding Bus (TGB) or Secondary Bonding Busbar (SBB), typically a 20 inch grounding busbar mounted on the wall at 90 inches above the finished floor, near either end of the equipment bay (usually next to the electrical panel servicing the TR).

D. Bond and ground the cable tray system as per NEC 70 Article 250. Install approved bonding apparatus between sections and at other locations where system continuity is interrupted.

E. Splice system sections using UL Classified connector splice kits, supplied by the same manufacturer. If the manufacturer does not manufacturer UL Classified splice kits, then install proper bonding UL Classified splice kits from a single manufacture for all slice kits used.

TELECOMMUNICATIONS BONDING BACKBONE (TBB)

1. GENERAL

A. The grounding system's Telecommunications Bonding Backbone (TBB) conductor cable is needed for a multi-story building containing TR's on multiple floors. The TBB should connect the TRs on multiple floors in a linear fashion. If there are two TRs per floor, as an example, there would be two TBB's.

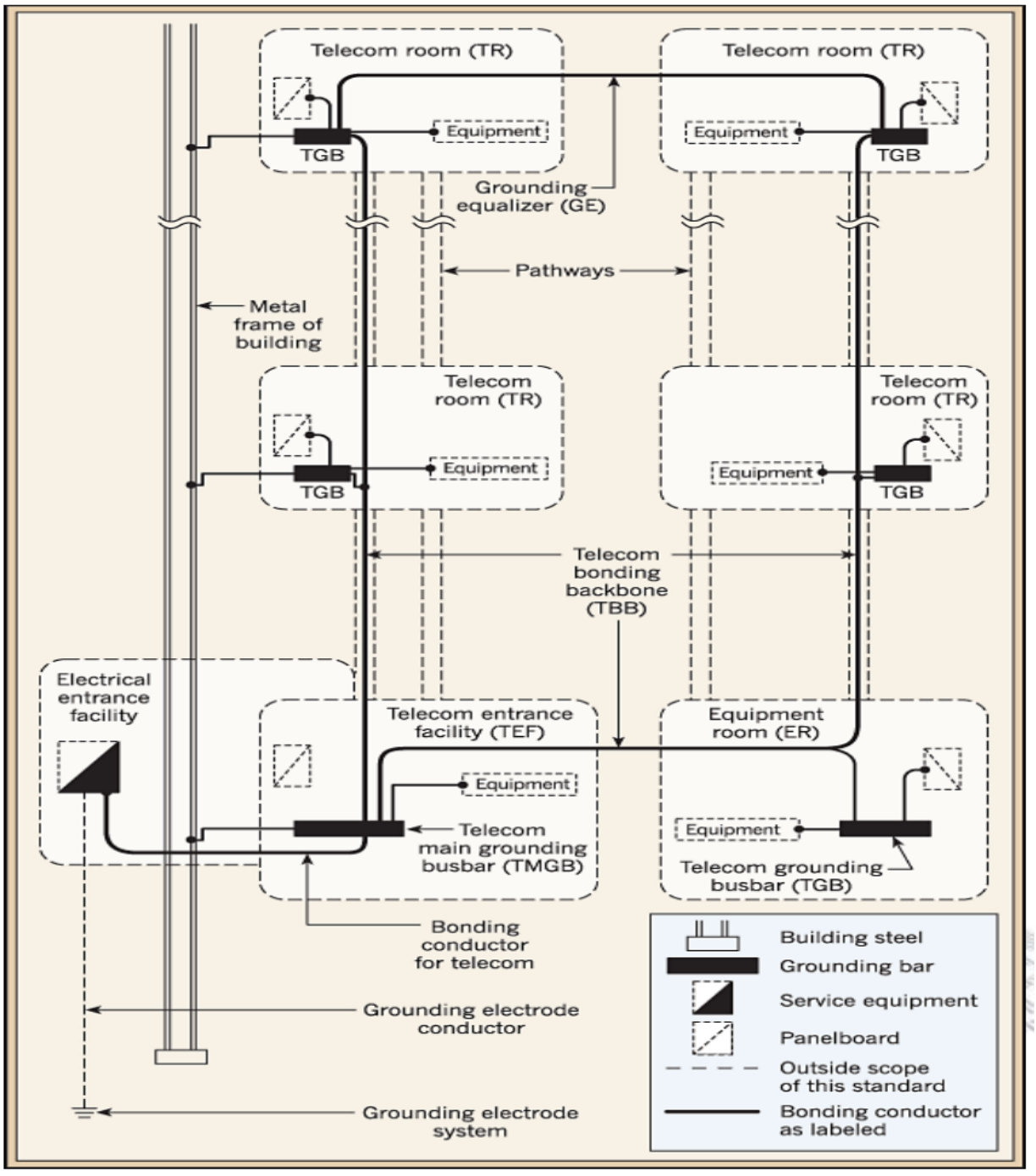
B. Each TR must contain a ground busbar with multiple two-hole connections and must be exothermically welded to the riser backbone wire using an AWG #4 bonding wire (refer to sketch SK800).

C. When a building contains more than three floors, a backbone wire connecting the TR's riser backbones on the same floor is used to mitigate a failure in one of the riser backbones. Place the connection on the mid-floor only, as performing this on multiple floors can produce a ground loop under certain conditions (needs to be placed on every 3rd floor for taller buildings).

D. Do not bond to a water pipe as it is not considered a proper grounding source. Maintenance and upgrades are generally performed with non-conductive plastic pipes and may not provide an acceptable earth ground.

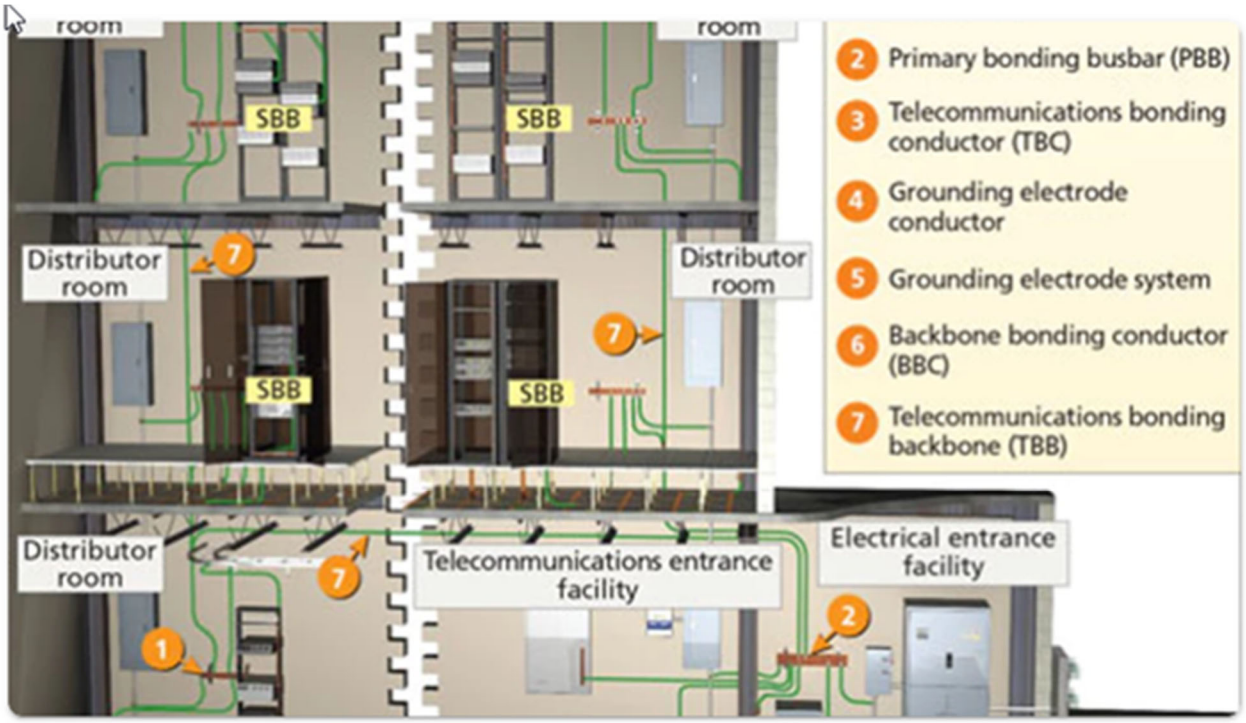
SECTION 11 – BONDING AND GROUNDING

Old Terminology



SECTION 11 – BONDING AND GROUNDING

New Terminology



SECTION 11 – BONDING AND GROUNDING

2 EQUIPMENT COMPONENTS WITHIN A TR

A. Within each TR each equipment component that can carry a static charge needs to be bonded to the room's TGB directly, meaning that bonding between equipment components can cause ground loops that can cause problems. Each piece of equipment requiring a ground is connected to the room's ground busbar using an AWG #6 green jacketed ground wire with a compression two-hole lug at each end.

B. Cable runway within the TR requires bonding straps between runway segments to ensure a continuous bond in addition to the runway being bonded to the room's TBB. Use a bonding strap from the same provider as the cable runway. Ensure there is a proper bond between the TBC and the equipment by properly preparing the attachment according to manufactures guidelines. If bonding washers are available from the manufacturer, install these when bonding the runway to the TGB.

C. Each component within the TR that can potentially carry a static charge must be bonded to the room's TGB, which includes the following:
   a. Equipment Rack bonded independently to the room's TGB (refer to sketch SK807).
   b. Patch Panels for foil wrapped cabling, such as Panduit DISCONTINUOUS FOIL CONSTRUCTION/100 METER/UTP Cat6A 4-pair cabling do not require bonding to a vertically mounted ground busbar.
   c. Each level of overhead cable runway bonded independently to the room's TGB.
   d. Wall mounted 110 towers and vertical managers can be bonded in series to the rooms TGB.
   e. Conduits penetrating the TR walls or floors must have a bonding clip and can be bonded in series to the room's TGB.

SKETCHES

Refer to the sketches as listed in this paragraph for further requirements applicable to this section. These sketches depict component configuration requirements for Bonding and Grounding.

SK800 – TR Ground Busbar (two-hole) and Labeling
SK801 – Conduit Bonding
SK802 – Riser Conduit Bonding
SK804 – Cable Runway Section Bonding
SK805 – 110 Tower Wall Field Bonding
SK807 – Equipment Rack Bonding

SECTION 12 – WIRELESS ACCESS POINTS

Section 12 - Wireless Access Points

SCOPE

This section describes the scope of work related to the installation requirements for wireless access points and covers the telecommunications infrastructure and Structured Cabling System (SCS).

DESIGN PARAMETERS

bIT-CIDB wireless engineer will provide and/or review all wireless surveys used to determine the location(s) of the wireless access points. The bIT-CIDB wireless engineer shall approve all software packages, such as AirMagnet, used in the design of wireless systems. Program the software with architectural components and quantity of user wireless devices expected.

Generate wireless heat maps and provide to bIT-CIDB for review and approval prior to applying the locations to the contract documents and installing the outlets. Include a report listing the input criteria used within the software to create the heat maps.

The current Berkeley campus standard WAP is the Aruba 535. This may change in the future, so consult with bIT-CIDB when planning the project. The recommended installation manuals are available.

The following cable is required for all new Wi-Fi installation: Cat6A Panduit PUP6AHD04BU-G, UL Listed CMP-LP (0.7A).

Do not place a WAP or cable within two feet of any electrical device that emits an electrical field (fluorescent lights, etc.).

All special cases (concrete walls, inaccessible locations) need to be approved by bIT prior to installation. It is always preferable to have the devices mounted in a horizontal aspect for optimum performance. Wall or vertical mounting should only be used when no other reasonable option exists. Coordinate outlet locations with ceiling and other building architectural components. In general, deploy outlets in the following configurations:

1 CEILING OUTLETS

A. For drop ceilings, terminate the horizontal cable on a RJ45 568A jack, and suspend from a cable-hanger 12 inches above the drop ceiling. This same cable-hanger may also support the cable slack loop.

B. Identify the access point's location by placing a removable non-marking tag, such as a piece of blue colored painter's tape or paper flag, on the underside of the ceiling grid to indicate location. This will assist bIT-CIDB's Wi-Fi installation unit deployment by indicating exact locations of the data connection outlets. This section applies only if WAP installation is not performed when cables are installed.

C. For hardcap ceilings, flush-mount the outlet using a steel 5 inch by 5 inch by 2-7/8 inch deep outlet box with a single-gang mud ring capable of supporting 5-pounds. Route the outlet conduit (1" conduit acceptable for WAP locations only) to an accessible ceiling space and store the cable slack on a cable-hanger at that location (refer to sketch SK903 for hardcap mounting).

2 WALL MOUNTED OUTLETS

A. The first preference for wall mounted outlets is to terminate the horizontal cable on a steel 5 inch by 5 inch by 2-7/8 inch deep outlet box with a single-gang mud ring, capable of supporting five pounds (approximate weight of the Wi-Fi access point). Route the outlet's conduit pathway to an accessible ceiling space and store the 10 feet of cable slack on a cable-hanger at this location. Typically the

SECTION 12 – WIRELESS ACCESS POINTS

height of the box is the lower of 10’ above finished floor or the level of the lighting fixtures in the space. Additionally they should be below the level of any duct work in the space.

B. Where conduit cannot be run inside the wall or the wall cannot be fished, surface raceway will need to be used. This can either be EMT conduit, or LD10 surface mount raceway. In either case the conduit or raceway will stub into the wall-mount WAP housing from either side. Do not come in from the bottom or top.

C. In existing buildings, bIT-CIDB will allow a ring-&-string approach with a single-gang ring for non-insulated, non-rated walls.

D. Please consult with bIT before installation of outdoor WAPs. For exterior wall-mounted WAPs, see the following links for drawings and Fire Marshall approval.
   a. Drawings: https://drive.google.com/file/d/1PkcrvUMlHjs27vrB6ij4QPwmg3BZ-mAm/view?usp=sharing
   b. Fire Marshall Approval: https://drive.google.com/file/d/1l1QCgIEQpNhb7zYIzZOT-ustqGMAcsDl/view?usp=sharing
   c. Aruba outdoor series: https://www.arubanetworks.com/products/wireless/access-points/outdoor-ruggedized-access-points/270-series/

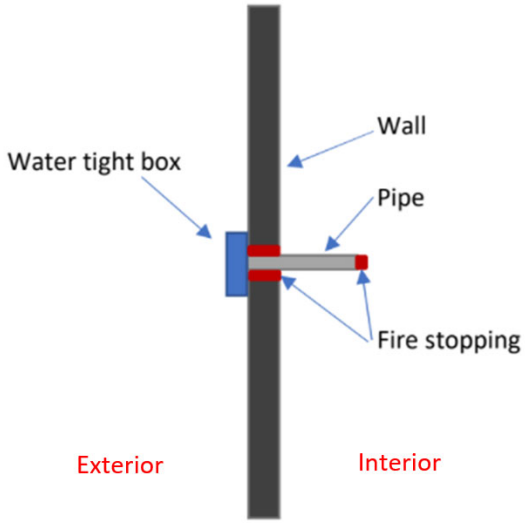
3 OUTDOOR BOLLARDS AND WALL MOUNTS

Outdoor cabling note: Terminations made to outdoor cables for outdoor access points shall be made to RJ45 plugs (Panduit part number FP6X88MTG) for direct connection through the watertight fitting into the access point. At no point on the exterior of the building shall the copper connections ever have the possibility of being exposed to the environment.

Oberon Model 3032 Polyethylene rotomolded bollard cutaway view showing components with Aruba AP-570 series access point (AP and antennas not included)

Any concealment method must be made of an RF neutral material and be approved by bIT prior to installation.

SECTION 12 – WIRELESS ACCESS POINTS

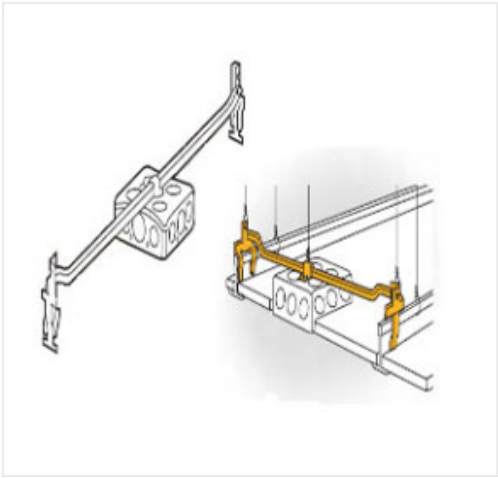


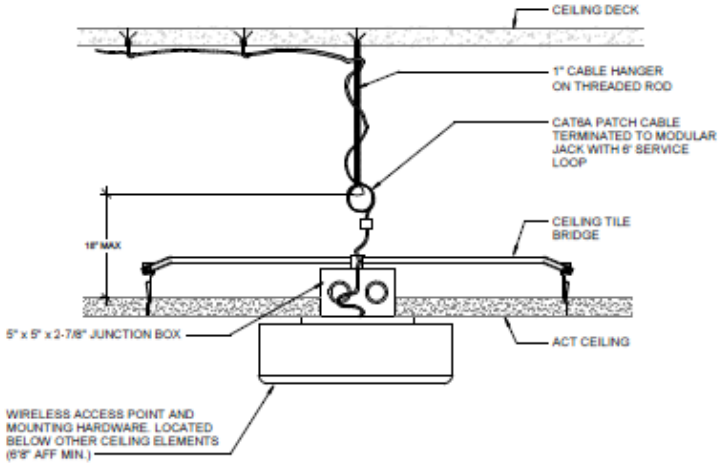
RED FIRESTOPPING NOTED ABOVE IS 3MTM Fire Barrier Water Tight Sealant 3000WT (OR EQUIVALENT). See sketch SK904 for details.

4 MOUNTING REQUIREMENTS:

A. T-Bar or Channel Grid Type ceilings. Narrow (9/16") T-Bar drop ceiling
   a. Install a minimum of 6 feet of Cat 6A UTP 4-pair plenum rated cable service loop.
   b. Support the cabling and slack on a 1 inch cable hanger suspended from the deck above by either 12 gauge wire or ½ inch threaded rod properly affixed from the structure deck above and no higher than 18 inches above any suspended acoustical ceiling. Do not suspend or support from other structures.
   c. Install a Cat 6A modular jack at the cable hanger dedicated for the wireless antenna.
   d. Mark the location of the wireless antenna on the underside of the T-Bar grid of the acoustical ceiling using a blue colored painter's tape one inch by one inch.
   e. Overhead box mounting instructions. The photo below shows a "T" grid box. This same Erico 512 hanger (or equiv.) with a standard electrical box shall be utilized whenever there is a new ceiling installation or when the tiles/grid are being replaced. Boxes shall be cut through the center of tile.

SECTION 12 – WIRELESS ACCESS POINTS

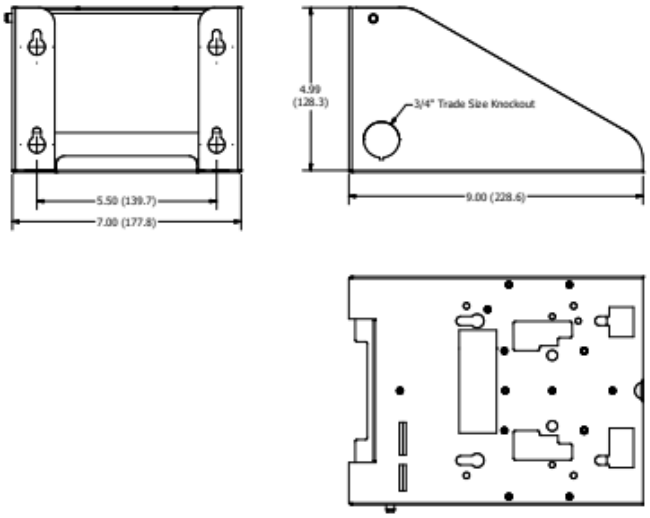


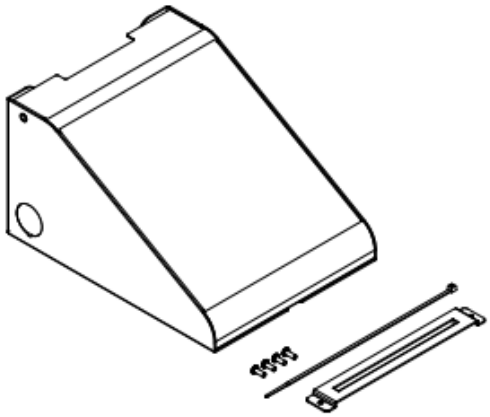


B. Wall Mount
   a. Install bIT-CIDB provided wall mount as per the manufacturer specifications at the common height for the floor area. The common height is the general height that all WAPs are mounted AFF in a floor area. It is usually the level where a suspended ceiling would be installed, the same plane as the building facilities (Lighting, HVAC, Fire Alarm, etc…), or where existing surface mount raceways are installed.
   b. Install a double-gang 5 inch by 5 inch by 2-7/8 inch deep back box with single-gang metal mud ring.
   c. Height should be the lower of 10ft AFF or 3in below finished ceiling.
   d. Install a 1 inch conduit from the back box to accessible ceiling space with a conduit bushing and pull string. Structure shall support a minimum 5 pound device attached to the back box.
   e. If the wall is concrete, surface mount the back box with equivalent 1 inch pathway to accessible ceiling space.
   f. Terminate Cat 6A station cable inside enclosure, no biscuit cover is to be installed. Cable service loop shall be stored at the nearest appropriate location NOT inside the enclosure.
   g. Install 10 feet of cable slack at accessible ceiling space suspended from a 1 inch cable hanger affixed from the structure above using either a 12 gauge wire or ½ inch threaded rod.
   h. Housing must be anchored with Red Head “E-ZAncor” self-drilling dry wall anchors (or equivalent). Use TripleGrip heavy duty anchors for other surfaces (such as lathe and plaster). Use of “dry wall” screws to mount housing to dry wall is expressly prohibited, unless screwing into a stud. Use washers as necessary.

Oberon Model: 1011-00-WH

SECTION 12 – WIRELESS ACCESS POINTS





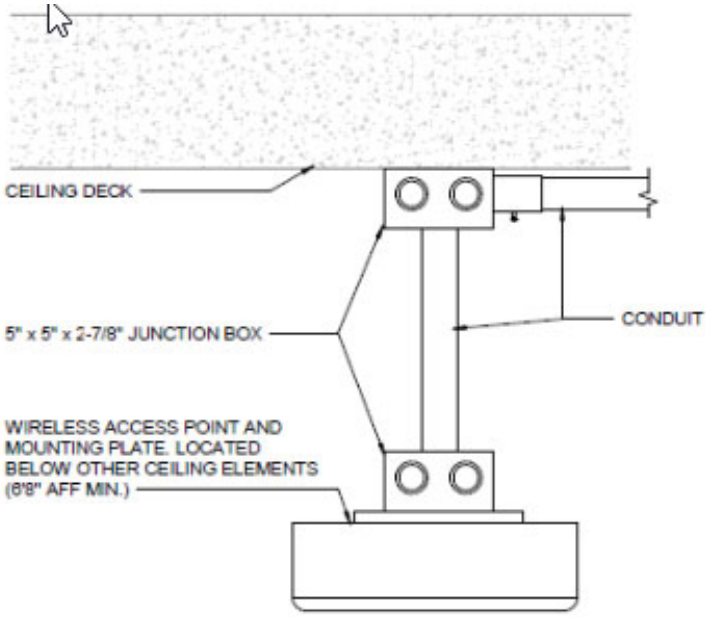
Notes:
- Weight: 3 lb
- Material: White or Black Powder Coated 20 Ga. Steel
- Includes: (1) T-bar Bracket
  (4) # 6-32 Screws
  (1) Cable Tie for securing AP

C. Custom ceiling (wood panel, large drop tile, hard cap, etc.)
   a. Install a 5 x 5 deep outlet box with a single gang mud-ring capable of supporting 5 pounds.
   b. Install a single gang metal mud-ring (Cooper Crouse-Hinds TP482, TP484 or equivalent) to make the ring flush with surface. Depth of mud ring to be determined by construction. Flat (TP480) not allowed.
   c. Crimp over or crimp and screw mud rings are not acceptable.
   d. If custom ceiling is not to be altered, wall mount at nearest location.

D. All cable pathways to termination points are to be in accordance with BICSI standards, NEMA regulations, and customer preferences. This may include conduit and/or additional surface raceway to be installed.

E. Pendant Mount: this is a 5 square deep mounting box affixed to a structural ceiling with a 1 inch conduit entering the box affixed to the ceiling deck, and also extending vertically downward to another 5 square deep mounting box to facilitate the installation of a WAP in an “Industrial” type environment, where no other horizontal mounting solution exists. For illustrative purposes only. Verify actual parts with bIT prior to installation.

SECTION 12 – WIRELESS ACCESS POINTS



WIRELESS ACCESS POINT MOUNT - EXPOSED CEILING

F. When installing WAPs in Residence Halls, use the AP 303H. Note that the T8 security screw installation for all 303H units is **MANDATORY**.

<u>Hard Cap Ceiling (Sheetrock or Plaster)</u>

- Single gang mud ring installed
    - Mud Ring
        - Allen-Tel AT90 or equivalent.
- Provide additional support above ceiling, if necessary. Support should be similar to what is used for "T" grid installation described above.
- Cable with required service loop above ceiling; terminated jack in outlet faceplate.

Links to Aruba Installation Guides

AP 53x Installation Guide:

https://drive.google.com/open?id=18ICzLEYZDgMSEd6xoYoMs2OgcTnhpNK

AP 303H Installation Guide:

https://drive.google.com/open?id=18J8asHYI6MfU4gDN0shLdnwKJ8tiSHju

SECTION 12 – WIRELESS ACCESS POINTS

Aruba AP-MNT-MP10 Indoor Access Point Mount Kits (3)

https://drive.google.com/open?id=17m35g5QmhIW7-DAcG3iaiHjv9n3QTEza

Aruba 0512071-02_AP-MNT-MP10-E_Install_Guide (1)

https://drive.google.com/open?id=18AwJrtcGIPQdwckZrJqEh38jkEC8I1f_

0512069-01_AP-MNT-MP10-D Template

https://drive.google.com/open?id=18-Oue9f_3M5m7CBwBVk4s-udwLXa3eGr

0512068-02_AP-MNT-MP10-D_Install_Guide (1)

https://drive.google.com/open?id=17fOa0eDmw3VjfgLm_n4nAMbA_EwSdRXr

0512067-02-AP-MNT-MP10-ABC_Install_Guide (2)

https://drive.google.com/open?id=17mgywixsAbx3bzwPzL9vxx0_Vl-F4Nye

CISCO

If the scope of work contains Cisco components, consult with bIT prior to any work.

SECTION 13 – AUDIO VISUAL PROJECT GUIDELINES

Section 13 – AUDIO VISUAL PROJECT GUIDELINES

SCOPE

This section describes the scope of work related to the installation requirements for audio visual (AV) systems. These standards are currently under review and our best information to date can be found at these links:

Classroom Video Conferencing and Technology Support

https://rtl.berkeley.edu/rtl-services-and-programs

Departmental Video Conferencing Recommendations

https://technology.berkeley.edu/video-conferencing

https://technology.berkeley.edu/video-conferencing-equip

DESIGN PARAMETERS

bIT does not install or support Audio/Visual (AV) equipment in conference rooms. Departments on campus are responsible for installation and support of AV equipment. If you are planning to install AV equipment (including Zoom Room or Zoom Room Connectors) with the help of a third party vendor or your own department's tech support team, please review the requirements below before proceeding.

Due to its scope and design, the UC Berkeley network may not operate the way many AV system installers and contractors are familiar with. It is common for them to make assumptions that are incorrect. The following pointers are offered to avoid potential issues when designing an AV solution which will integrate with the UC Berkeley Campus Network. This list is not extensive, and if departments or their vendors require any clarification or have questions we encourage them to reach out to us early in the process so that we can discuss any potential design concerns.

It is important to note that installation of cabling and activation for data networking to support AV installation can take many weeks due to available staff and queued work requests. Please work with the campus Network team prior to scheduling an AV install which may require our support.

Items to be aware of when designing an AV installation for UCB:

- No network resources will be made available until and unless the AV contractor (including technical and installation personnel) have met with the assigned Sr. Network Engineer for a design review. Campus networking staff may require design revisions if it is determined that the proposed design is untenable in our environment.
- Campus networking deployment processes have a standard form that all vendors must use for the cable schedule.

SECTION 13 – AUDIO VISUAL PROJECT GUIDELINES

- All connections have a specific ID that will be used to deploy networking services. Installers must comply with this schedule to ensure proper service coordination. Regular communication between the SNE and installation staff is critical.
- If installing a Zoom room:
    - Keep in mind that the process of setting up Zoom Rooms may differ in the amount of time it takes to set up based on the equipment you choose and how your network is configured at your location. It could take a few hours to several weeks based on our experience.
    - To begin the process of requesting a Zoom Room License, follow the instructions in Zoom Room Creation Process (KBT0013651).
    - One of the things to do first is calendar integration. See KB and instructions below on how to set up calendar integration.
        - Zoom Room bCal Integration (KBT0013570)
- The UC Berkeley network does not support IP Multicast. This means that audio protocols such as Dante may not work, and should be avoided. In situations where these protocols are required, the AV installer and department should plan on implementing a local, isolated network to carry this traffic (i.e., installing their own network switch - this solution is **not recommended** by the UC Berkeley Network team because it **cannot** be supported by us). Also, this network will not occupy campus network space (Telecom Rooms (TR)).
- The UC Berkeley Wi-Fi network does not support the connection of devices which are acting as a "server" to allow direct connection from other devices. Systems and devices which support connection from users (e.g., for screen sharing) should have a wired ethernet port installed, connected to the campus network.
- Screen sharing devices cannot use WiFi for connectivity, they must be on a wired connection and be reached via campus WiFi through the wired connection.
- Quality of Service (QoS) is not supported on the campus network.
- Even within a building, AV equipment will likely be on separate subnets across a given location. All protocols utilized should be fully routable. AV equipment should be implemented on its own subnet, separate from the user and administrative networks for the location. The UC Berkeley Network team will assist in determining the appropriate network implementation and configuration parameters upon request.
- AV Equipment installed must comply with all appropriate University IT security policies, especially the Minimum Security Standards for Networked Devices (MSSND). An extensive list of these policies is available at https://security.berkeley.edu/policy/policy-catalog. In particular, someone must be responsible for ensuring that devices continue to receive appropriate software updates and act as a security contact for the installation.
- AV subnets should be protected by a Departmental Firewall or the Campus Shared Firewall Service. The UC Berkeley Network team can provide further information about these services.
- Implementing systems which create or broadcast their own Wi-Fi network is PROHIBITED on campus. Such systems may be disabled/disconnected from the campus network at the UC Berkeley Network team's discretion as they can interfere with the campus Wi-Fi service which is a critical resource for our community.

SECTION 14 – SECURITY CAMERAS

Section 14 – SECURITY CAMERAS GUIDELINES

SCOPE

This section describes the scope of work related to the installation requirements for security camera systems. The campus security video system is intended to deter crime as well as aid in the criminal and administrative investigation of violations of law and policy. Security cameras are thoughtfully installed — only where reasonably anticipated to be useful in response to a specific safety or security risk, and in a manner that respects privacy rights and minimizes any negative impact to lawful activity. Campus policy requires security cameras to be installed at all official cash handling points. These standards are currently under review and our best information to date can be found at these links:

Security Cameras

https://technology.berkeley.edu/services/security-video-system

SECTION 15 – PRODUCT LISTING

Section 15 - Product Listing

While every effort has been made to include the necessary parts and part numbers in this section, manufacturer parts and their associated numbers change over time. Please verify that all required parts and their associated part numbers have not changed prior to ordering. Confirmation with bIT Telecom is best accomplished by a product submittal with parts, pictures and numbers listed with a request for approval. The Product Listing link is here.

SECTION 16 – SKETCHES

Section 16 - Sketches

SCOPE

Sketches provided under this section are illustrations of installation examples. Exact measurements of components may vary from the actual product provided, however the purpose is to demonstrate key components and their general relationship for an installation that meets Campus IT Infrastructure Standards.

The sketches are not intended to provide direction to the contractor over the contract documents, but rather as additional information to help a designer or contractor understand Campus IT Infrastructure Standards and promote clarification in understanding between bIT-CIDB and the project parameters.

When something differs between contract documents and published Campus IT Infrastructure Standards, the designer or contractor is encouraged to obtain confirmation from bIT-CIDB.

DESIGN PARAMETERS

1 USER PATHWAY SUPPORT (SK100 SERIES)

Support member sketches are related to the bIT-CIDB User space and not the Telecommunication Rooms (TRs) within the building. Support details are general and may not include each and every type of support required for a complete installation, but rather the basic components typically found in the User space. Some projects may require specialized support systems and would be found on design documents for the specific project, but should be reviewed with bIT-CIDB for ease of use and functionality so as not to obstruct access to the cabling within User space, as other systems exist, such as mechanical and piping, etc.

2 LABELING (SK200 SERIES)

Labeling details are intended for components maintained by bIT-CIDB over the life of a building and therefore may change from time to time.

3 FIRESTOPPING (SK523 AND SK524 SERIES)

A. bIT-CIDB has standardized on STI EZ-Path™ due to its ability to maintain a consistent fire barrier through the life of a TR where new cables may be pulled or old ones removed.

B. The EZ-Path™ firestop system does not rely on firestop material being removed and replaced during modifications. Cables can be introduced or removed without touching the actual firestop material. For this reason, bIT-CIDB finds this to be a unique application that ensures a high degree of Life Safety and reliability that no other product provides.

4 TELECOM ROOM LAYOUTS (SK500 SERIES)

Telecommunications rooms have basic components that are consistent between the different types of TR functions, such as fiber tray or runway.

A. General TR Layout

a. There are sketches that show the basic configuration of a TR used by bIT-CIDB. They demonstrate the direction the front of the equipment racks face, the size of vertical cable managers, the optimum placement of the room's electrical service panel and ground busbar, and allocated wall space for placement of horizontal cabling termination field, and security.

b. The plan views show required clearances that must be maintained around equipment for proper access to equipment (refer to sketch SK500 for general plan view). These views show the preferred location for equipment relative to the room's door.

SECTION 16 – SKETCHES

c. The elevation sketches show the required elevation of primary equipment typically found in an bIT-CIDB telecommunications room. They show placement of the 110 wall termination field and relative location to any incoming cable services, such as AT&T voice cable and lightning protection devices (refer to sketches SK504 and SK507).

B. Equipment Rack Runway
   a. The overhead cable runway contains 7 inch retaining posts for the purpose of keeping cabling within the runway (refer to sketches SK510 and SK511). This allows the use of runway over cable tray that is more difficult to manage within a typical TR. The retaining posts must contain protectors on the open ends to avoid any potential for sharp edges being exposed to workers in the TR.
   b. The first level of cable support is the runway over the equipment rack bay that serves as a pathway for copper patch cables between racks and their vertical cable managers, as well as patch cables between the racks and wall mounted 110 style termination blocks (refer to sketch SK510).
   c. The upper most runway cable support serves to support horizontal cabling from User space that transitions from the runway to either wall mounted 110 style termination blocks, or equipment rack patch panels typically. This may also support backbone cabling.

C. Fiber Trough
   a. Fiber trough is located above the equipment rack's cable runway and is used for routing fiber optic patch cables between equipment racks in a rack bay. It is supported from the upper cable runway support system. Fiber optic patch cables can transition downward into the vertical cable managers and then to the terminating equipment, such as network switches (refer to sketches SK502 and SK504).
   b. There may be circumstances where the ceiling of the TR is too low (less than 10 feet) to allow for the levels of cable support typically found. In these cases, the situation must be brought to bIT-CIDB's attention in order to determine the best solution.

D. Vertical Cable Runway
   a. For management of cables rising from a floor penetration to the overhead cable runway, runway is mounted vertically on the wall between the floor and the overhead runway. (Refer to elevation sketch SK507).
   b. For cabling that rises to the floor above, runway is placed vertically on the wall above the upper most horizontal runway to the beginning of the floor penetration system at the floor above.
   c. For situations where incoming horizontal cabling enters a TR more than 18 inches above the upper level of runway, vertically mounted runway should be utilized for cable support, or, depending on quantity of cable, open access style D-rings.

5 CABLE ROUTING (SK600 SERIES)

A. Sketches for cable routing demonstrate the varying components for routing cable between the User's work space and the nearest TR. The actual project may differ in components, however the sketches aid in understanding the general combination of typical installations (refer to sketches SK600 and SK601).

6 OUTSIDE PLANT (SK700 SERIES)

A. All OSP details are diagrammatic in nature, but provide the important installation criteria for each piece of equipment generally found in a basic telecommunications OSP pathways. Additional equipment may be provided within vault, however the installer should follow the manufacturer's guidelines and should notify bIT-CIDB any time the manufacturer guidelines differ from the details shown on the sketches for clarification on completing the installation.

B. Vault Lids

SECTION 16 – SKETCHES

a. The contractor should confer with bIT-CIDB prior to ordering any vault covers/lids to verify the proper labeling that is required. The labeling shall be provided by the manufacturer according to the contractor's ordering criteria.
b. Confer with bIT-CIDB for the requirement of vault security covers by Lockdown™ to determine if they are required for the project in question (refer to sketch SK704).
c. Duct bank connections to vaults shall meet bIT-CIDB requirements for telecommunications pathways.

7 BONDING (SK800 SERIES)

A. All bonding details are diagrammatic in nature, but provide the important installation criteria for each piece of equipment generally found in a basic telecommunications room. Additional equipment may be provided within a telecom room (TR), however the installer should follow the manufacturer's guidelines and should notify bIT-CIDB any time the manufacturer guidelines differ from the details shown on the sketches for clarification on completing the installation.

B. All bonding conductor lugs must be two-hole lugs to maximize the continuous bonding should one of the bolts loosen for any reason. Preparation for bonding should always include exposing of bare metal components, should any type of finish exist on the equipment in order to provide a proper bond to ground.

C. Only ground one end of a conduit run, never both ends in order to avoid a ground loop of any kind.

D. All bonding for telecommunications must include the testing of each bond.

8 SPECIALTY ITEMS (SK900 SERIES)

A. Specialty items cover any item not typical to the Structured Cabling System (SCS) such as emergency phones and wireless access points. Other items may be included in this section if they do not fall within prior sketch categories.

B. Sketches relative to emergency phones are intended to bridge the gap between typical telecommunications equipment normally found on projects and emergency phones used by UCB throughout the campus. These phones are directly linked to the campus police department and their location is typically specified by the University Campus Police Department (UCPD).

C. The sketches contain an actual template for use in setting the in-ground pedestal with support anchors and conduit that feeds the required power and telecommunications voice cabling. The size of the pedestal base is shown, as well as basic components of the emergency phone for OSP installation (refer to sketch SK902).

D. Accompanying the sketches is cut-out information for placement of wall mounted emergency phones (refer to sketch SK901 printed on 11x17 inch paper).

SKETCH IDENTIFICATION

Sketch documents are typically on an 8 1/2x11 inch format that is printed on almost any printer. The layouts are typically in portrait mode, but may also be found in landscape mode for items covering an expanded area.

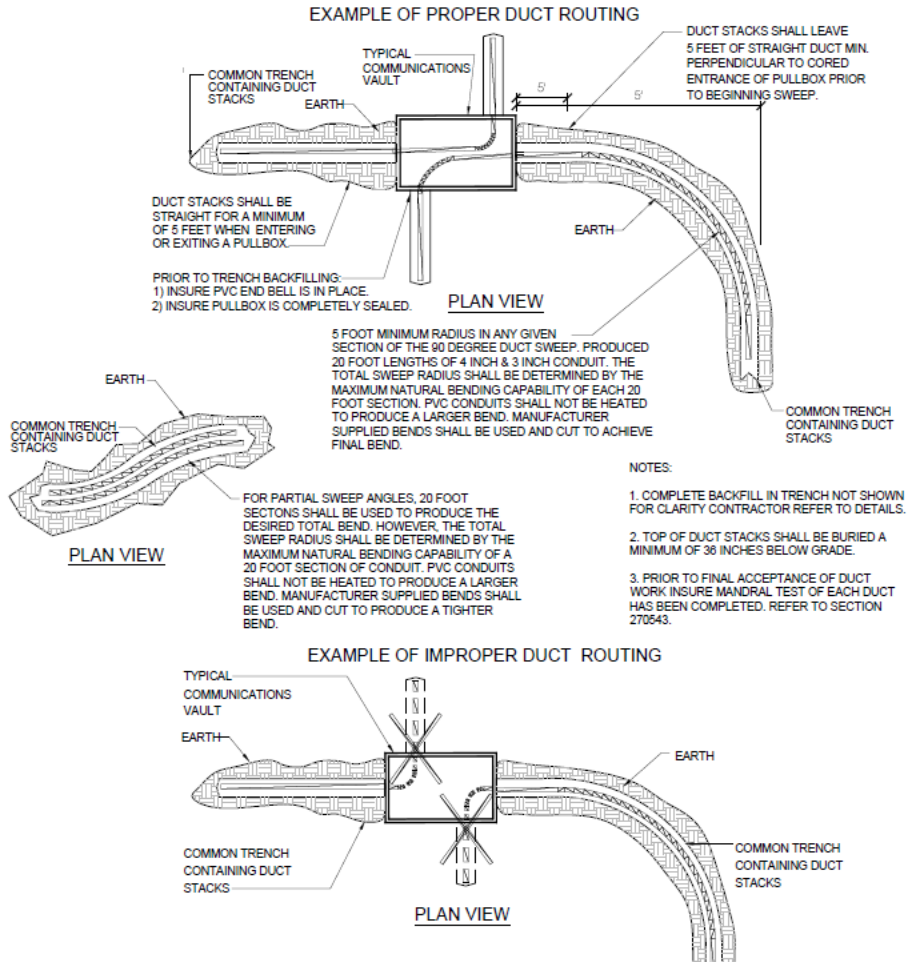
Some sketches may be found in the 11x17 inch format based on the size of the sketch detail.

1 GROUPED SKETCHES

Sketches are grouped together to make it easier to find related information as follows:

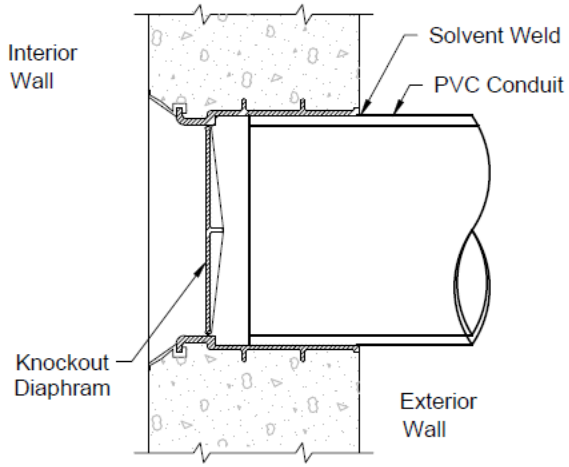
SECTION 16 – SKETCHES

Communications Duct Sweep and Approach at Vault



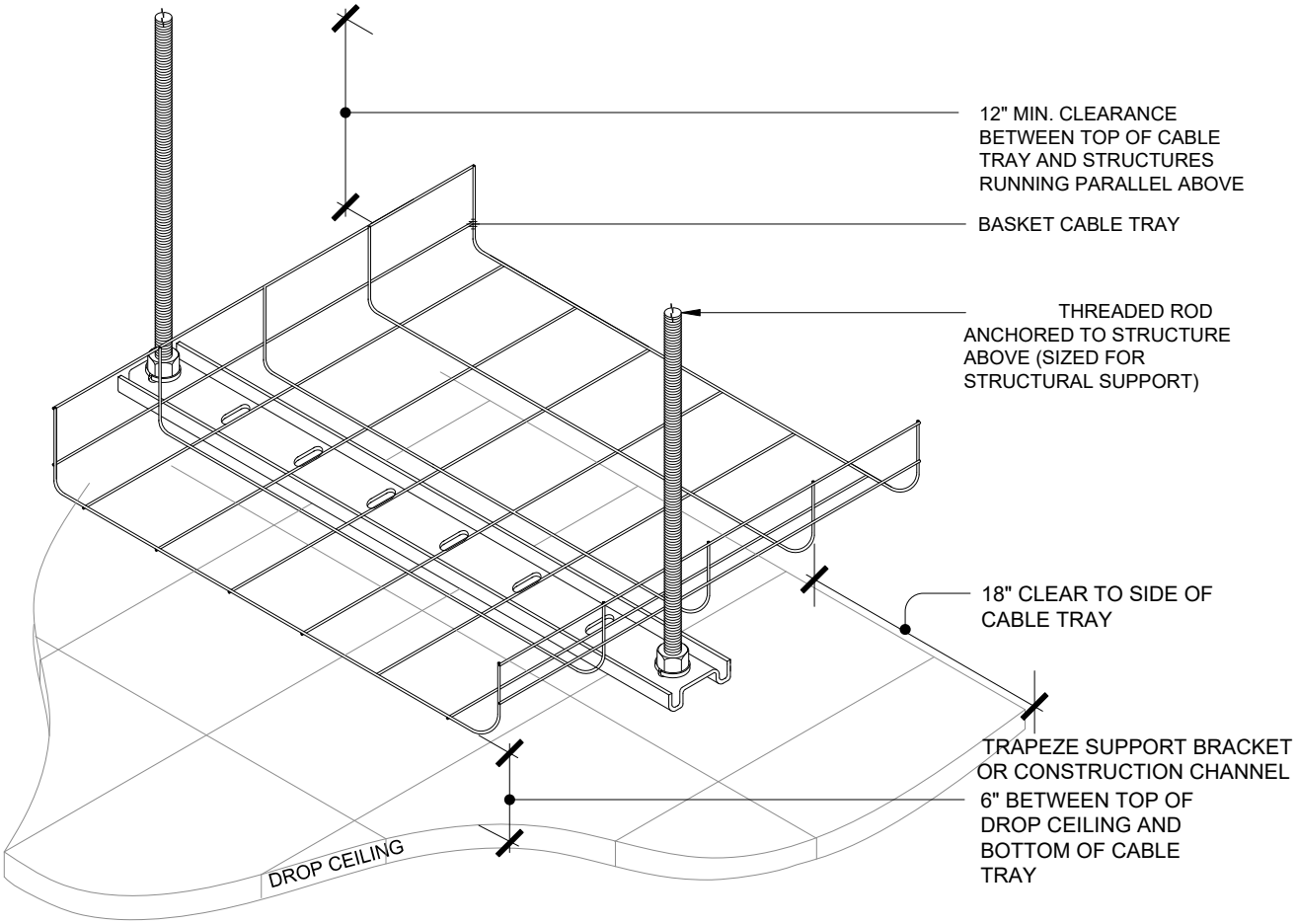
SECTION 16 – SKETCHES

Bell End Entry Fitting



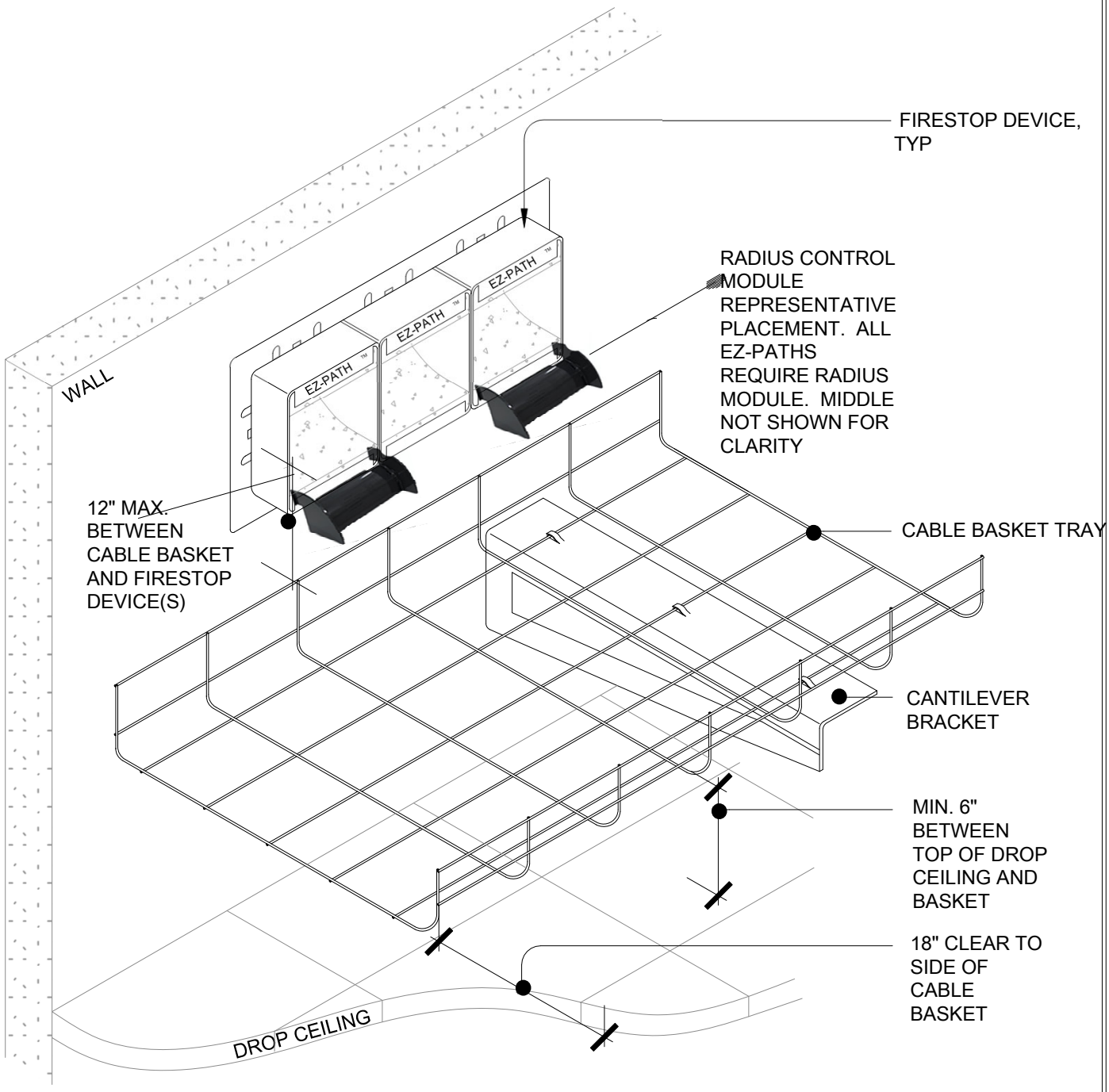
TYPICAL INSTALLATION OF BELL END ENTRY FITTING AT UNDERGROUND COMMUNICATIONS STRUCTURE. WATERTIGHT COMMUNICATIONS DUCT FOR UNDERGROUND UTILITY CONDUIT.

TABLE OF CONTENTS



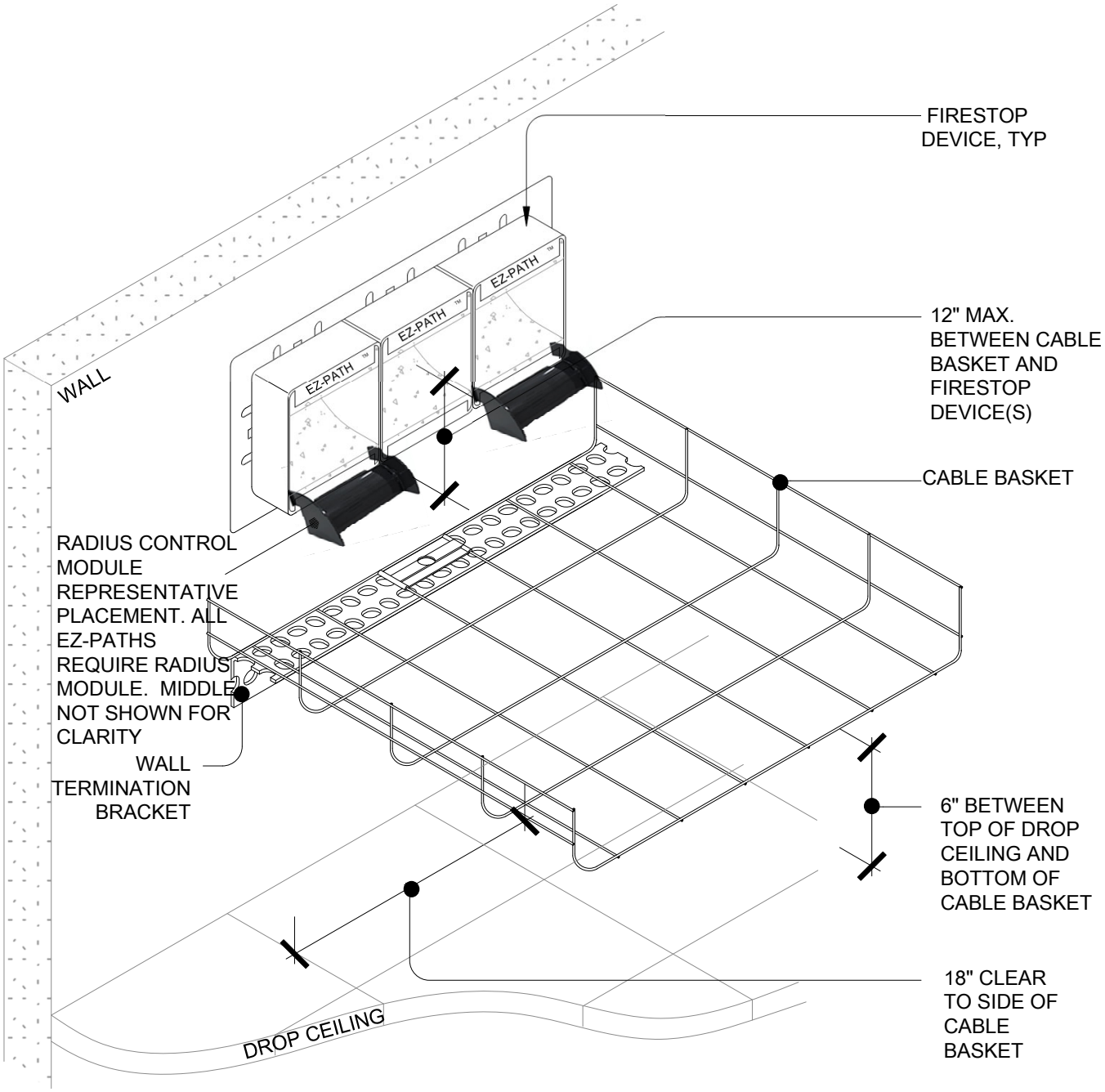
NOTES:
1. TRAPEZE SUPPORT BRACKET MAY VARY. SHOWN HERE AS EXAMPLE ONLY.
2. DETERMINE BRACING REQUIREMENTS BASED ON LOCAL SEISMIC CODES.
3. SUPPORT CABLE TRAY WITHIN 24" ON BOTH SIDES OF ANY TWO JOINED SECTIONS.

UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS BASKET TRAY SUPPORT DETAIL WITH TRAPEZE SUPPORT AND CLEARANCE REQUIREMENTS	SKETCH No: SK100 DATE: 6/15/14 REVISION: 3 SCALE: NONE



NOTES:1. REFER TO FLOOR PLANS FOR CABLE BASKET SIZE AND ROUTE(S).
2. CANTILEVER BRACKET MAY DIFFER BETWEEN MANUFACTURERS. SHOWN HERE AS EXAMPLE.
3. REFER TO FLOOR PLANS FOR FIRESTOP DEVICE SIZE AND QUANTITY.
4. REFER TO ARCHITECTURAL DRAWINGS FOR WALL TYPE AND CEILING TYPE. SHOWN HERE FOR CLARITY ONLY.

UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS BASKET TRAY SUPPORT DETAIL AT EZ-PATH – PARALLEL TO WALL	SKETCH No: SK101 DATE: 8/31/16 REVISION: 4 SCALE: NONE



NOTES:
1. ALIGN FIRESTOP DEVICE(S) WITH HORIZONTAL SECTION OF CABLE BASKET.
2. REFER TO FLOOR PLANS FOR CABLE BASKET SIZE AND ROUTE(S).
3. WALL TERMINATION BRACKET MAY DIFFER BETWEEN MANUFACTURERS. SHOWN HERE AS EXAMPLE.
4. REFER TO FLOOR PLANS FOR FIRESTOP DEVICE SIZE AND QUANTITY.
5. REFER TO ARCHITECTURAL DRAWINGS FOR WALL TYPE AND CEILING TYPE. SHOWN HERE FOR CLARITY ONLY.

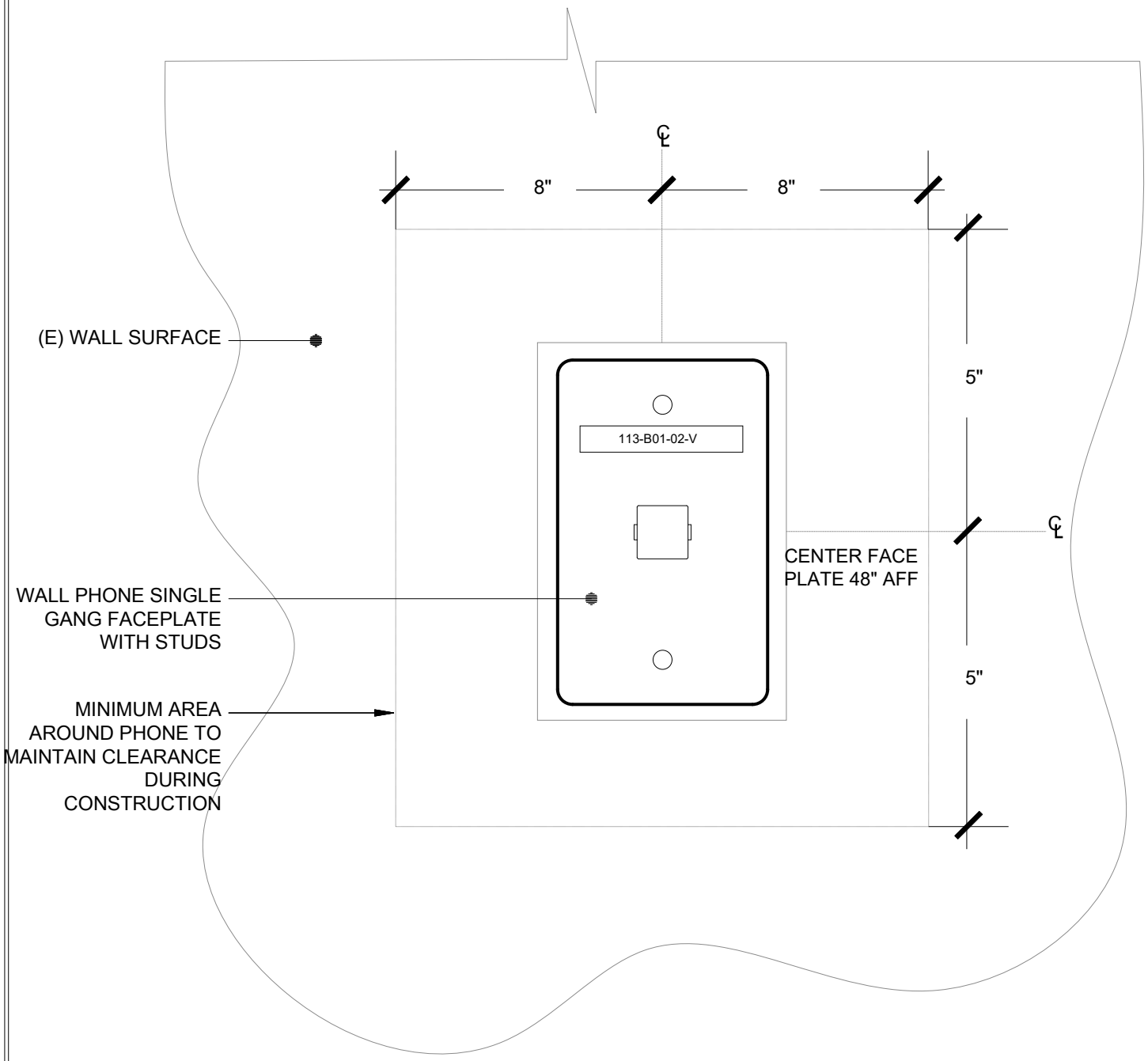
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS BASKET TRAY SUPPORT DETAIL AT EZ-PATH – PERPENDICULAR TO WALL

SKETCH No:	SK102
DATE:	8/31/16
REVISION:	4
SCALE:	NONE



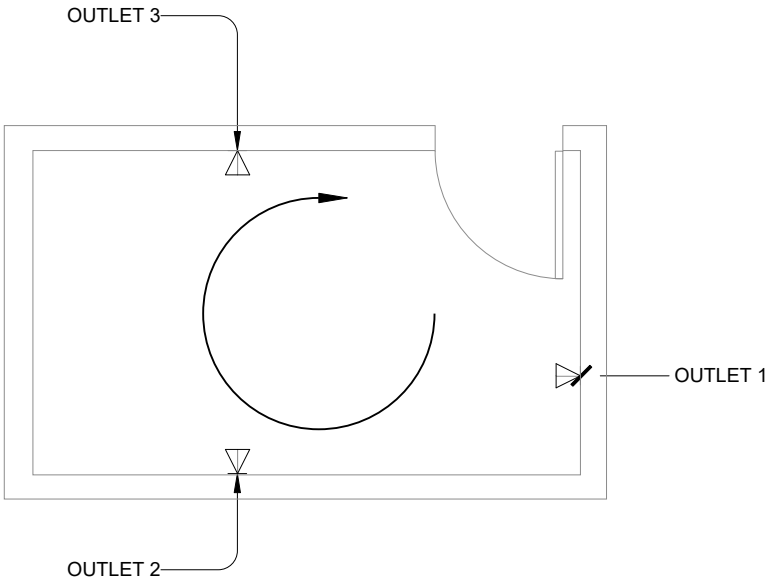
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

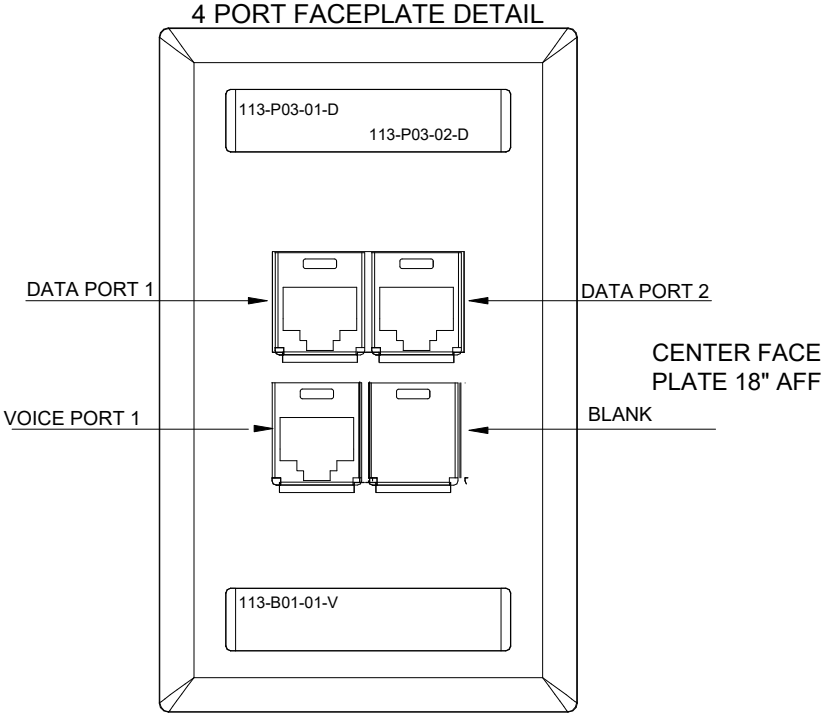
TELECOMMUNICATIONS
CLEARANCE AROUND WALL
PHONE OUTLET BOX

SKETCH No:	SK103
DATE:	9/5/17
REVISION:	4
SCALE:	NONE



ROOM OUTLET LABELING ORDER

4 PORT FACEPLATE DETAIL



NOTES: 1. ROOM NUMBERS SHOWN IN DETAIL ARE AN EXAMPLE AND MAY NOT REFLECT ACTUAL ROOM NUMBERS.

UNIVERSITY OF CALIFORNIA
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BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
OUTLET FACEPLATE
LABELING
AND ROOM ORDER PLAN

SKETCH No:	SK200
DATE:	8/30/16
REVISION:	6
SCALE:	NONE

Naming Conventions
11/3/2017

Type of Room	Code for CCU	Description	IST Example (jack ID)	UCPD Example (includes 10 char BLDG + 9 char ROOM)	Usage
We do not allow multiple locations for new phone lines.					
Atrium	ATRIUM	Atrium area of a building, not the lobby. RSF has both a lobby and an atrium	RSF-ATRIUM	RSF-ATRIUM	RSF ATRIUM AREA
Blue Light/emergency Phones	EM	EM used with the room number or direction indicator	SSL-EM	SSL EM	SSL EMERGENCY
Breeze way	BRZWY	BRZWY is used with the building it is associated with (could not find an example in Mysoft)	OBRIEN-BRZWY	O BRIEN BRZWY	OBRIEN HALL BREEZEWAY
Elevators	ELV N F	ELV' space Directional indicator, an 'F' should be used for freight	WUR-ELEV NE F	WURSTER ELV NE F	WURSTER HALL ELEVATOR NORTH EAST FREIGHT
Entrances	ENT	can be inside or outside	BOTA-ENT	BOT GDN A ENT	BOTANICAL GARDEN BUILDING A OFFICE ENTRANCE
Exterior	EXT	exterior, should have a directional indicator; exterior to the building referenced	CITRIS-EM EXT NE	CITRIS EM EXT NE	CITRIS EMERGENCY LINE EXTERIOR NE SIDE
Field	FLD	at this time, specifically for Underhill playing field	UNDER-FLD E	UNDER-FLD E	UNDERHILL PLAYING FIELD, EAST SIDE OF THE FIELD
Floor	FL	referencing a floor number in a building	EVANS-FL 9	EVANS FL 9	EVANS HALL FLOOR 9
Hallways	HL 105	HL is always followed by a room number that the phone is near	CK09 -HL 105	CKC-9 HL 105	CLARK KERR CAMPUS, BUILDING 9, IN THE HALLWAY OUTSIDE ROOM 105
Level	LVL	indicates what level, or floor the phone line is located on	UNDER-LVL1	UNDERHILL LVL1	UNDERHILL PARKING GARAGE, LEVEL 1 EMERGENCY PHONE
Loading Docks	DOCK	Can use a directional indicator if there is more than one dock	RH1CH-DOCK	UNIT-1 CHE DOCK	RESIDENCE HALL 1-CHENEY LOADING DOCK
Lobbys	LBY	LBY	LSA-LBY	LSA LBY	LIFE SCIENCES ADDITION LOBBY
Parking Lot	LOT	As of 11/8/13 room type LOT is only used for 1608 4th St. Other parking lots have their own building designation.	4TH1608-LOT	1608 4th St LOT	1608 4TH ST PARKING LOT
Lower	LWR	This would follow the object of the location, i.e., "LOT LWR" for Parking lot the lower level. (COULD NOT FIND LOWER LEVEL IN PARKING LOTS IN DB)	BOALTSA-LWR STK N	BOALTSA LWR STK N	BOALT SOUTH ADDITION LOWER LEVEL STACK NORTH
Mezzanine	MEZZ	Mezzanine level between two floors	RSF-MEZZ	RSF-MEZZ	RSF Mezzanine level
On a street corner	CHAN BOWD	Use up to 4 chars of each street with a space between	C2547-EM Cha Bow	2547 CHAN CHAN BOWD	2547 CHANNING EMERGENCY LINE ON THE CORNER OF CHANNING AND BOWDITCH
One room bldgs	100	one room buildings always have room #100	RFS-155-100	RFS-155 100	RICHMOND FIELD STATION BUILDING 155
Plazas	PLZ	Can add UPR for upper or LWR for lower (could not find an example of plaza)	SPROUL-PLZ-LWR	SPROUL PLZ LWR	LOWER SPROUL PLAZA
Pool	POOL	to designate the pool for a recreation area	RSF-POOL	RSF POOL	Recreational Sports Facility-Pool
Sign Post	SP	For Fire Trails	don't have examples		SIGN POST NUMBER
Stairs, stairwell	STAIR	Can use a directional indicator where needed	MTZ-2ESTAIR	MARTINEZ CO 2ESTAIR	MARTINEZ COMMONS 2ND FLOOR EAST STAIRCASE
Telecom Room	TELCO RM	Telecom communications room/closet	DUR-TELCO RM	DURANT TELCO RM	DURANT HALL TELCOM ROOM
Upper	UPR	This would follow the object of the location, i.e., "LOT UPR" for Parking lot the Upper level.	SPROUL-PLZ-UPR	SPROUL PLZ UPR	UPPER SPROUL PLAZA
Yard	YD	as in court yard, play yard	don't have examples		

For Questions, email: naming-conventions-cmte@lists.berkeley.edu

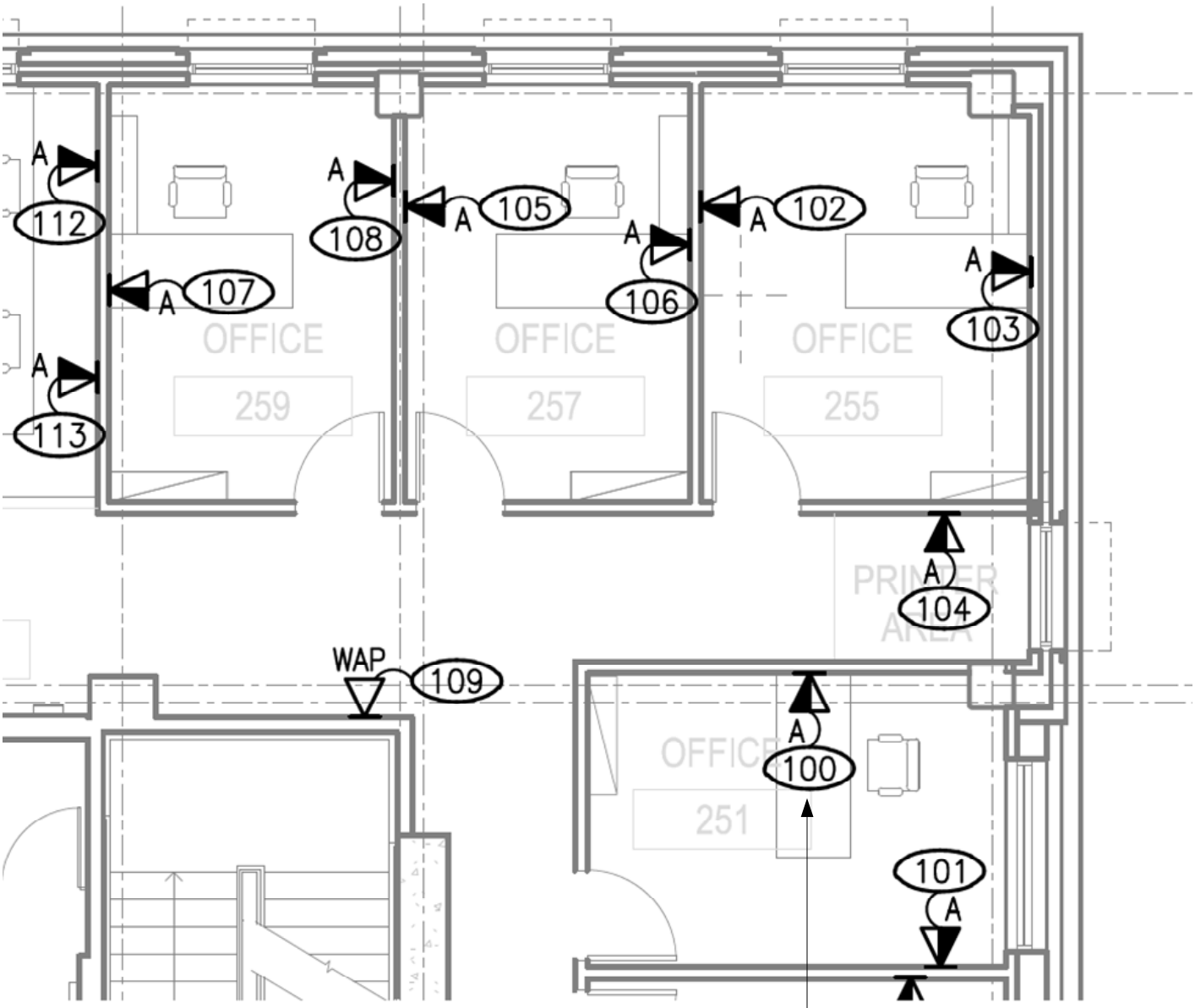
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

ROOM TYPE NAMING CONVENTION

SKETCH No:	SK201
DATE:	11/3/17
REVISION:	2
SCALE:	NONE



OUTLET ASSIGNED A UNIQUE 3 DIGIT SEQUENTIAL NUMBER BASED ON ENTERING THE ROOM'S DOOR AND MOVING TO THE LEFT AND AROUND THE ROOM IN A CLOCKWISE DIRECTION, TYPICAL

OUTLET NUMBERING IS FOR CONVENIENCE, AND IS NOT PART OF CABLE ID

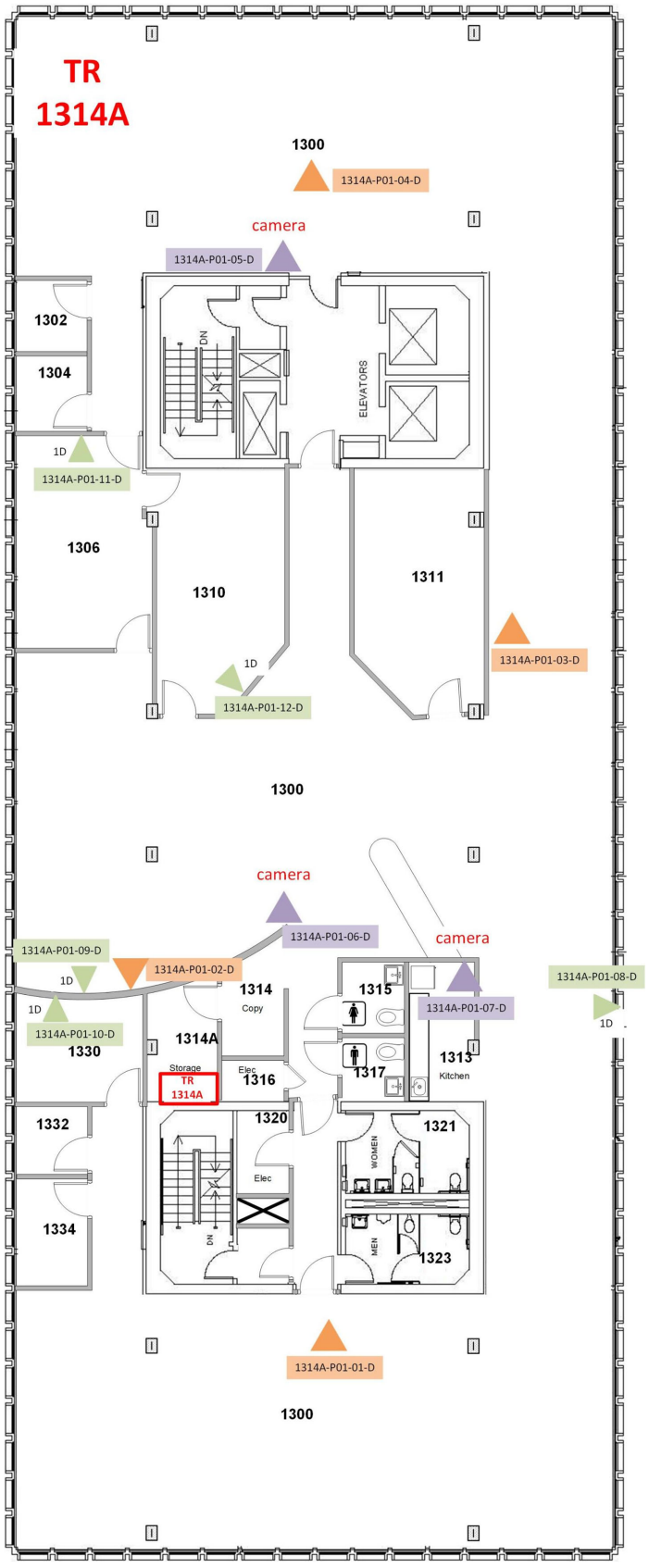
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

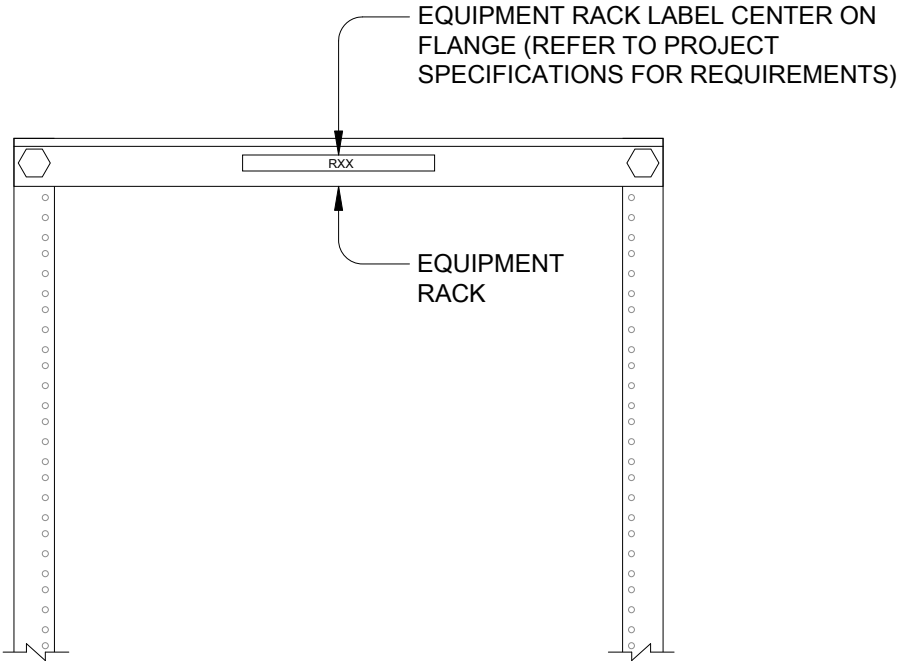
DESCRIPTION:

TELECOMMUNICATIONS EXAMPLE OF FLOOR PLAN DRAWING AS PART OF THE 100% CD SUBMISSION

SKETCH No:	SK202
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS EXAMPLE OF FLOOR PLAN DRAWING AS PART OF THE 100% CD SUBMISSION	SKETCH No: SK202A DATE: 3/2/2023 REVISION: SCALE: NONE



FRONT VIEW

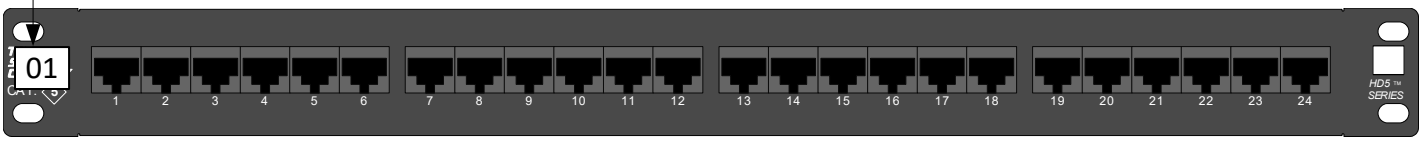
NOTE: PROVIDE A PERMANENT LASER GENERATED LABEL APPLIED TO A LABEL RETAINING BRACKET. BRACKET ONLY REQUIRED IN ZONES AND MDC. OTHERWISE, LABEL MAY BE APPLIED DIRECTLY TO TOP FLANGE OF RACK.

FORMAT:

START LABELING AS “R01” AT THE RACK NEAREST THE WALL.

UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS EQUIPMENT RACK LABELING	SKETCH No: SK203 DATE: 6/15/14 REVISION: 3 SCALE: NONE

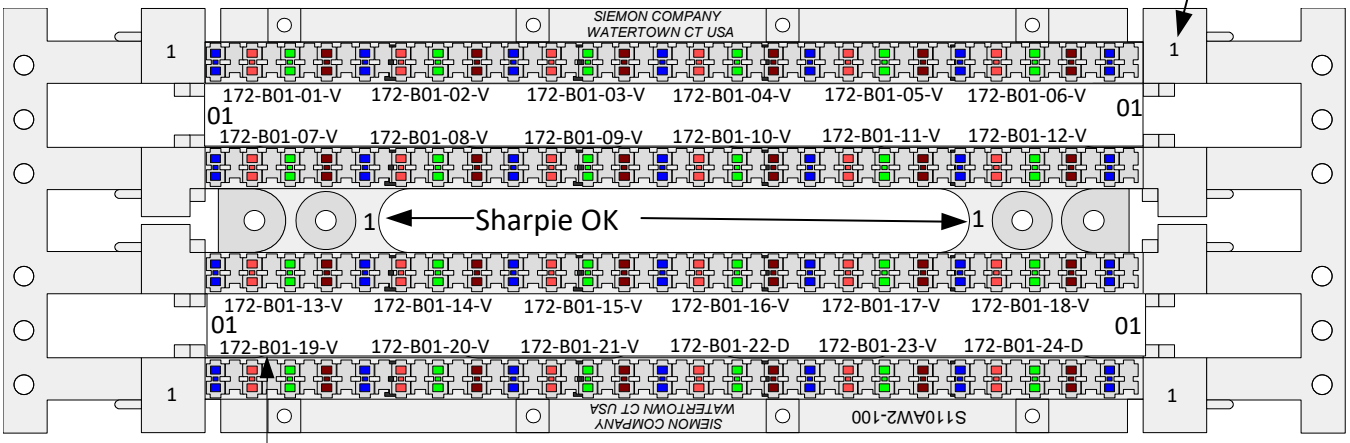
NUMERIC - POSITION PATCH PANEL LABEL AS SHOWN, TYP



24-PORT PATCH PANEL

48-PORT PATCH PANEL

Sharpie OK on 4 corners

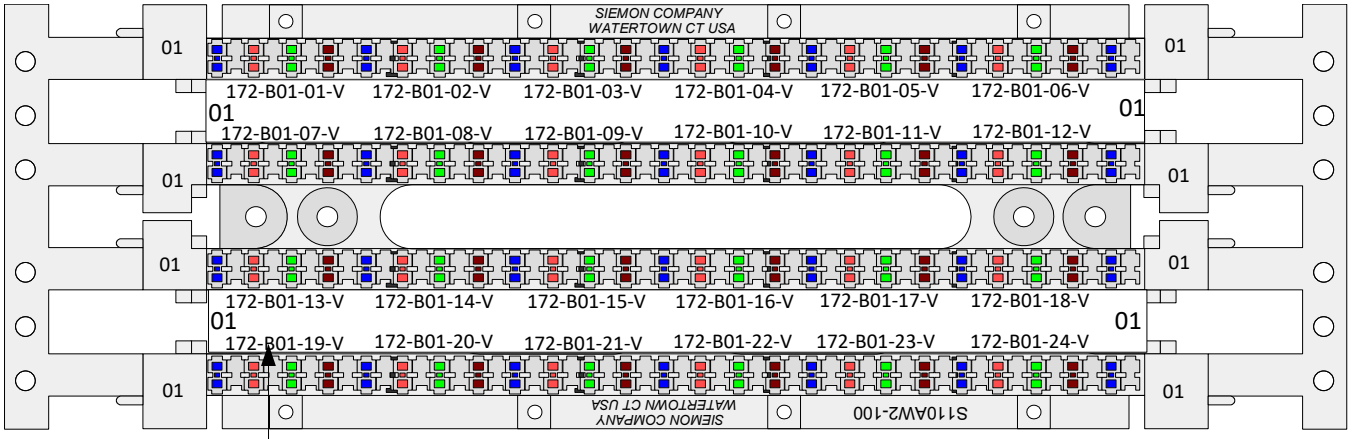


110 STYLE WALL TERMINATION BLOCK

LABELING OF 110 STYLE BLOCK

FORMAT: TELECOM ROOM + BLOCK# + SEQUENCE# + “V” FOR VOICE, “D” FOR DATA

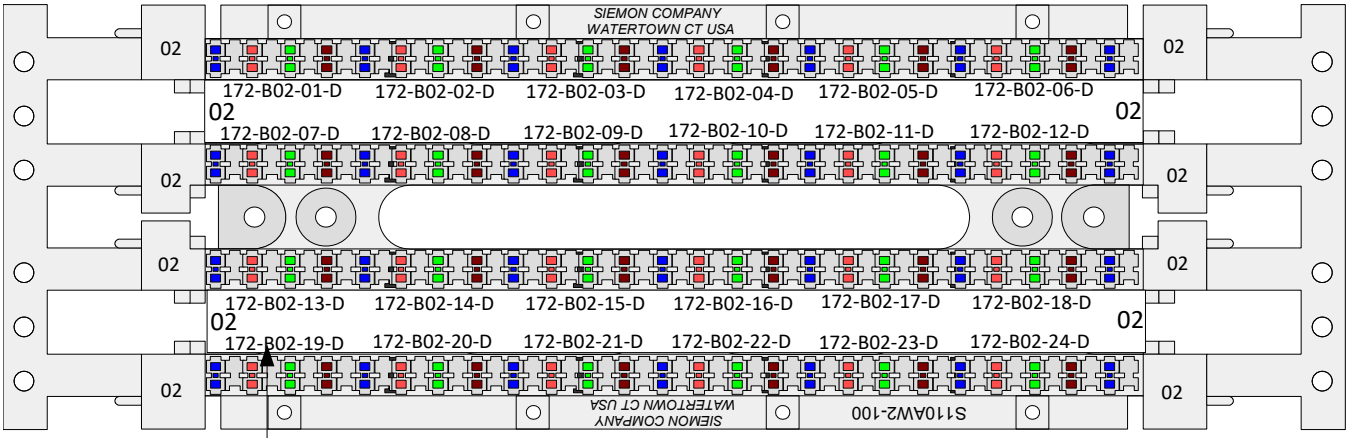
UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS LABELING FOR PATCH PANELS AND 110 WALL FIELD	SKETCH No: SK204 DATE: 9/6/16 REVISION: 4 SCALE: NONE



110 STYLE WALL TERMINATION BLOCK

LABELING OF 110 STYLE BLOCK

FORMAT: TELECOM ROOM + BLOCK# + SEQUENCE# + "V" FOR VOICE



110 STYLE WALL TERMINATION BLOCK

LABELING OF 110 STYLE BLOCK

FORMAT: TELECOM ROOM + BLOCK# + SEQUENCE# + "D" FOR DATA

UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

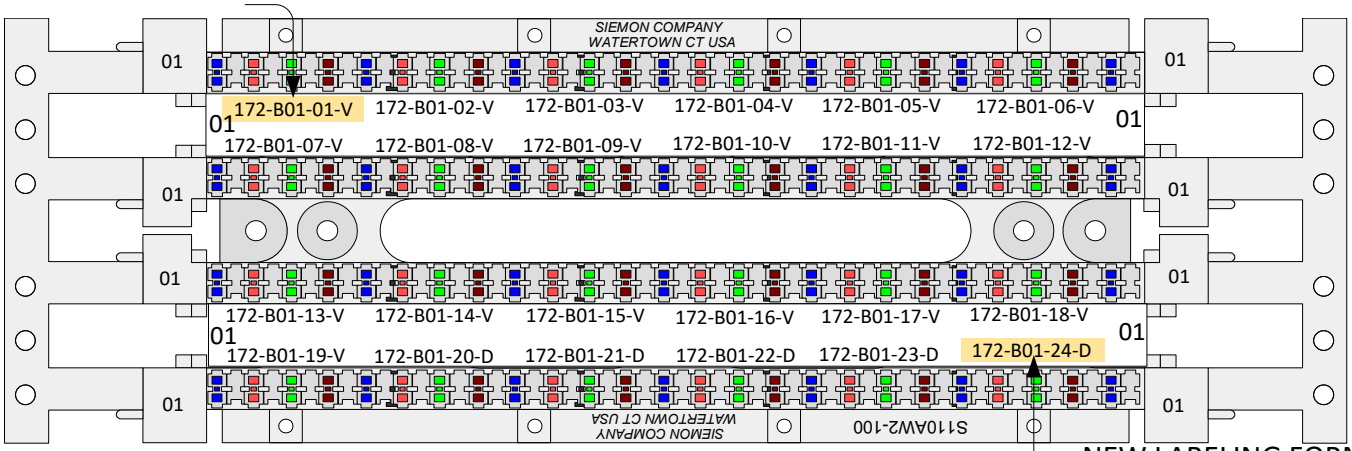
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
LABELING FOR 110 BLOCKS, VOICE AND DATA

SKETCH No:	SK205
DATE:	8/30/16
REVISION:	1
SCALE:	NONE

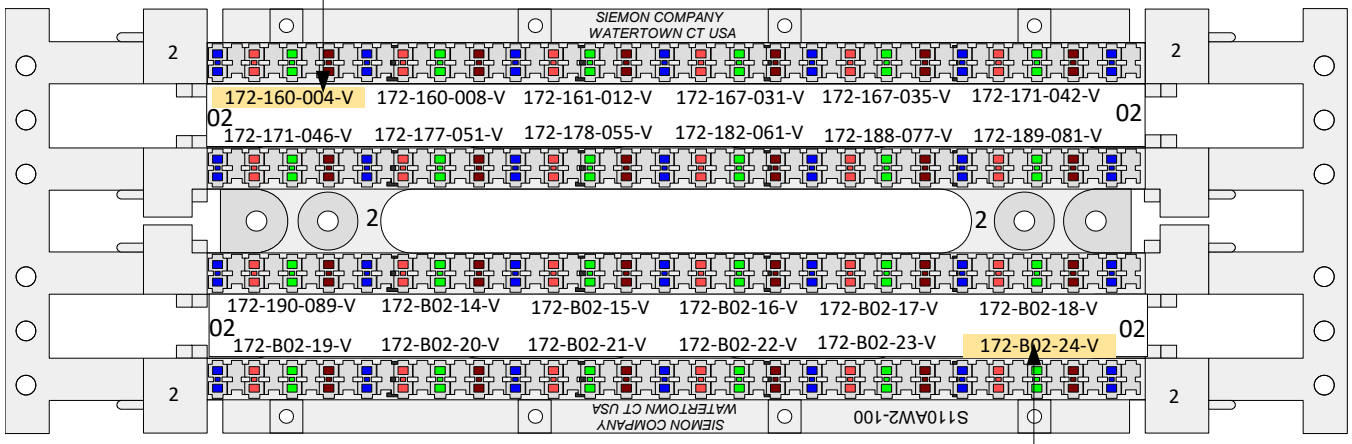
NEW LABELING FORMAT VOICE



NEW LABELING FORMAT DATA

SAMPLE OF VOICE AND DATA WITH NEW LABELING FORMAT
MIXING VOICE AND DATA ON SAME 110 BLOCK

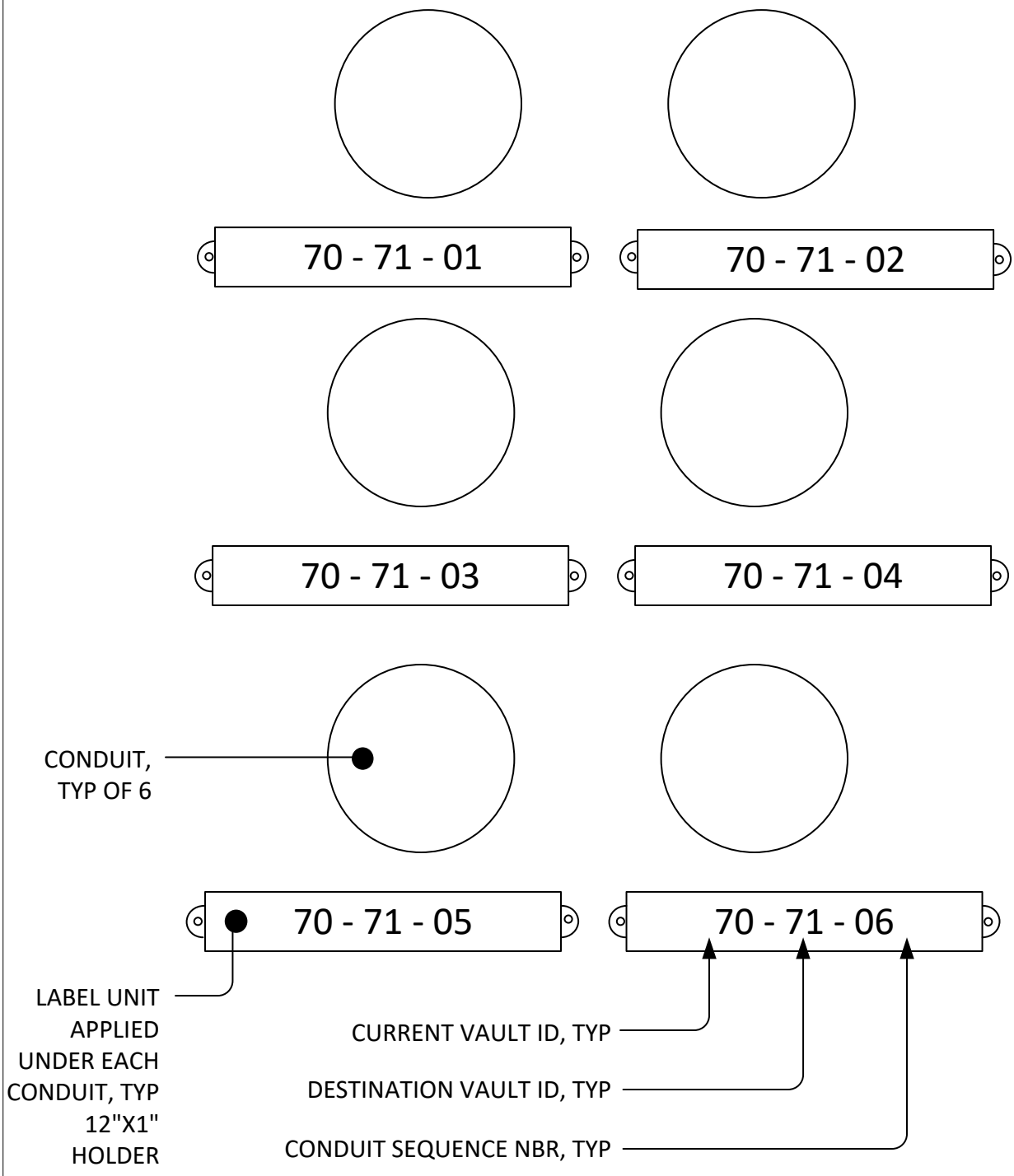
OLD LABELING FORMAT



NEW LABELING FORMAT

SAMPLE OF MIXED VOICE AND DATA LABELING FORMAT

UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: POSSIBLE SCENARIOS IN EXISTING TR'S: TELECOMMUNICATIONS LABELING FOR 110 BLOCKS, VOICE AND DATA	SKETCH No: SK206 DATE: 9/6/16 REVISION: 1 SCALE: NONE



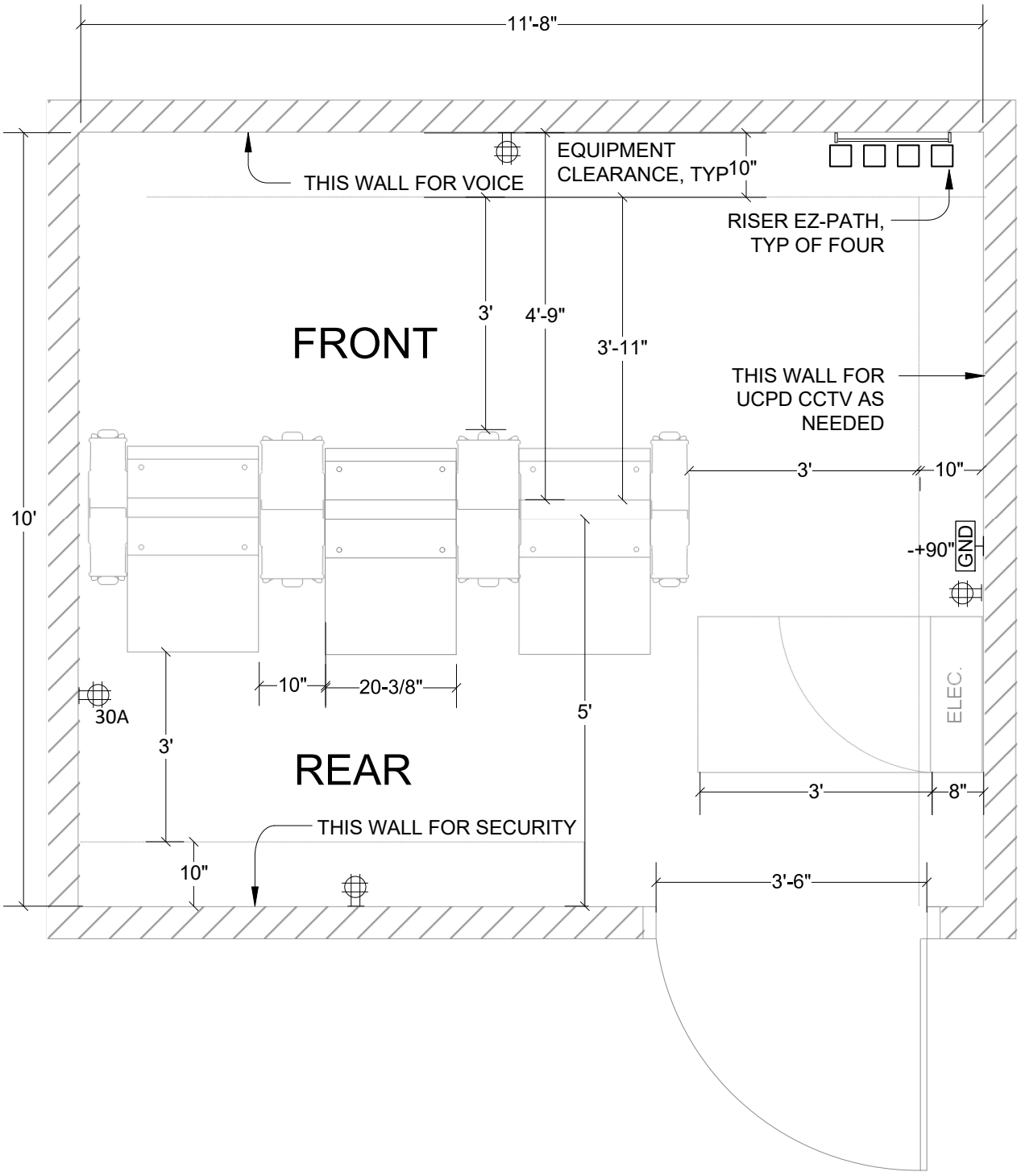
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
OSP VAULT CONDUIT
LABELING

SKETCH No:	SK207
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



UNIVERSITY OF CALIFORNIA
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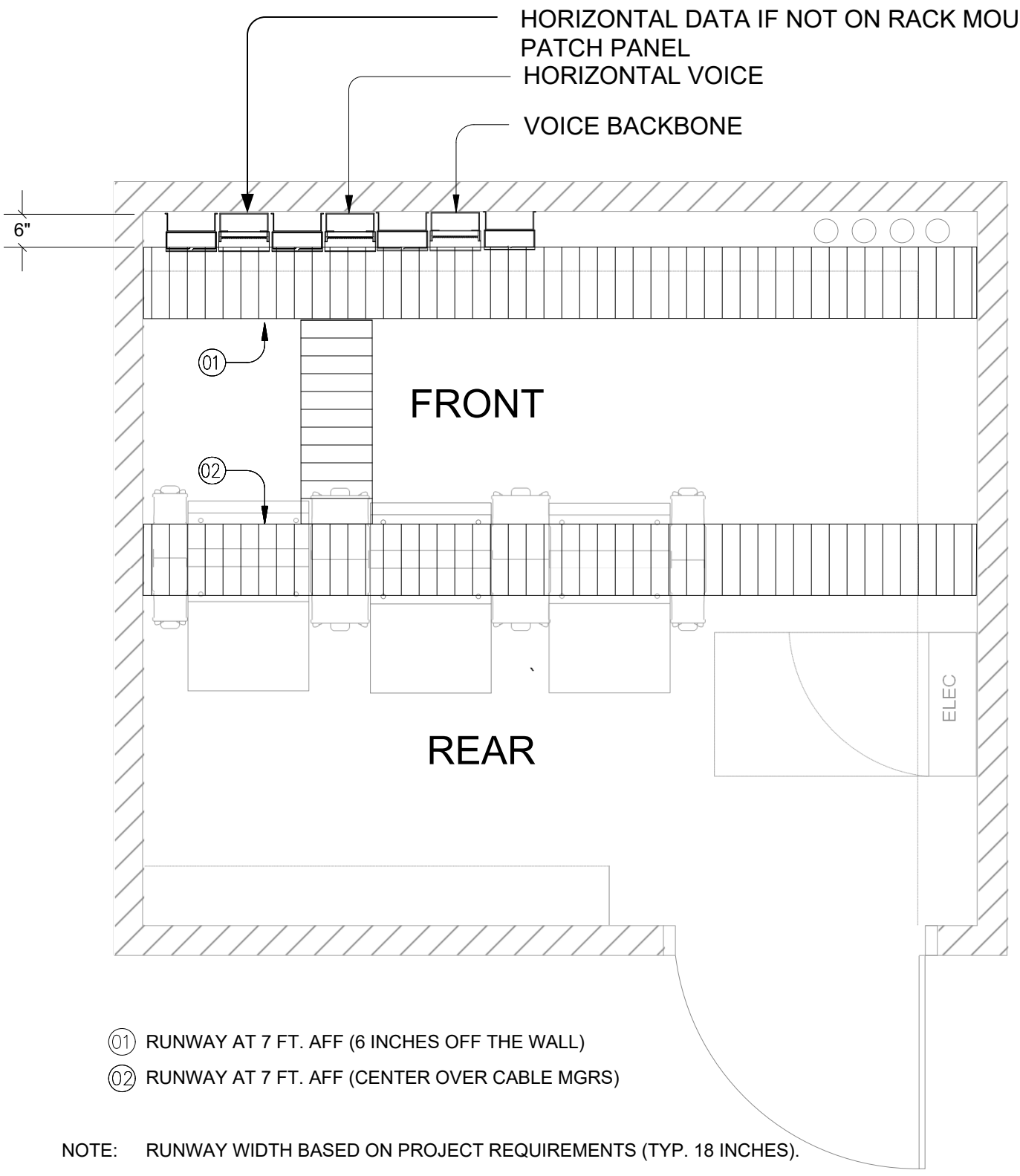
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
BASIC TELECOM ROOM PLAN
WITH THREE EQUIPMENT
RACKS, VERTICAL MGRS, AND
WALL MOUNTING SPACE

SKETCH No:	SK500
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



01 RUNWAY AT 7 FT. AFF (6 INCHES OFF THE WALL)

02 RUNWAY AT 7 FT. AFF (CENTER OVER CABLE MGRS)

NOTE: RUNWAY WIDTH BASED ON PROJECT REQUIREMENTS (TYP. 18 INCHES).

UNIVERSITY OF CALIFORNIA
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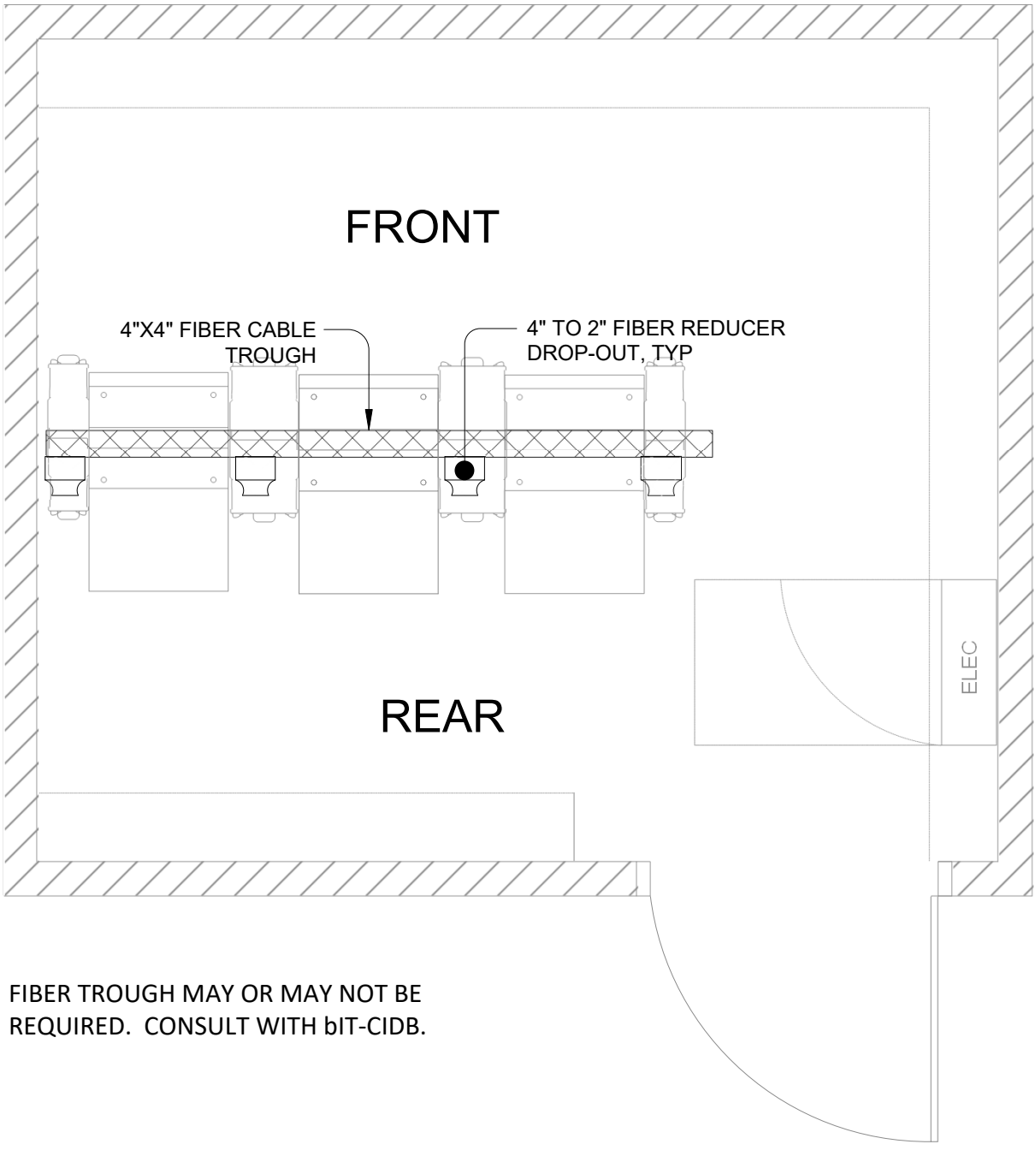
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
BASIC TELECOM ROOM PLAN (EXISTING PRIOR 2014)
LEVEL-1 CABLE RUNWAY

SKETCH No:	SK501
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



FIBER TROUGH MAY OR MAY NOT BE REQUIRED. CONSULT WITH bIT-CIDB.

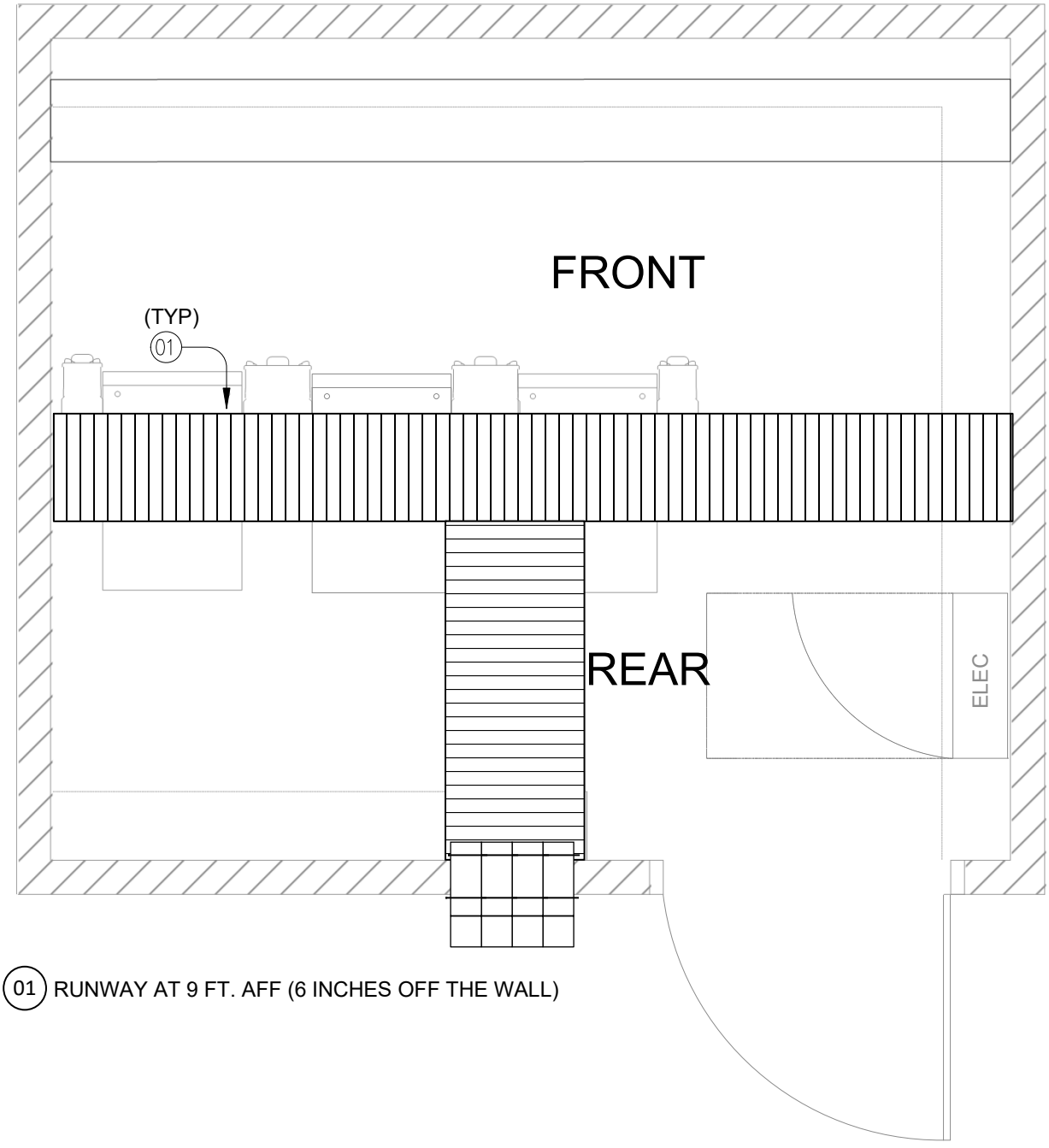
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
BASIC TELECOM ROOM PLAN
LEVEL-2 FIBER TROUGH
ONLY REQUIRED IN BDF

SKETCH No:	SK502
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



01 RUNWAY AT 9 FT. AFF (6 INCHES OFF THE WALL)

NOTE: MIN. 18 INCH RUNWAY UNLESS OTHERWISE NOTED (WIDTH BASED ON PROJECT REQUIREMENTS).
CABLE RUNWAY ORIENTATION MAY DIFFER BASED ON ROOM PLAN AND CABLE ENTRY POINT(S).
MAY NOT BE REQUIRED. CONSULT WITH bIT-CIDB

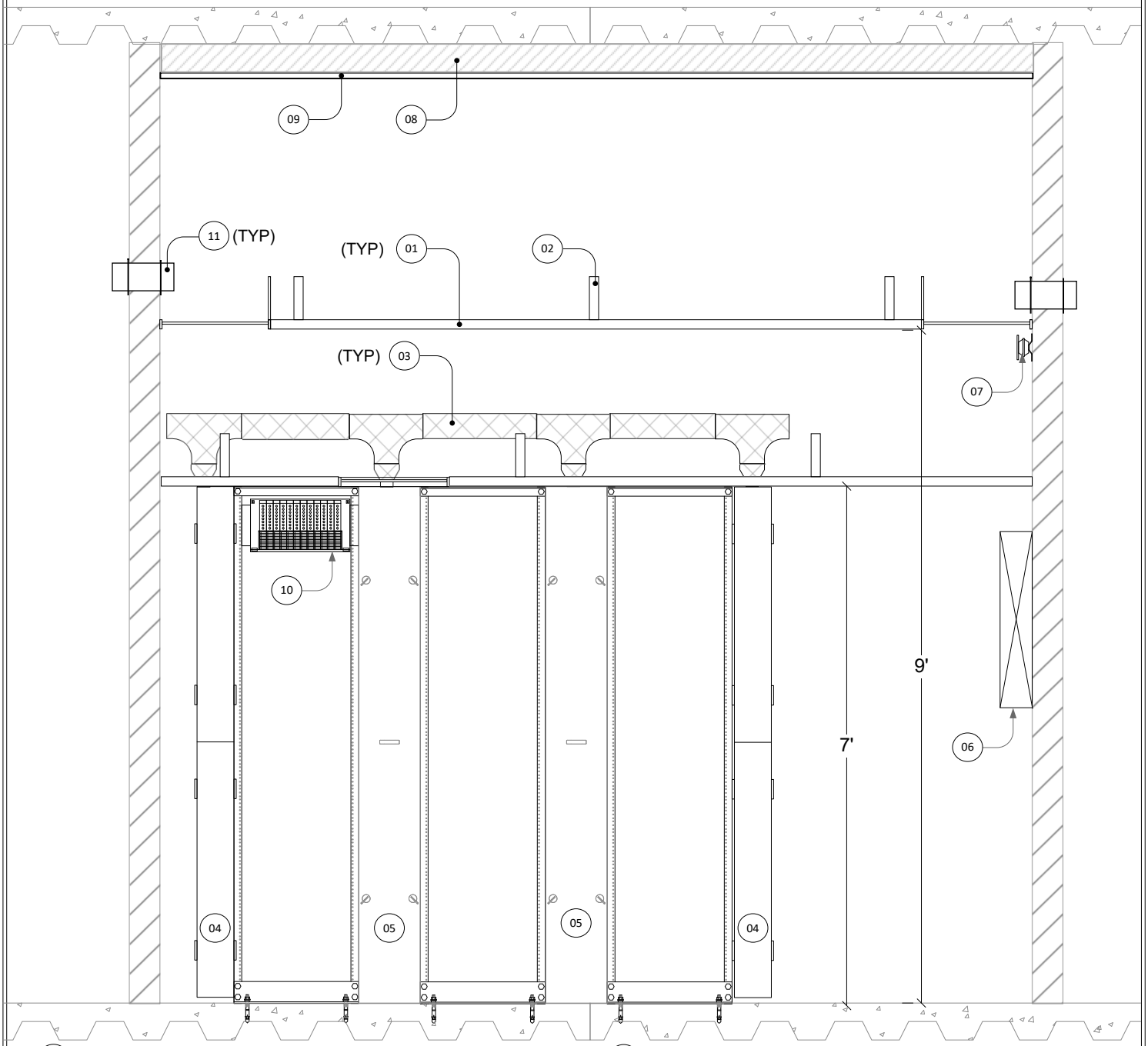
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
BASIC TELECOM ROOM PLAN
LEVEL-3 CABLE RUNWAY
MAY NOT BE REQUIRED
CONSULT WITH bIT

SKETCH No:	SK503
DATE:	8/30/16
REVISION:	4
SCALE:	NONE



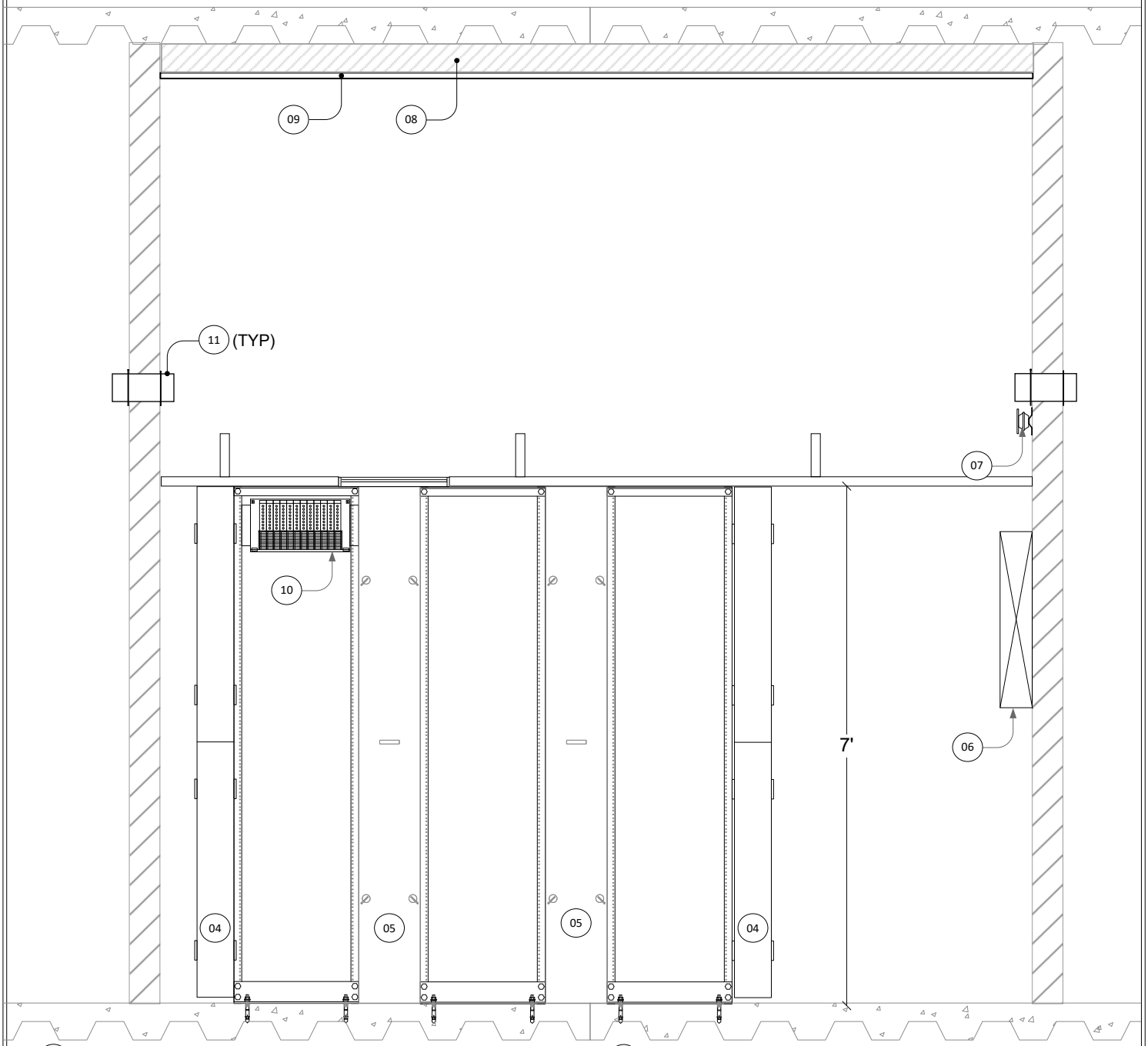
01 CABLE RUNWAY - 18 INCH
02 CABLE RUNWAY - 7 INCH RETAINER POST
03 ACD FIBER RUNWAY - 4 INCH SECTIONS + DROPOUTS
04 VERTICAL CABLE MANAGER - 6 INCH WIDE W/COVER
05 VERTICAL CABLE MANAGER - 10 INCH WIDE W/COVER
06 ROOM'S ELECTRICAL PANEL
07 ROOM'S BONDING BUSBAR AT 90 INCHES AFF
08 INSULATION BATTING
09 GYPSUM BOARD CAPPED CEILING
10 ACD FIBER OPTIC PATCH PANEL
11 EZ-PATH 44
12 MAKE SURE TRAY SUPPORTS DO NOT HINDER OPENING OF CABLE MANAGER DOORS

UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
BASIC BDF LAYOUT ELEVATION
RACK-BAY

SKETCH No: SK504
DATE: 6/15/14
REVISION: 3
SCALE: NONE



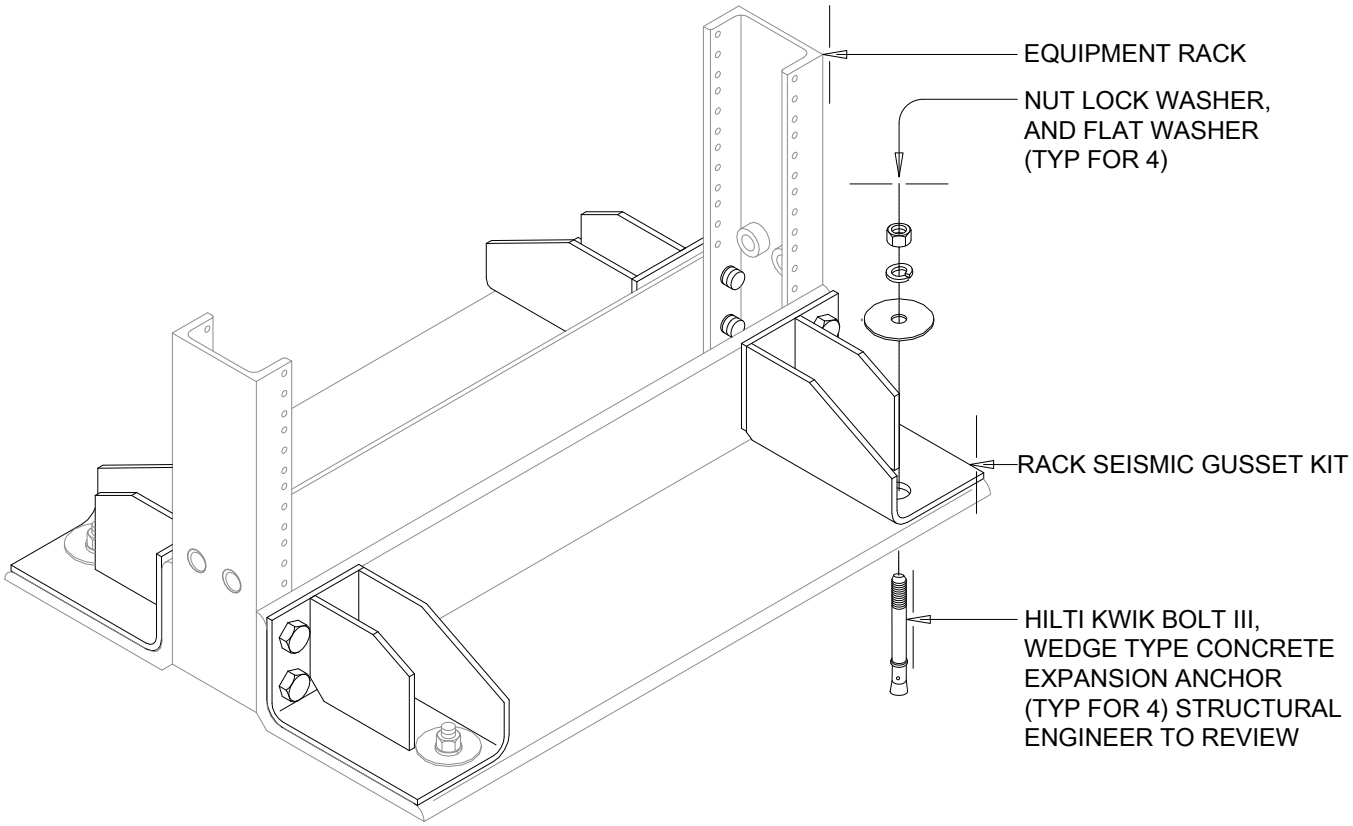
01 CABLE RUNWAY - 18 INCH
02 CABLE RUNWAY - 7 INCH RETAINER POST
03 PURPOSELY OMITTED
04 VERTICAL CABLE MANAGER - 6 INCH WIDE W/COVER
05 VERTICAL CABLE MANAGER - 10 INCH WIDE W/COVER
06 ROOM'S ELECTRICAL PANEL
07 ROOM'S BONDING BUSBAR AT 90 INCHES AFF
08 INSULATION BATTING
09 GYPSUM BOARD CAPPED CEILING
10 ACD FIBER OPTIC PATCH PANEL
11 EZ-PATH 44
12 MAKE SURE TRAY SUPPORTS DO NOT HINDER OPENING OF CABLE MANAGER DOORS

UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
BASIC IDF (TR) LAYOUT ELEVATION
RACK-BAY

SKETCH No: SK504A
DATE: 3/4/2023
REVISION: 3
SCALE: NONE



NOTE: 1. REFER TO ROOM PLANS FOR EQUIPMENT RACK TYPE, SIZE, AND LOCATION(S).

UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

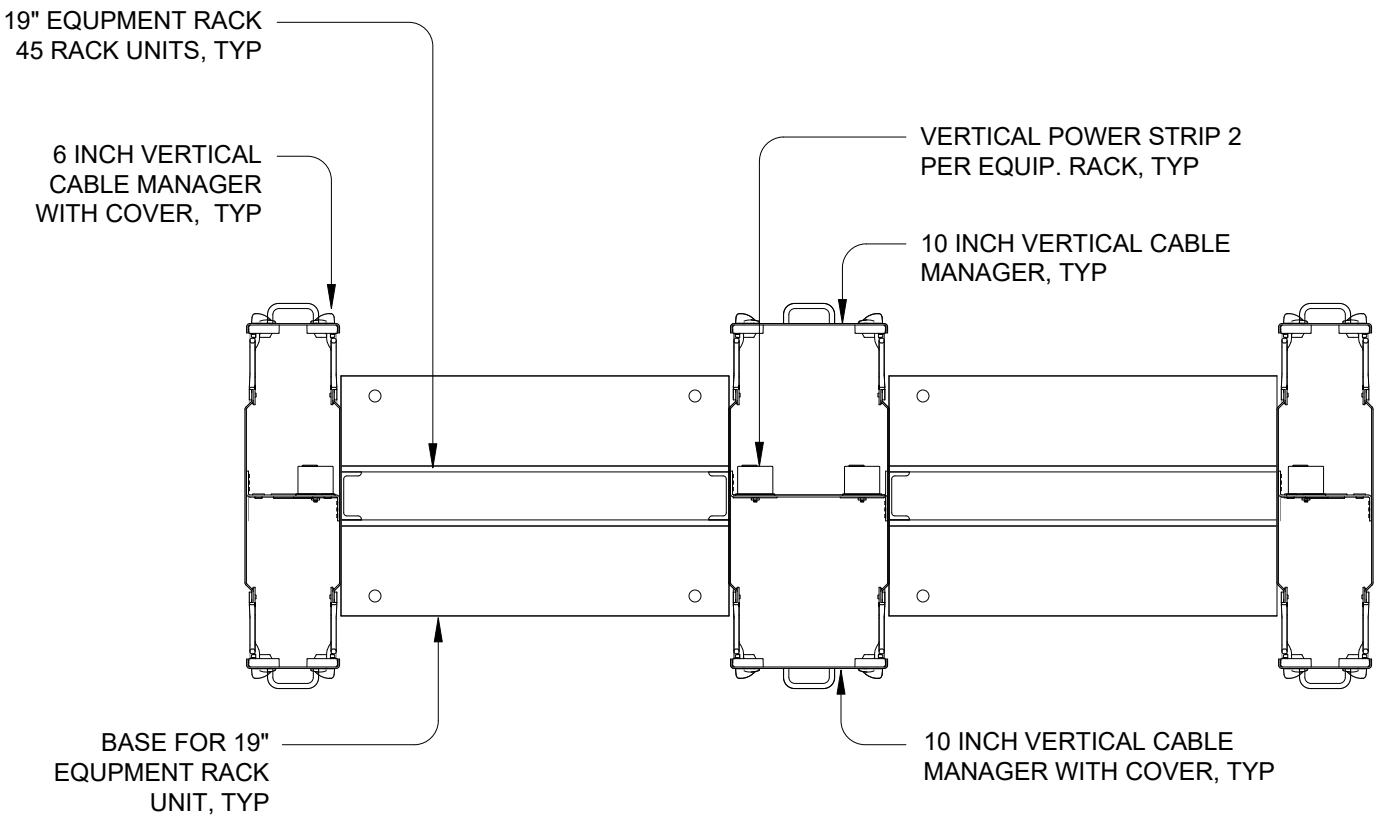
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS EQUIPMENT RACK ANCHORING – WITH GUSSET KIT

SKETCH No:	SK505
DATE:	6/15/14
REVISION:	3
SCALE:	NONE

REAR OF RACK BAY



FRONT OF RACK BAY

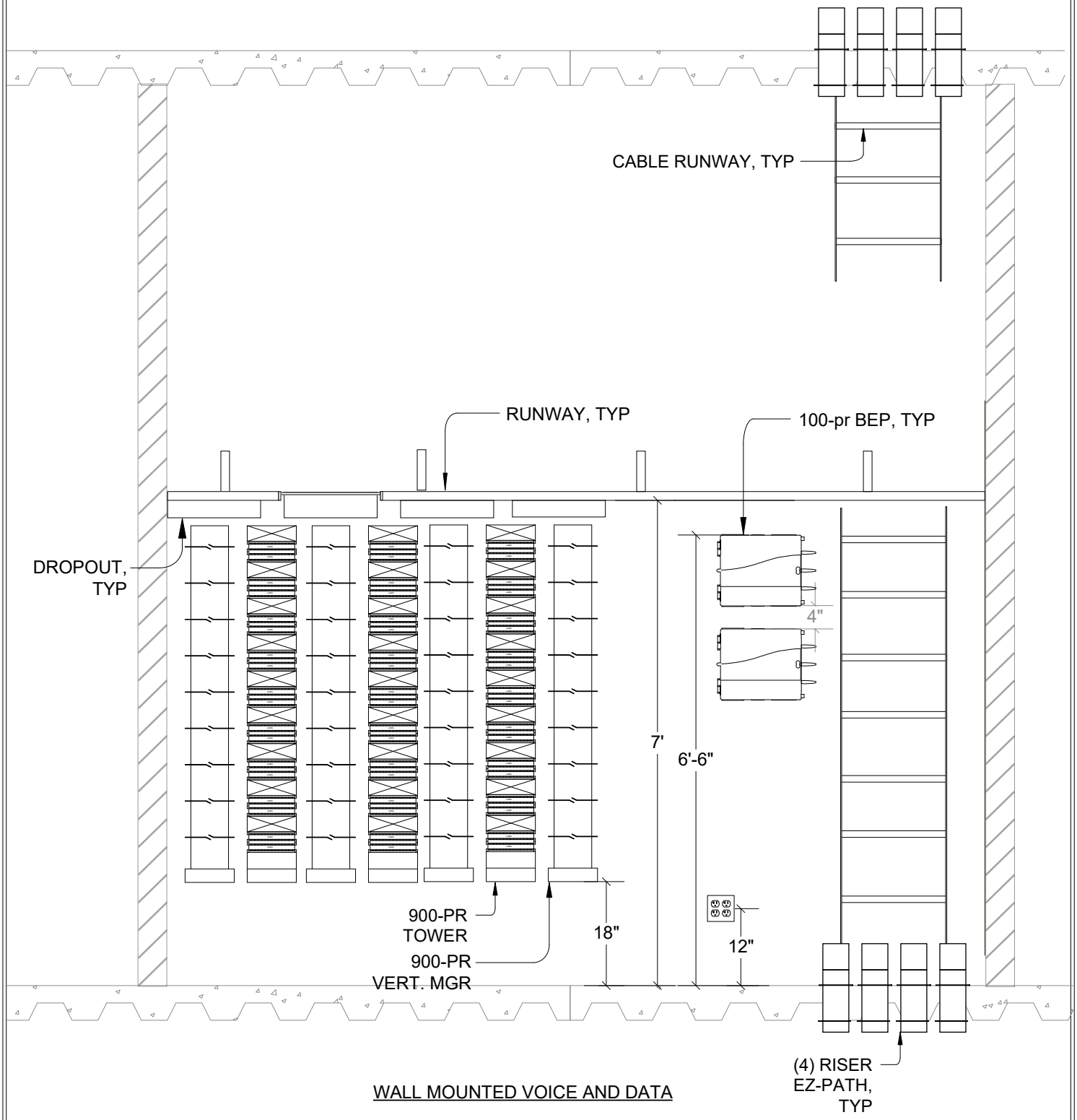
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION
TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
POWER DISTRIBUTION UNIT
MOUNTING WITHIN
EQUIPMENT RACK
VERTICAL CABLE MANAGER

SKETCH No:	SK506
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



WALL MOUNTED VOICE AND DATA

(FOR LAYOUT OF 110 FIELD, REFER TO SK508)

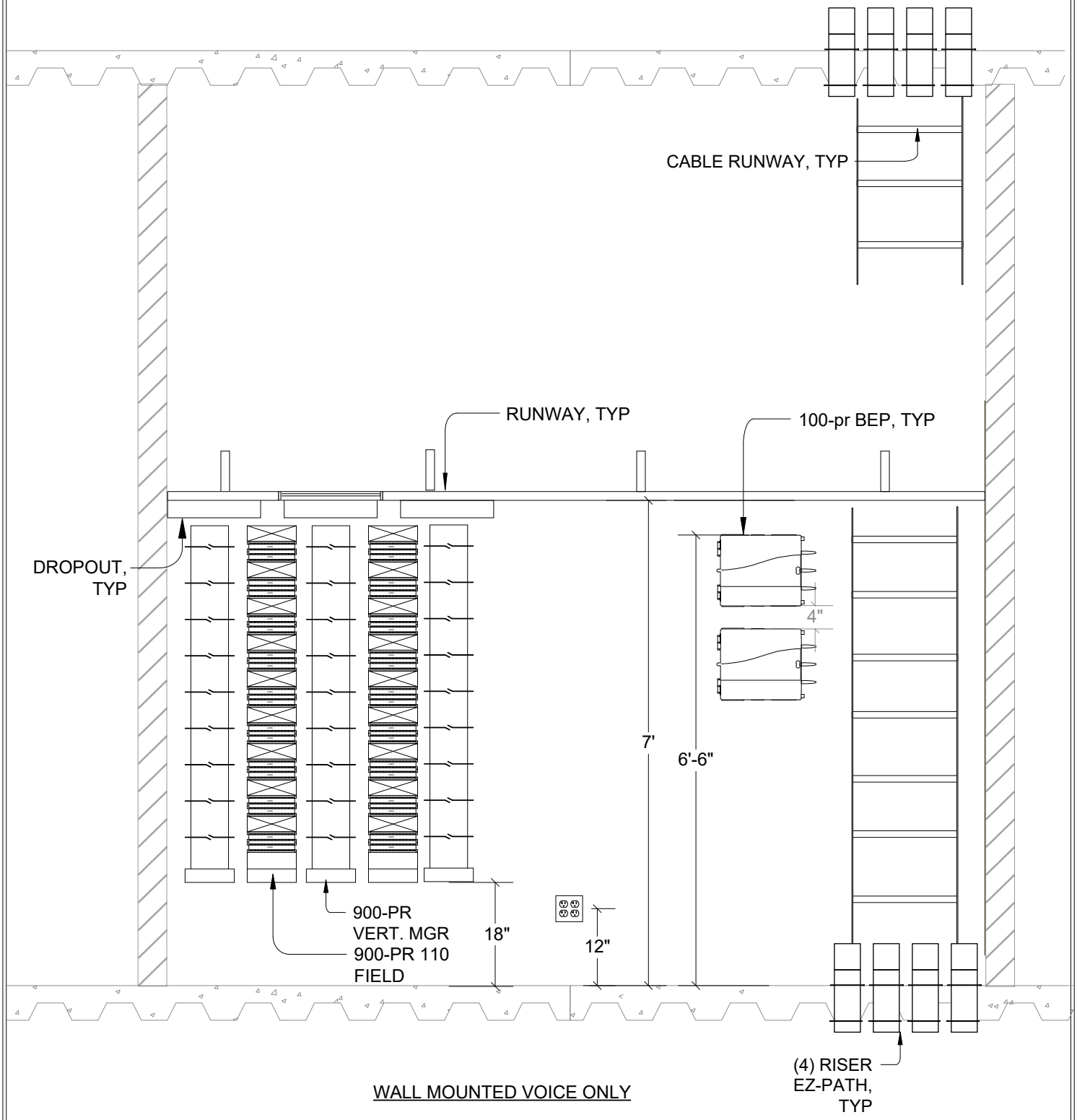
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
WALL MOUNTED VOICE AND DATA TERMINATION EQUIPMENT

SKETCH No:	SK507
DATE:	6/15/17
REVISION:	4
SCALE:	NONE



WALL MOUNTED VOICE ONLY

(FOR LAYOUT OF 110 FIELD, REFER TO SK508A)

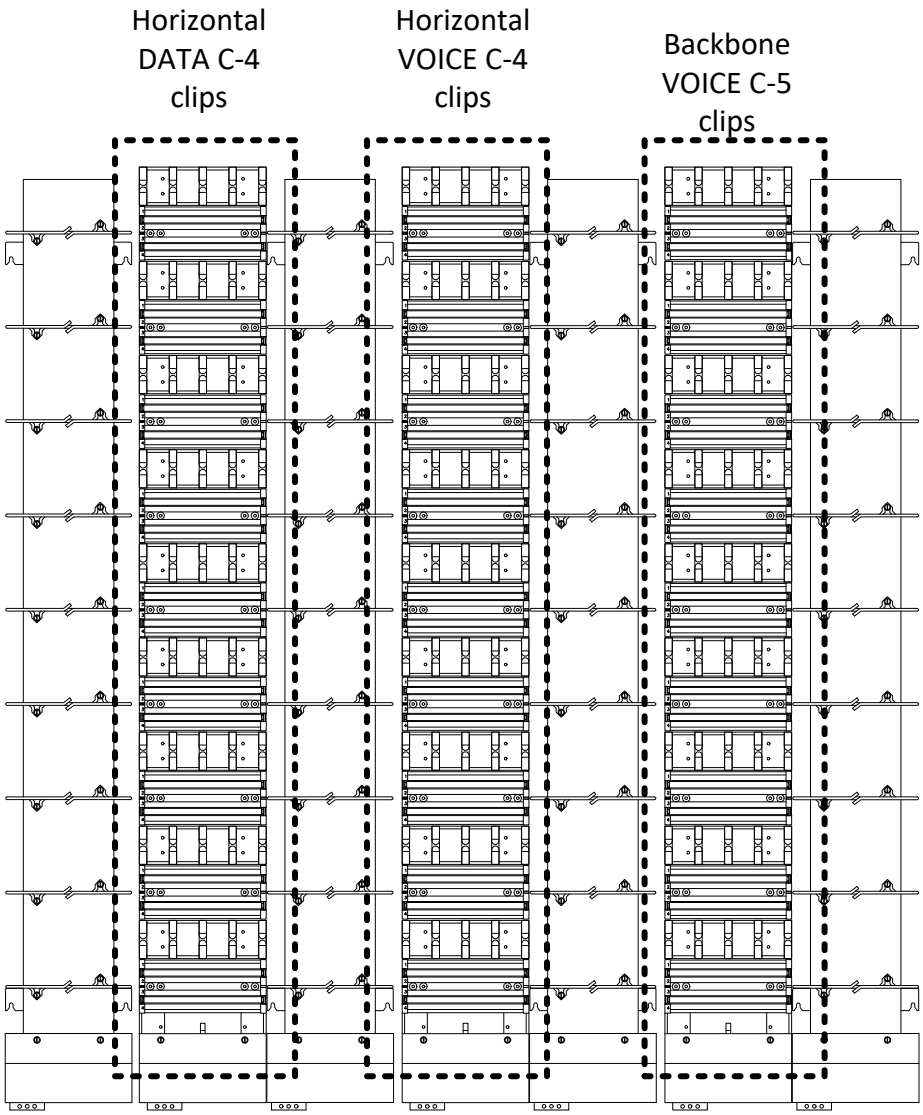
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
WALL MOUNTED VOICE
TERMINATION EQUIPMENT

SKETCH No:	SK507A
DATE:	6/15/17
REVISION:	4
SCALE:	NONE



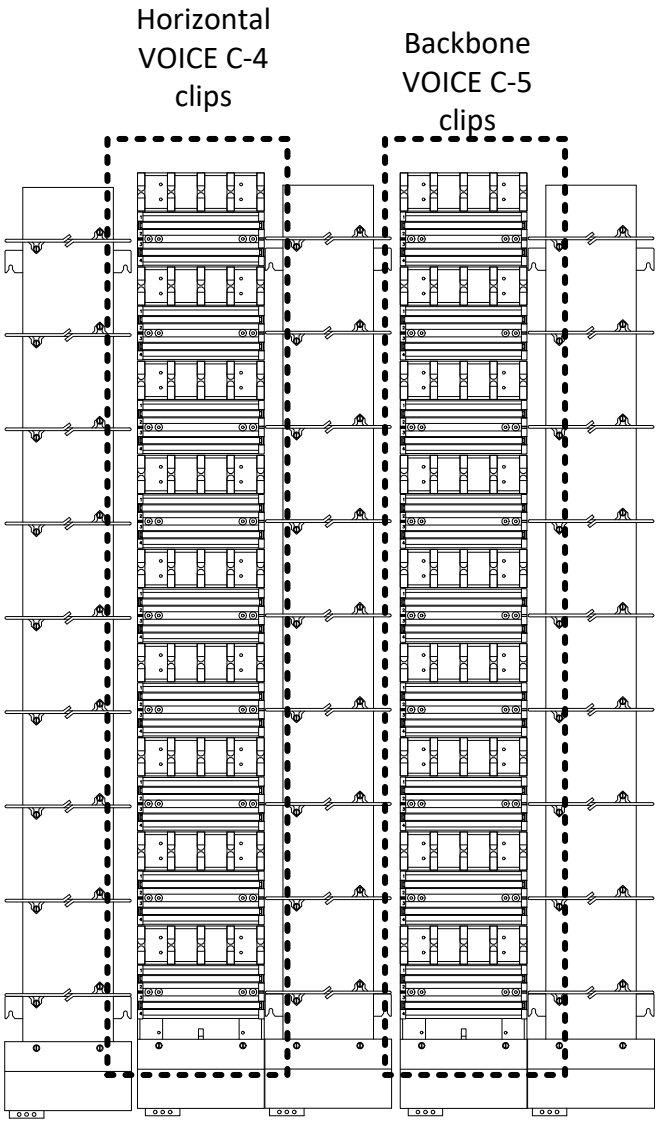
FOR ANY INSTALLATION OF 110 BLOCK WHERE HORIZONTAL VOICE AND DATA ARE TERMINATED ON THE WALL

UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

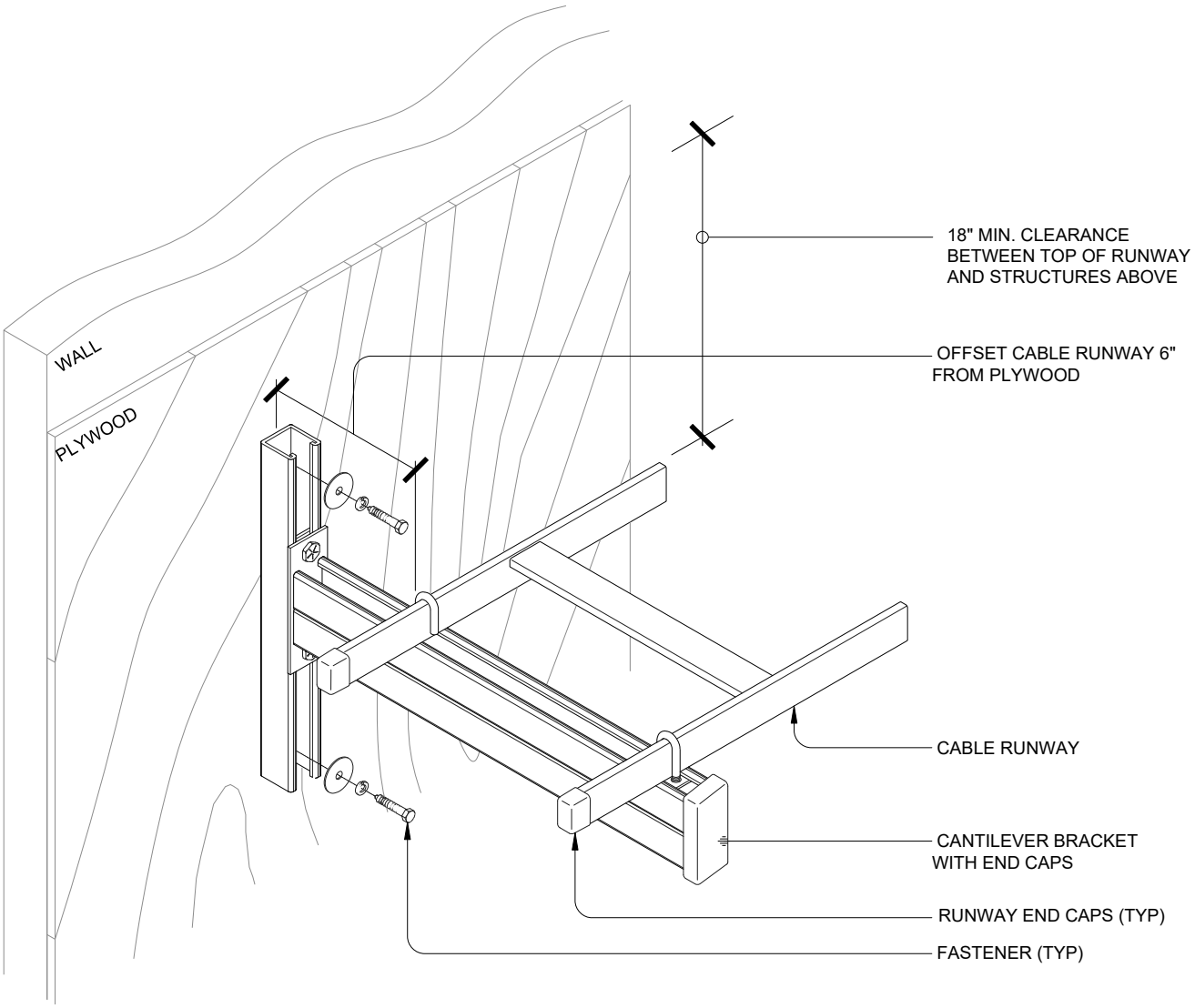
DESCRIPTION:
TELECOMMUNICATIONS
900-pr 110 BLOCK ELEVATION AND ALLOCATION VOICE AND DATA

SKETCH No:	SK508
DATE:	6/15/17
REVISION:	4
SCALE:	NONE



FOR ANY INSTALLATION OF 110 BLOCK WHERE ONLY HORIZONTAL VOICE IS TERMINATED ON THE WALL

UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS 900-pr 110 BLOCK ELEVATION AND ALLOCATION VOICE ONLY	SKETCH No: SK508A DATE: 6/15/17 REVISION: 4 SCALE: NONE



NOTE:1. SECURE BRACKET TO PLYWOOD USING APPROPRIATE FASTENERS.

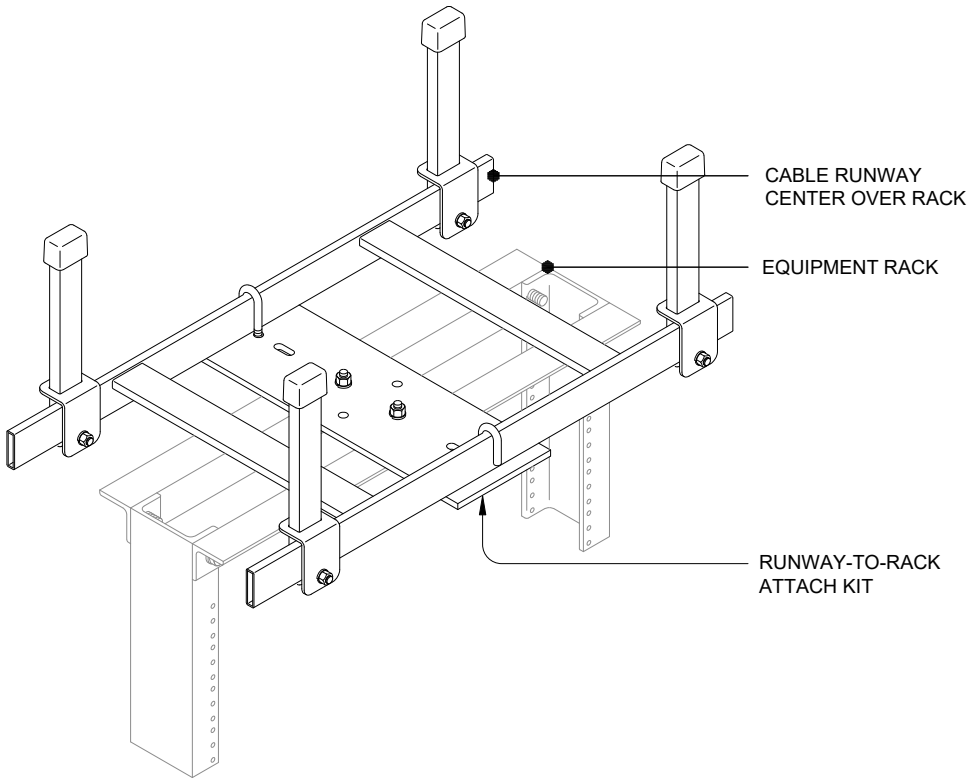
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
CABLE RUNWAY TO WALL
BRACING

SKETCH No:	SK509
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



NOTES: 1. UTILIZE FASTENERS INCLUDED WITH RACK-TO-RUNWAY-ATTACHMENT KIT

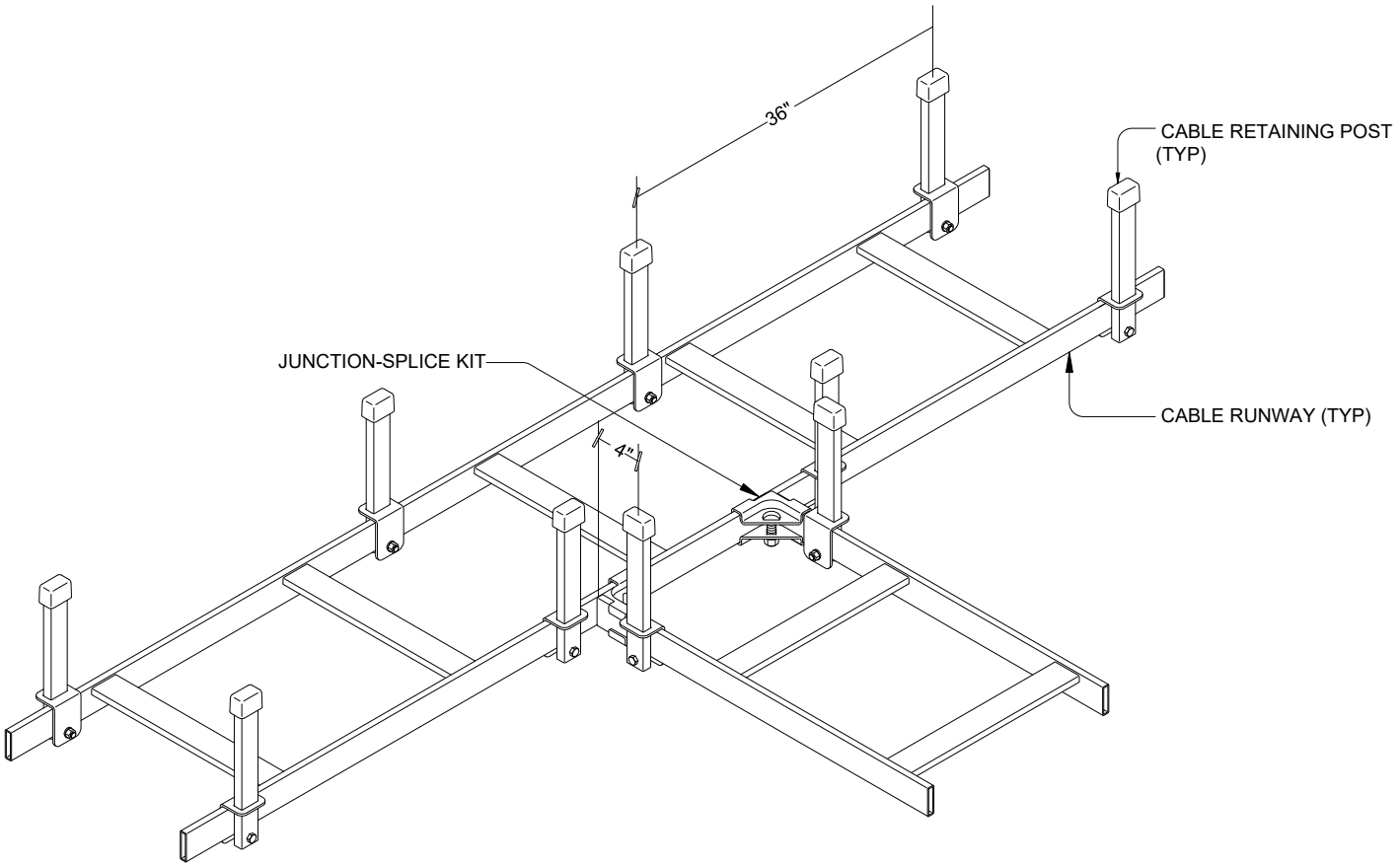
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
CABLE RUNWAY TO RACK
BRACING

SKETCH No:	SK510
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



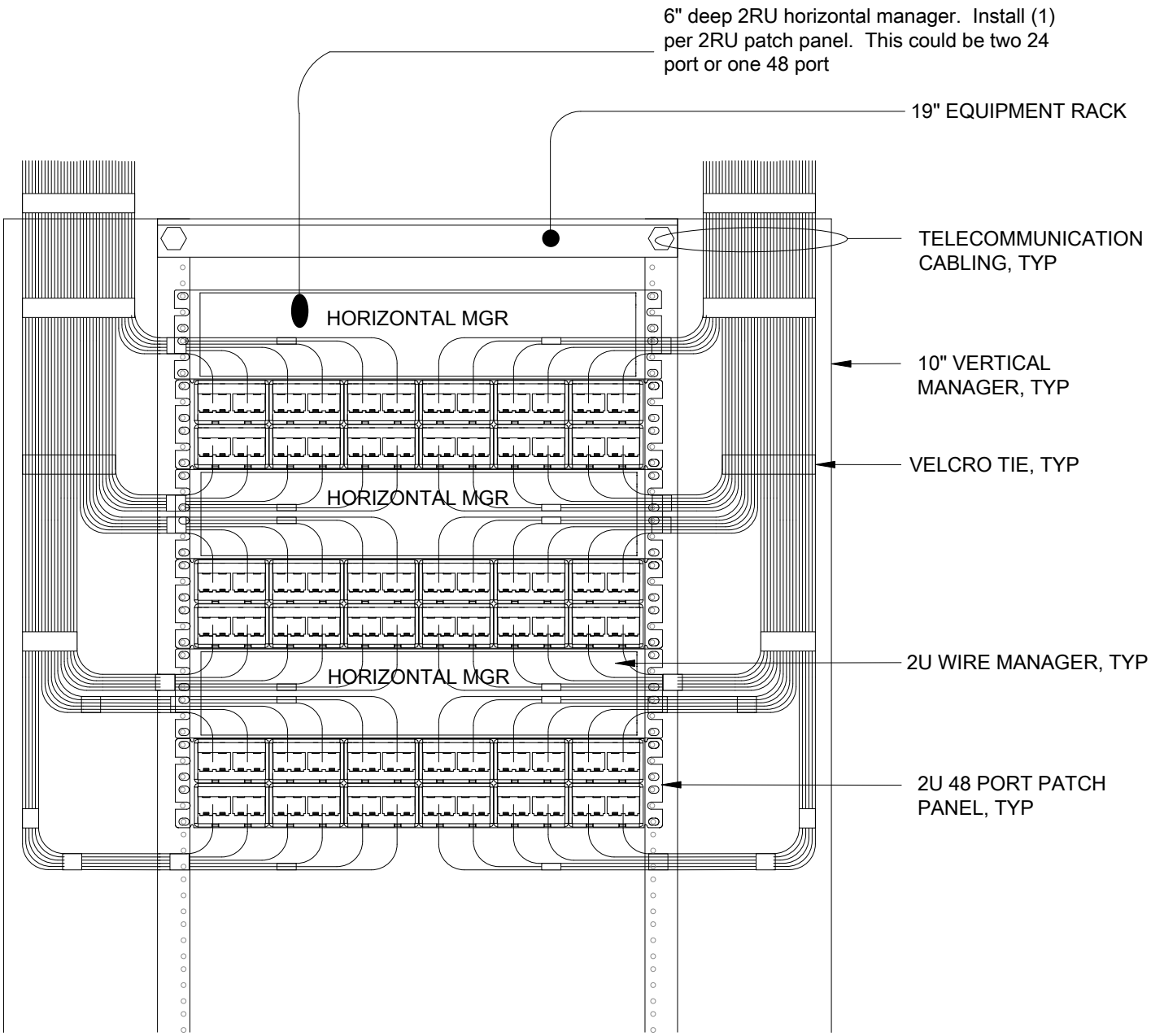
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
CABLE RUNWAY RETAINER
POST

SKETCH No:	SK511
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



VIEW FROM BACK OF RACK

TOTAL OF 7 HORIZONTAL MINDERS ON FRONT OF RACK AND 6 ON BACK FOR A TOTAL OF 13 PER RACK.
CAT5E AND CAT6A PATCH PANEL MINDERS MAY BE COMBINED ON THE SAME RACK.

UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

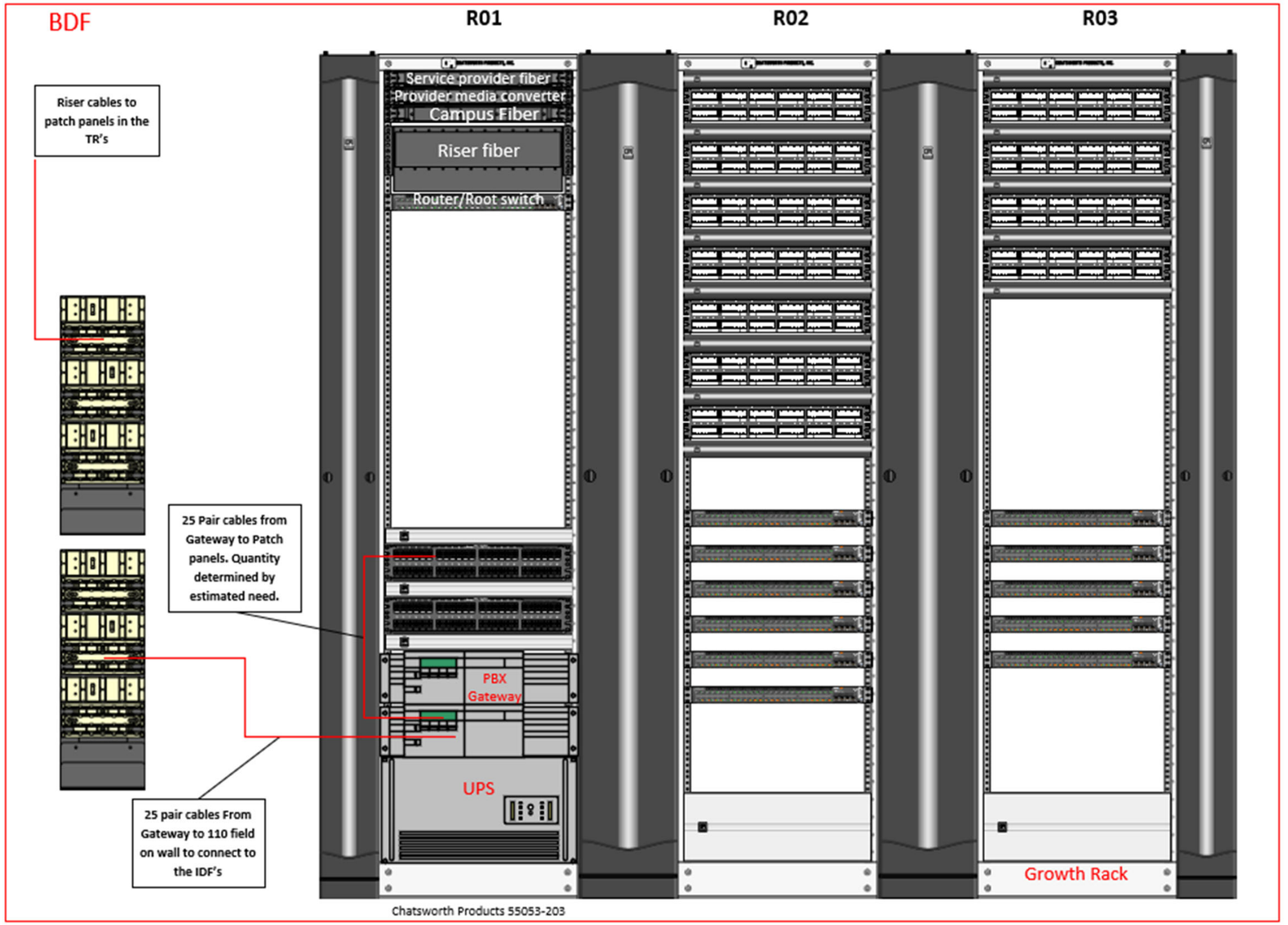
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
HORIZONTAL CABLE ROUTING
AT EQUIPMENT RACK BAY

SKETCH No:	SK512
DATE:	6/15/14
REVISION:	3
SCALE:	NONE

BDF



Panduit FRME4
Fiber shelf for riser cables

Panduit FRME1
Fiber shelf for feeder cable

Panduit #DP485E88TGY
48 Port Cat 5E Patch panel
Used for single pair circuits from the PBX Gateway

Panduit #CPP48FMWBLY
Flush Mount Modular Patch Panel accepts up to 48 Mini-Com Modules. Used for station cables

Chatsworth #35441-704
Evolution Single-Sided Horizontal Cable Manager, 19"W x 4 RMU x 8.2"D

Evolution Single-Sided Horizontal
Cable Manager, 19"W x 1 RMU x 8.2"D

CPI #35521-703
7'-0"H x 6"W x 24.5"D, double sided, black, "Evolution Cable Management"

CPI #35523-703
7'-0"H x 10"W x 24.5"D, double sided, black, "Evolution Cable Management"

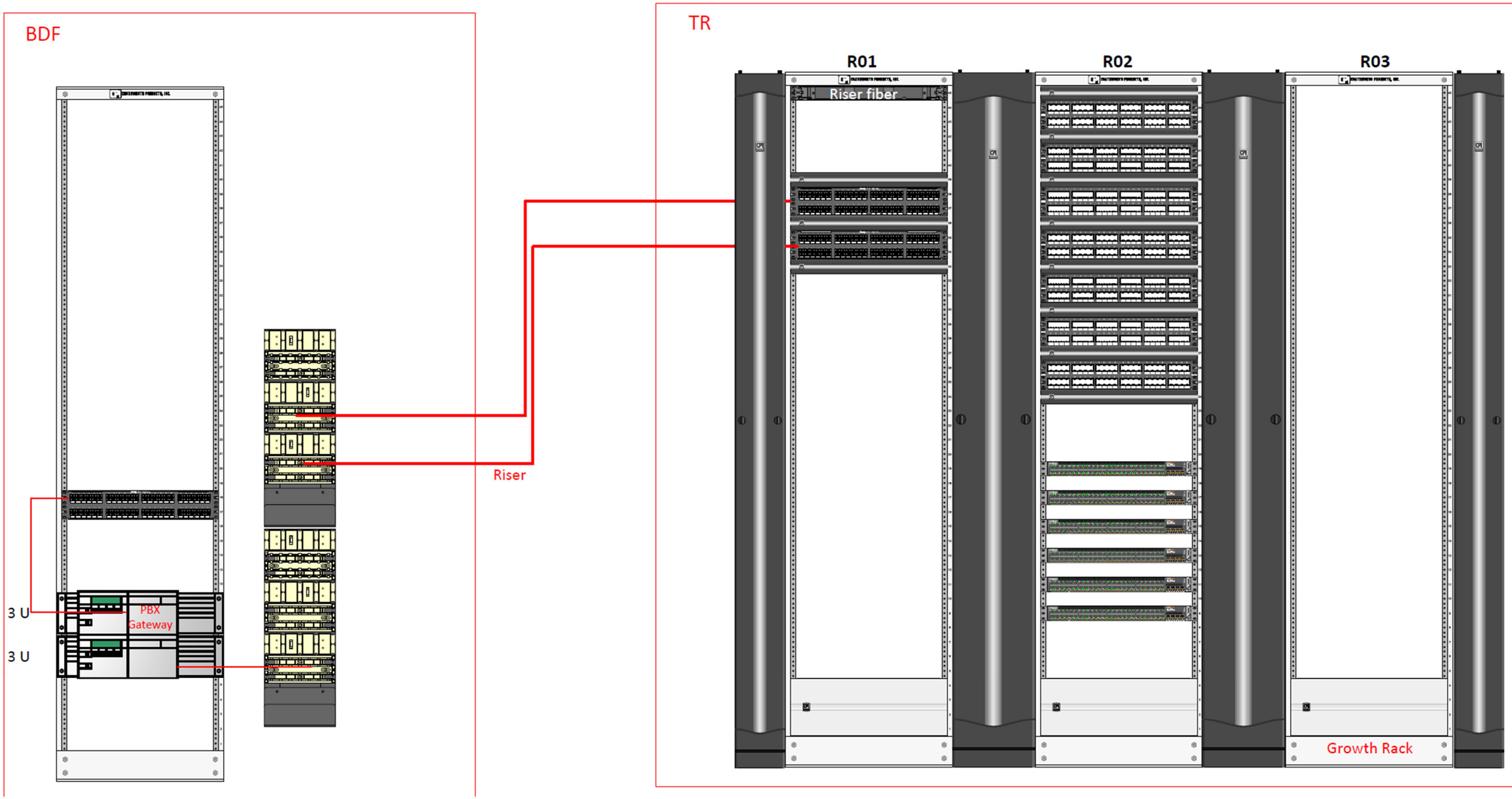
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS

MDF (BDF) ELEVATION STANDARD DESIGN AND VOICE FEEDER TERMINATIONS

SKETCH No:	SK513
DATE:	3/4/2023
REVISION:	
SCALE:	NONE

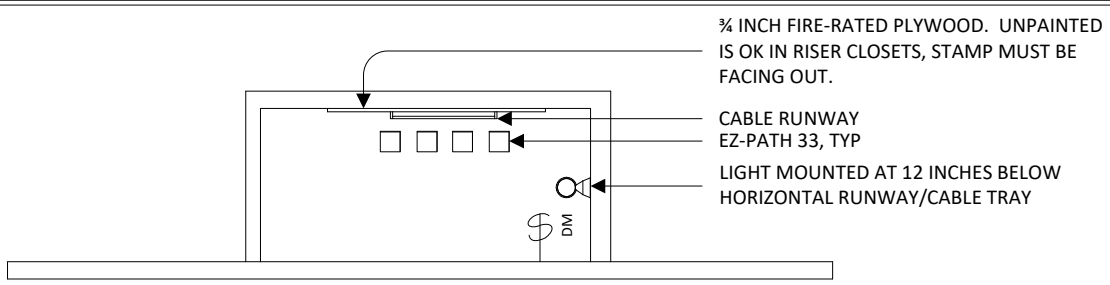


UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY
IT Infrastructure Standards

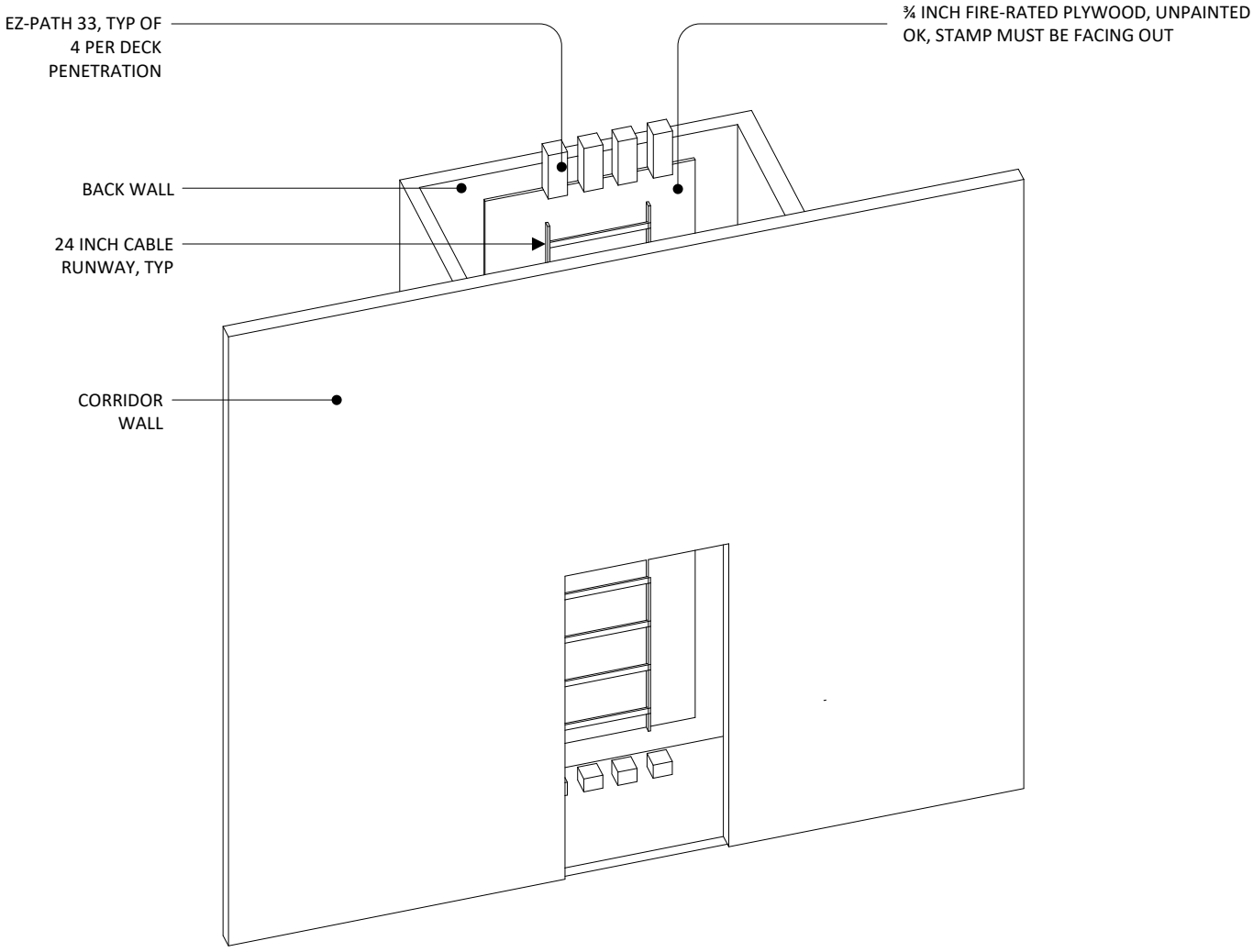
DESCRIPTION:

IDF (TR) Elevation Standard Design and Voice Feeder Terminations

SKETCH No:	SK514
DATE:	3/4/2023
REVISION:	
SCALE:	NONE



PLAN VIEW



ISO VIEW

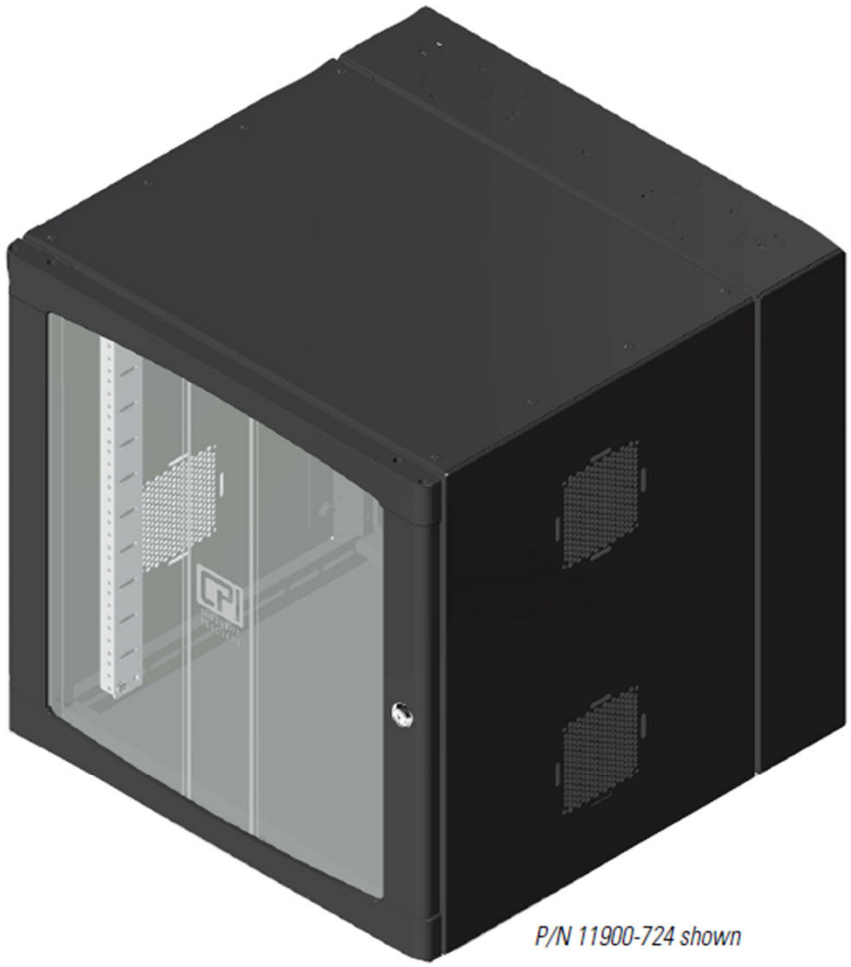
UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS RISER CLOSET	SKETCH No: SK520 DATE: 6/15/14 REVISION: 3 SCALE: NONE

CUBE-iT Wall-Mount Cabinets

- Attaches to the wall with included installation hardware
- Available in 12U, 19U and 26U heights, with solid metal or tempered glass door options
- All cabinet styles are 24"W (610 mm)
- Includes CH751 keyed lock

Part Number	Cabinet Depth	Door Style	Shipping Weight lb (kg)
24"H (610 mm) CUBE-iT Cabinet			
11890-X24	18" (460 mm)	Solid	90 (40.9)
11901-X24	18" (460 mm)	Tempered Glass	90 (40.9)
11840-X24	24" (610 mm)	Solid	101 (45.9)
11900-X24	24" (610 mm)	Tempered Glass	101 (45.9)
11996-X24	30" (760 mm)	Solid	112 (50.9)
12419-X24	30" (760 mm)	Tempered Glass	112 (50.9)
36"H (910 mm) CUBE-iT Cabinet			
11890-X36	18" (460 mm)	Solid	114 (51.8)
11901-X36	18" (460 mm)	Tempered Glass	114 (51.8)
11840-X36	24" (610 mm)	Solid	128 (58.2)
11900-X36	24" (610 mm)	Tempered Glass	128 (58.2)
11996-X36	30" (760 mm)	Solid	142 (64.5)
12419-X36	30" (760 mm)	Tempered Glass	142 (64.5)
48"H (1220 mm) CUBE-iT Cabinet			
11890-X48	18" (460 mm)	Solid	139 (63.2)
11901-X48	18" (460 mm)	Tempered Glass	139 (63.2)
11840-X48	24" (610 mm)	Solid	155 (70.5)
11900-X48	24" (610 mm)	Tempered Glass	155 (70.5)
11996-X48	30" (760 mm)	Solid	171 (77.7)
12419-X48	30" (760 mm)	Tempered Glass	171 (77.7)

Note: X=Color; 7=Black and E=Glacier White



P/N 11900-724 shown

UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
STANDARD CUBE-iT WALL MOUNT CABINET

SKETCH No: SK521

DATE: 3/4/2022

REVISION:

SCALE:

ThinLine II Wall-Mount Cabinet

The space-saving ThinLine II safely secures 19"EIA rack-mount network equipment with minimal intrusion into the room—perfect for tight areas and high-traffic places such as classrooms and retail stores.

The ThinLine II maximizes interior space using a distinctive equipment mounting rail system. Individual rails can be easily rotated for horizontal or vertical mounting and then bolted into place, making patch panel punchdown easier. The cabinet can hold a server, switch, horizontal cable manager, patch panel, fiber service loop and fiber-optic patch panel — with room to accommodate additional mounting needs.

An easy-to-remove top panel slides in and out of position (without tools) using a spring button release. In addition, the 26"H (660 mm) cabinet can be mounted so that the removable "top" panel becomes a side panel.

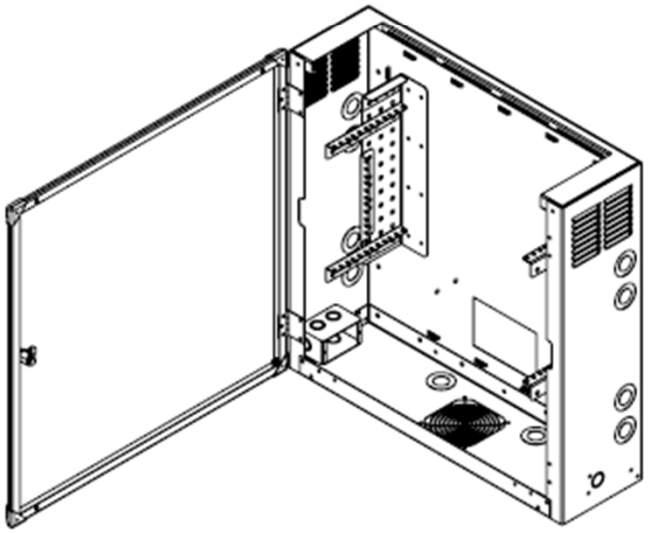
A 4" x 6" (100 mm x 150 mm) opening in the rear of the cabinet and knockouts sized 3/4" and 1-1/2" allow cable entry and exit. Multiple cable tie-down points in rear panel and included Saf-T-Grip® straps secure cables safely.

- Door features rounded edges and corners and can be mounted to open from either right or left
- Removable top panel provides direct access to equipment without disturbing other devices
- Multiple pairs of mounting rails support equipment in vertical, horizontal or angled orientation
- Multiple sets of knockouts allow flexibility in cable organization
- Louvers and fan accessory provide ventilation
- Cabinet includes a 2" x 4" (50 mm x 100 mm) junction box to hold an optional surge-suppressed duplex outlet, eliminating the need for a power strip
- Made of steel
- Ships assembled with extra mounting rails and mounting hardware
- Static load rating is 100 lb (45.4 kg)

ORDERING INFORMATION

Part Number	Description	Shipping Weight lb (kg)
13050-X11	26"H x 26"W x 5"D, 2U (660 mm x 660 mm x 130 mm)	47 (21.3)
13050-X12	26"H x 26"W x 8.5"D, 4U (660 mm x 660 mm x 216 mm)	54 (24.5)
13050-X13	26"H x 26"W x 12"D, 6U (660 mm x 660 mm x 300 mm)	60 (27.2)
13050-X21	36"H x 26"W x 5"D, 2U (910 mm x 660 mm x 130 mm)	60 (27.2)
13050-X22	36"H x 26"W x 8.5"D, 4U (910 mm x 660 mm x 216 mm)	68 (30.8)
13050-X23	36"H x 26"W x 12"D, 6U (910 mm x 660 mm x 300 mm)	76 (34.5)

X-color: 1-Gray, 2-Computer Beige, 7-Black



UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

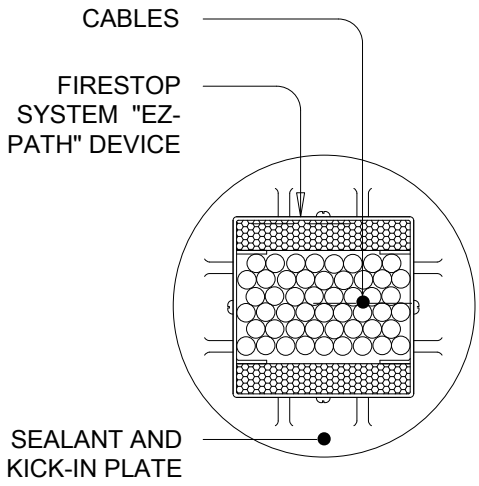
TELECOMMUNICATIONS
THINLINE II WALL MOUNT CABINET

SKETCH No: SK522

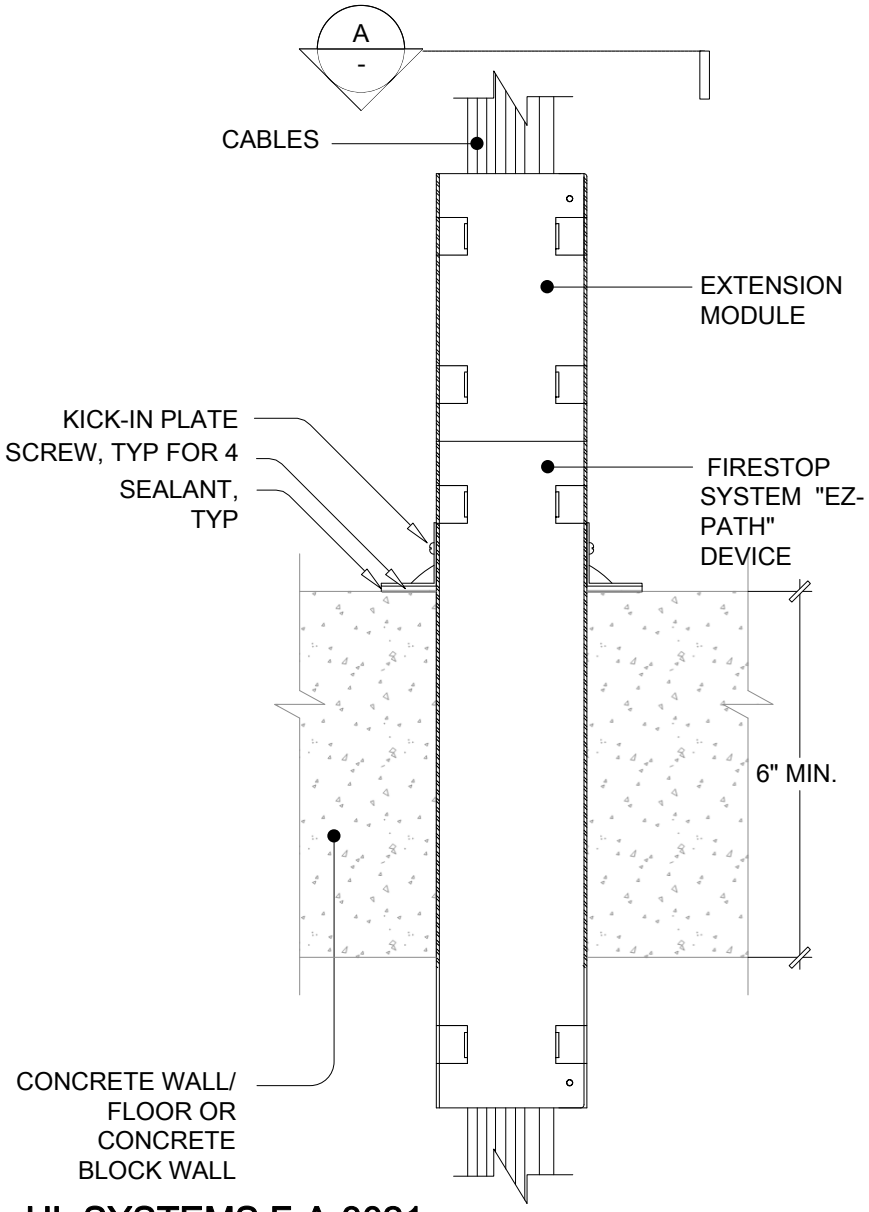
DATE: 3/4/2022

REVISION:

SCALE: NONE



SECTION A



UL SYSTEMS F-A-3021

T = 2 HR

F = 3 HR

CONSULT CURRENT UNDERWRITERS LABORATORIES "FIRE RESISTANCE DIRECTORY" FOR DETAILS

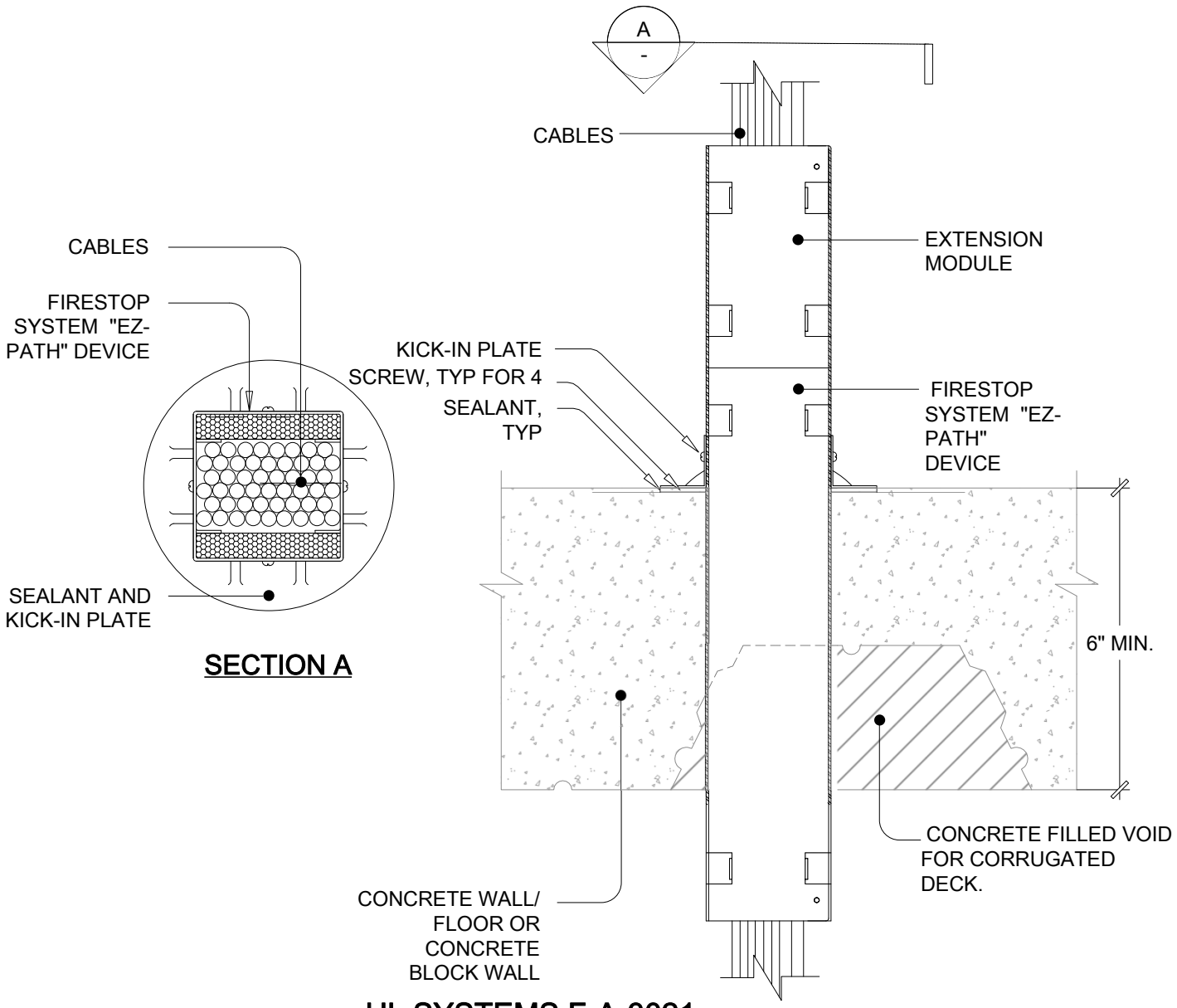
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
EZ-PATH FLOOR
PENETRATION FOR 2 HR
TEMPERATURE 3 HR FIRE
(**NON-CORRUGATED DECK**)

SKETCH No:	SK523
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



SECTION A

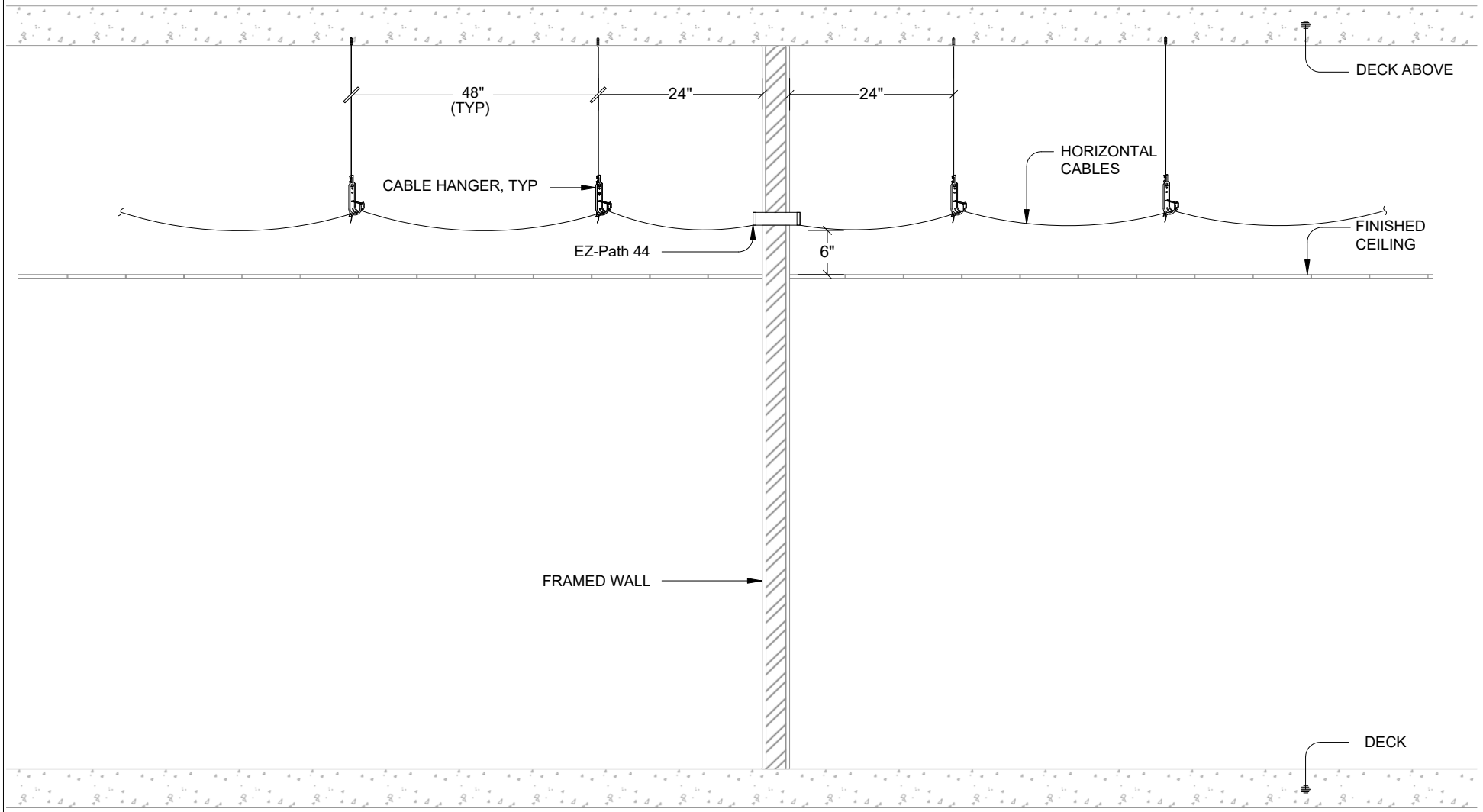
UL SYSTEMS F-A-3021

T = 2 HR

F = 3 HR

CONSULT CURRENT UNDERWRITERS LABORATORIES "FIRE RESISTANCE DIRECTORY" FOR DETAILS

UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS EZ-PATH FLOOR PENETRATION FOR 2 HR TEMPERATURE 3 HR FIRE FOR **CORRUGATED DECK**	SKETCH No: SK524 DATE: 6/15/14 REVISION: 3 SCALE: NONE



NOTES:
1. DO NOT TIE CABLES TO BUILDING STRUCTURES.
2. PROVIDE SLEEVES OR CONDUITS WHERE REQUIRED.
3. SIZE BASED ON QUANTITY OF CABLES PLUS 40% SPARE CAPACITY.
4. PROVIDE BUSHING ON SLEEVE AND CONDUIT ENDS.
5. PROVIDE CABLE RETAINING CLIP ON CABLE HANGERS.

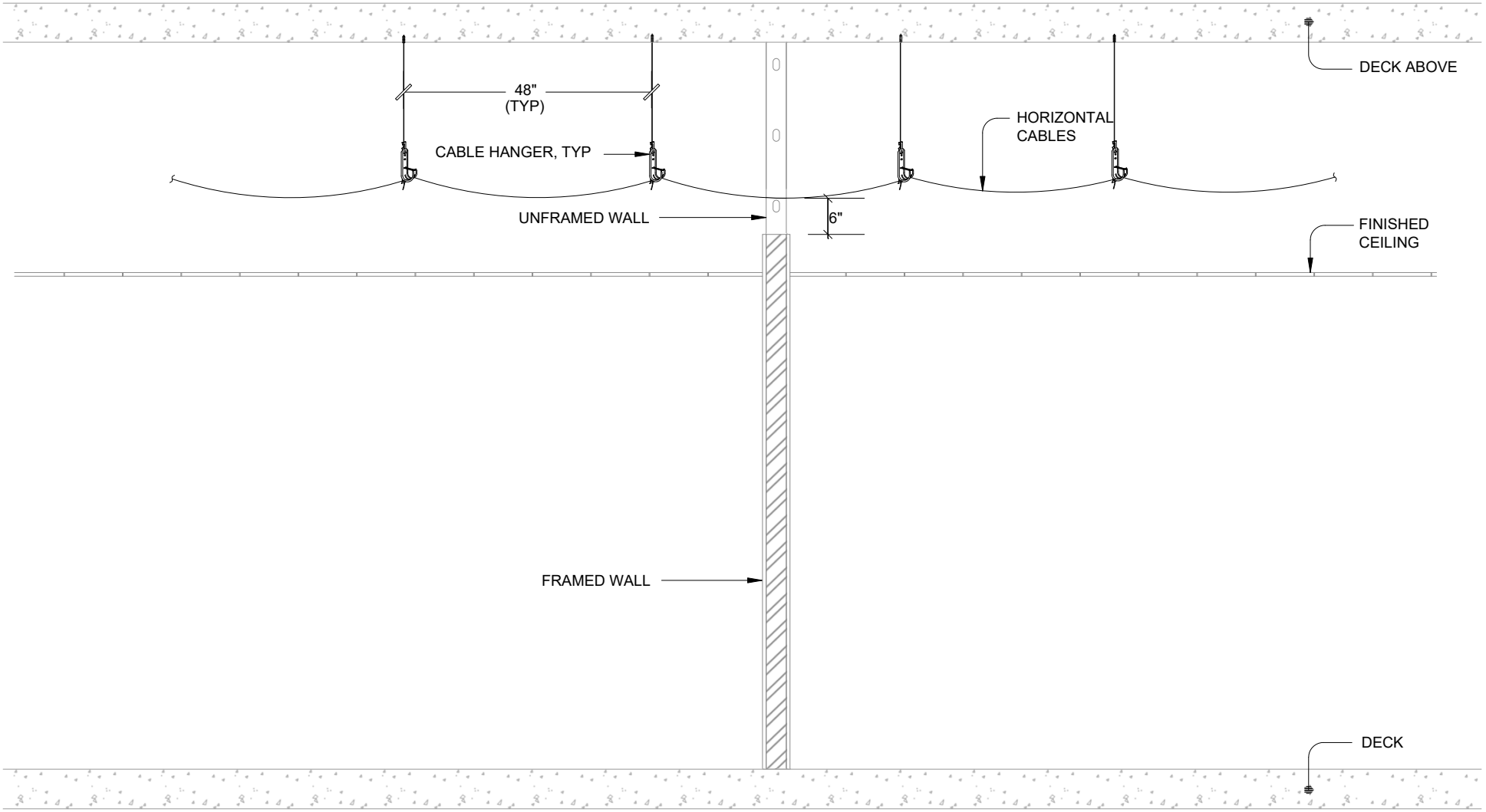
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
CABLE ROUTING DETAIL IN USER SPACE USING J-HANGER SUPPORT THROUGH FULL HEIGHT PARTITIONS.

SKETCH No:	SK600
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



NOTES:
1. DO NOT TIE CABLES TO STUDS.
2. DO NOT REST/SUPPORT CABLES ON TOP OF FRAMED WALL.
3. PROVIDE CABLE RETAINING CLIP ON CABLE HANGERS.

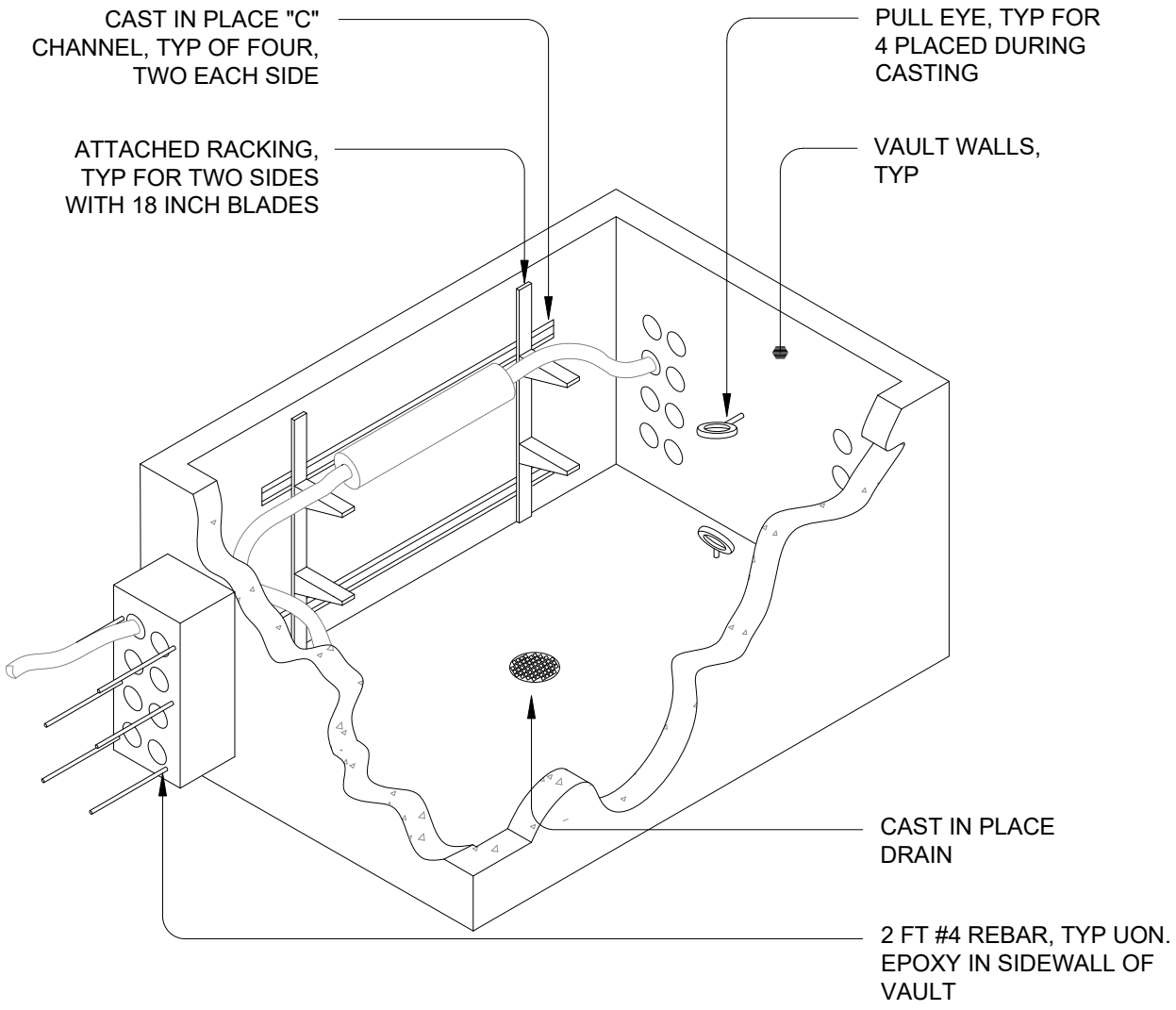
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
CABLE ROUTING DETAIL IN USER SPACE USING J-HANGER
SUPPORT FOR LOW PROFILE PARTITIONS

SKETCH No:	SK601
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



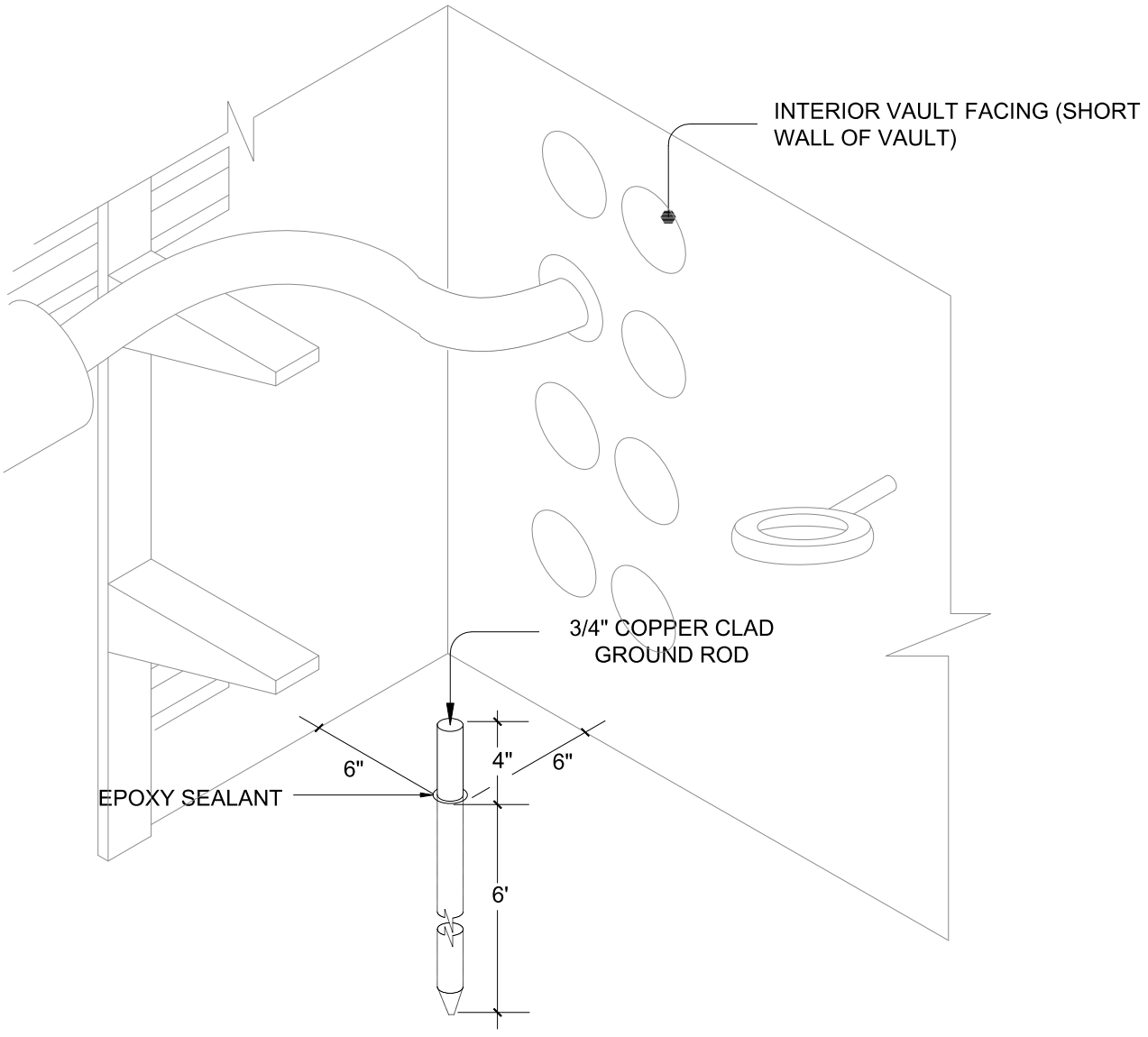
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS VAULT DETAIL (EXAMPLE ONLY)

SKETCH No:	SK700
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



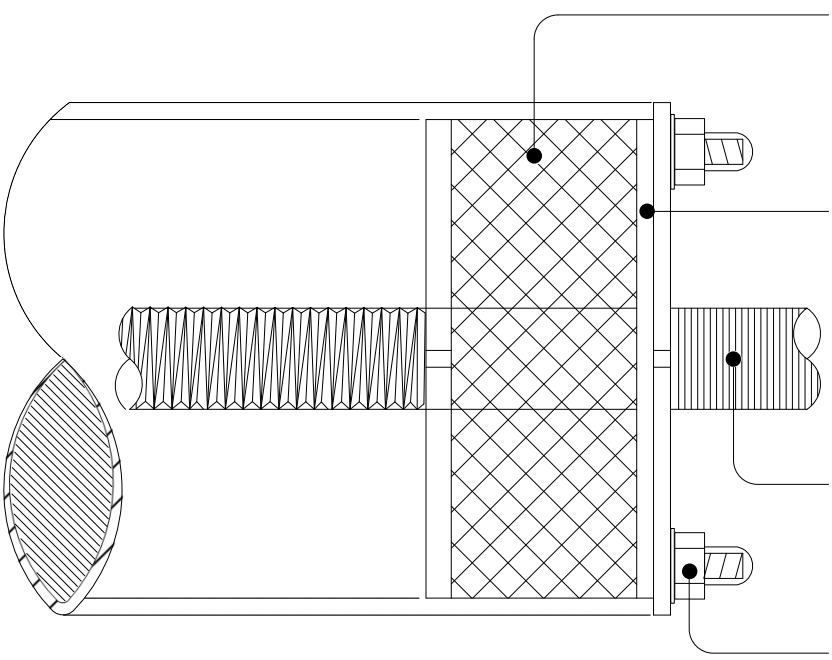
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

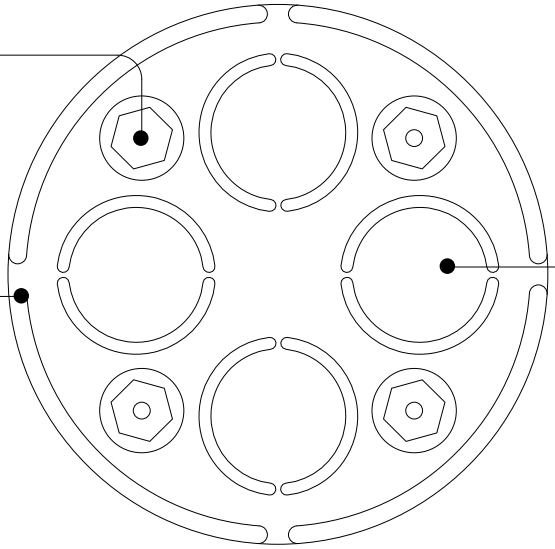
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS VAULT GROUND ROD

SKETCH No:	SK701
DATE:	6/15/14
REVISION:	3
SCALE:	NONE





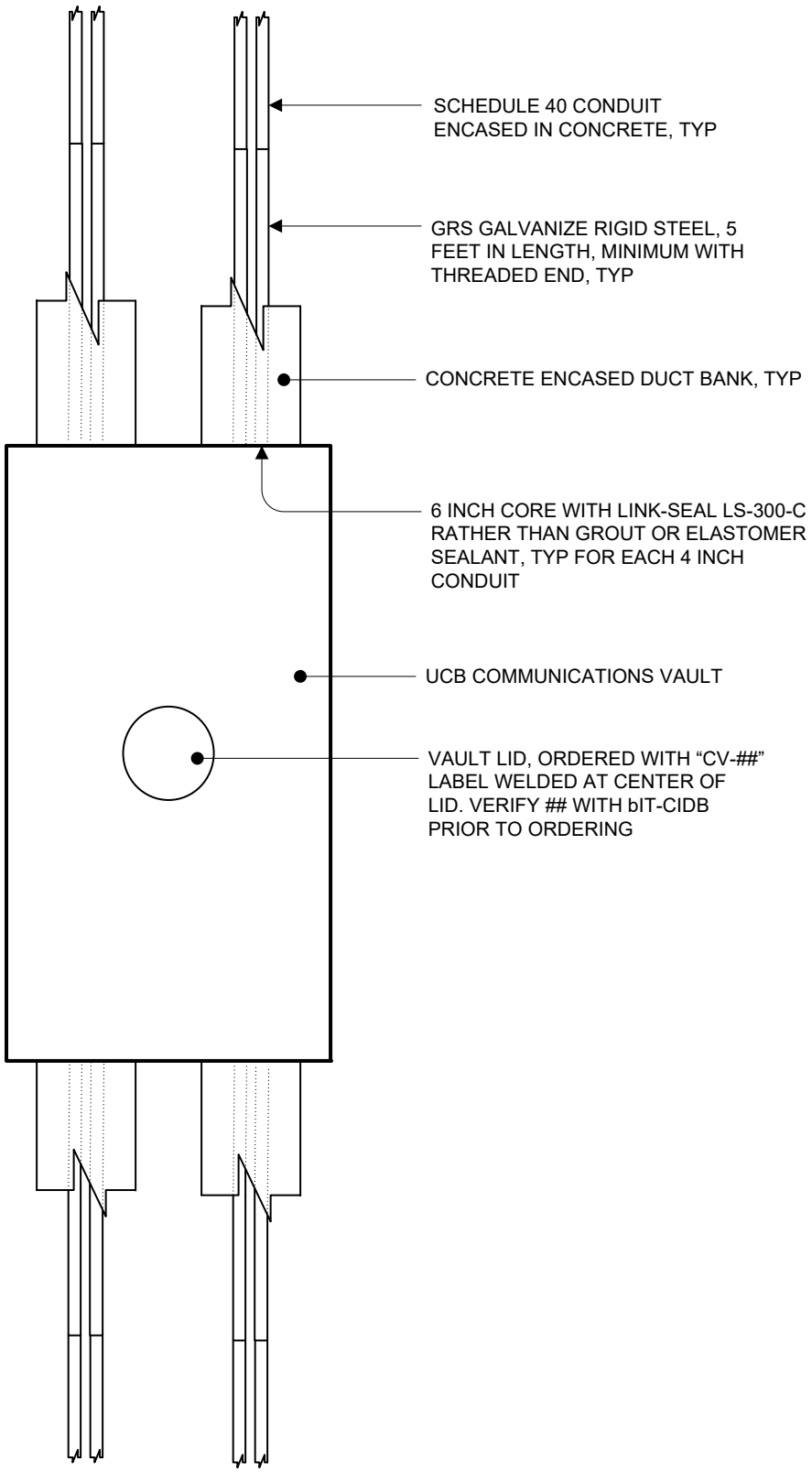
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
QUAD DUCT PLUG

SKETCH No:	SK702
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



UNIVERSITY OF CALIFORNIA
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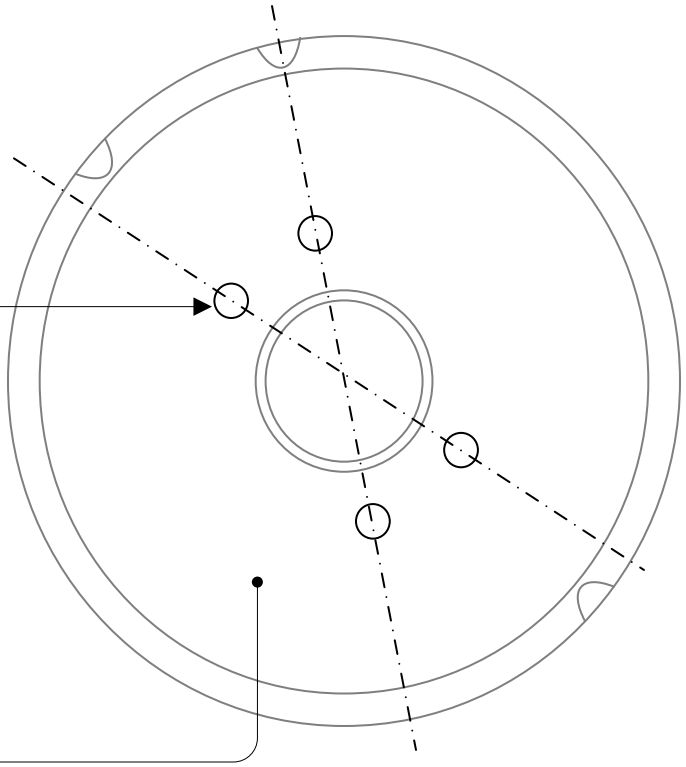
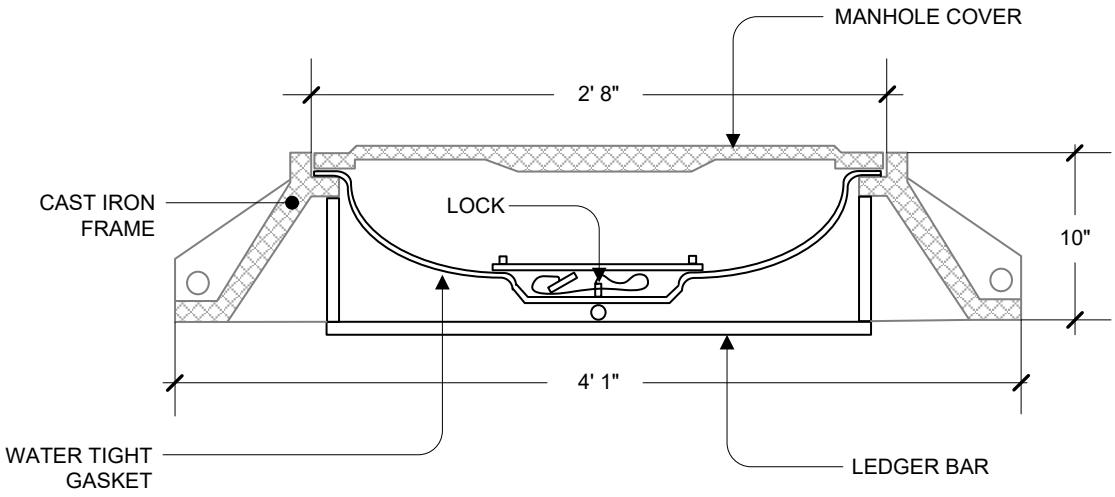
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS VAULT AND DUCT BANK CONNECTION DETAIL

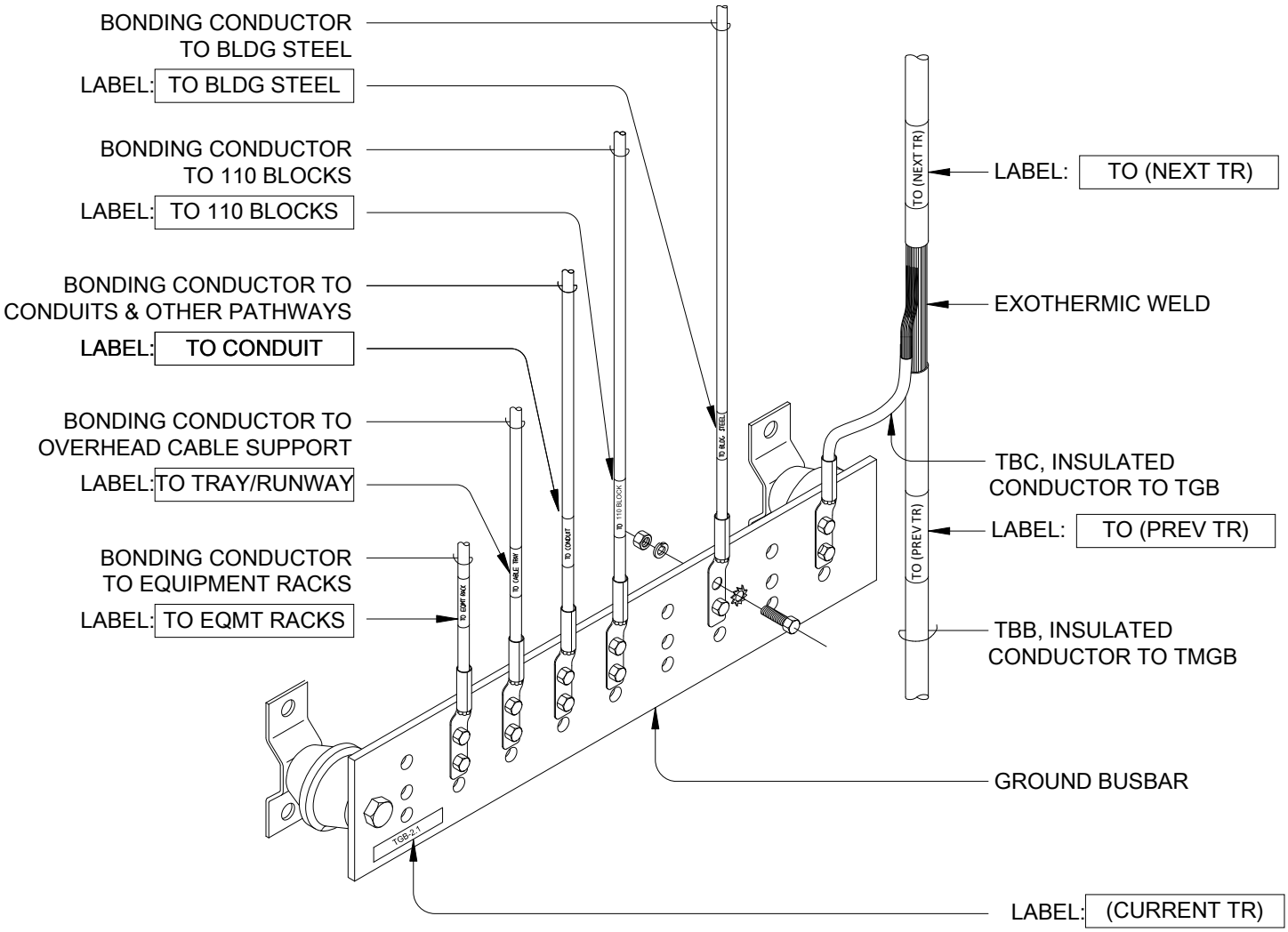
SKETCH No:	SK703
DATE:	6/15/14
REVISION:	3
SCALE:	NONE





NOTE: CONTRACTOR SHALL PROVIDE SHOP DRAWING FROM MANUFACTURER TO CONFIRM LOCATION OF LIFTING HOLES

UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS VAULT LID LOCKDOWN DEVICE	SKETCH No: SK704 DATE: 6/15/14 REVISION: 3 SCALE: NONE



NOTES: REFER TO ROOM PLANS FOR BUSBAR MOUNTING LOCATION.
REFER TO GROUNDING RISER DIAGRAM FOR LIST OF EQUIPMENT REQUIRING GROUNDING.
ITEMS SHOWN HERE ARE AN EXAMPLE.

UNIVERSITY OF CALIFORNIA
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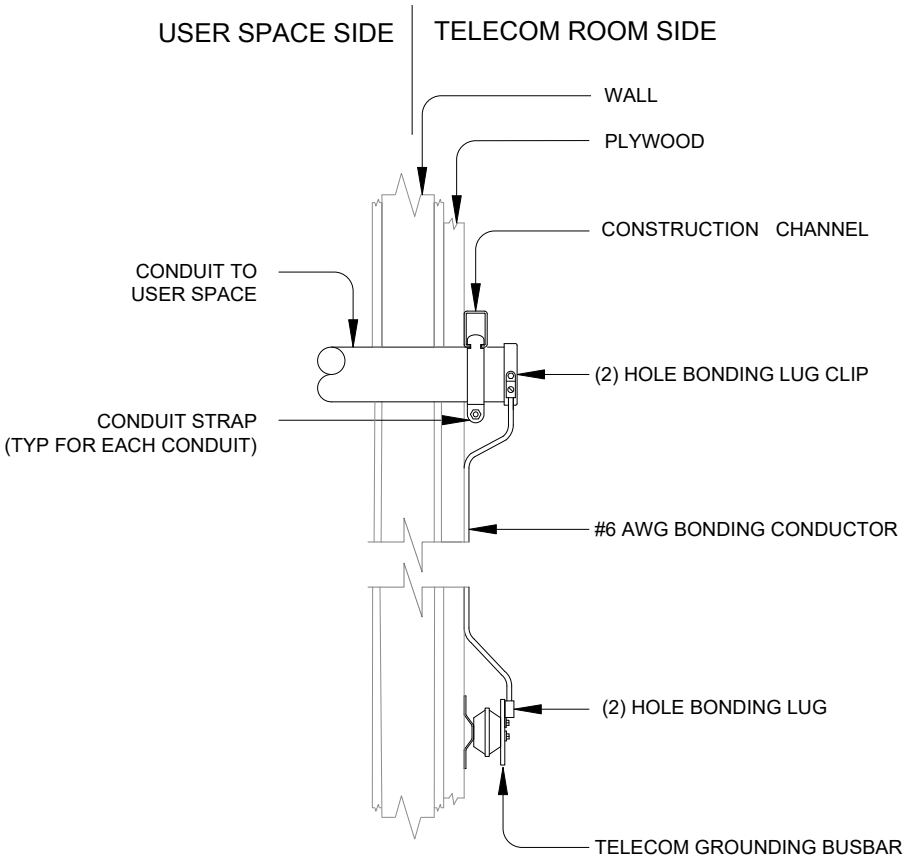
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS ROOM GROUNDING BUS BAR (TWO-HOLE) AND LABELING

SKETCH No:	SK800
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



NOTES: FOR FIRE RATED WALL CONSTRUCTION, PROVIDE FIRESTOPPING TO MATCH WALL RATING.

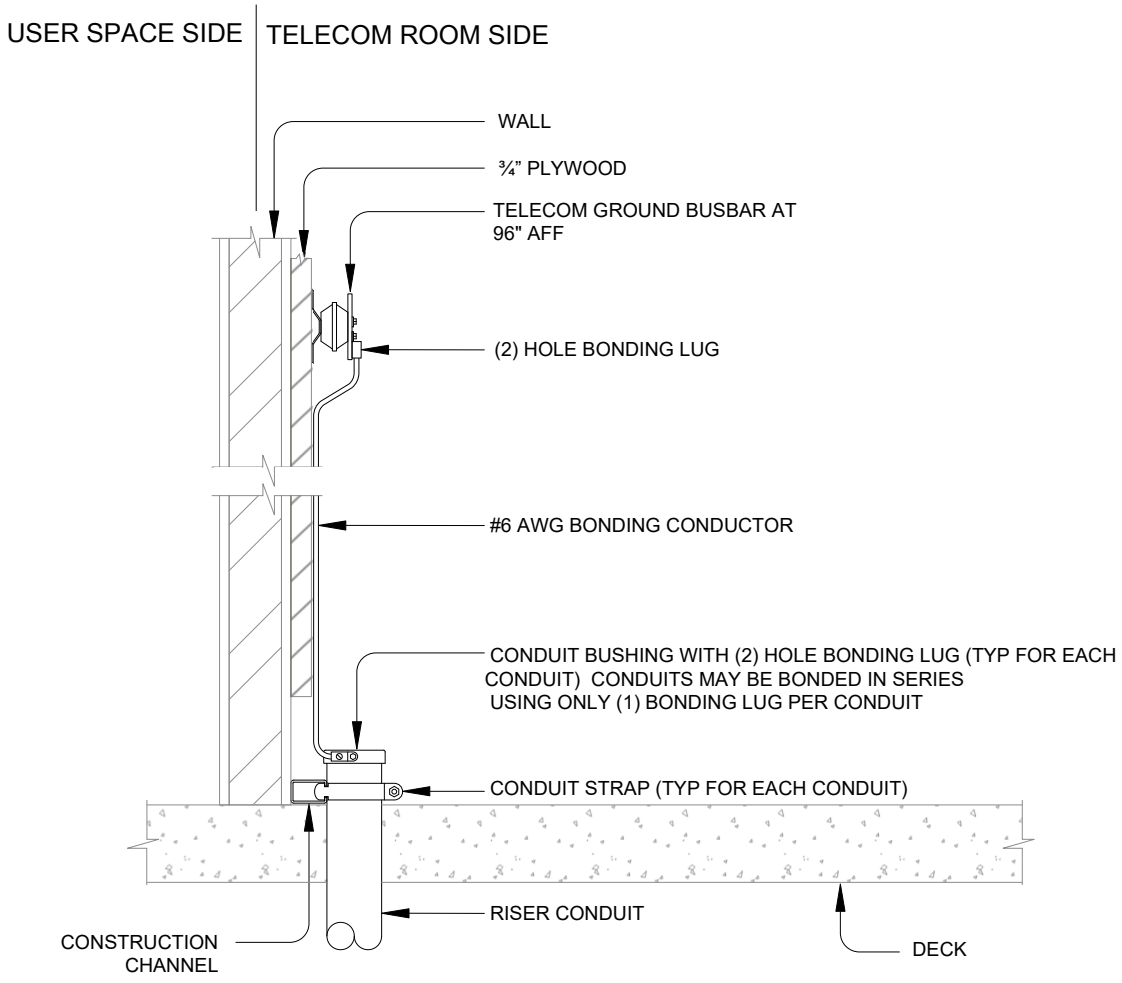
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS CONDUIT BONDING

SKETCH No:	SK801
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



NOTES: FOR FIRE RATED FLOOR/DECK CONSTRUCTION, PROVIDE FIRESTOPPING TO MATCH FLOOR/DECK RATING.

UNIVERSITY OF CALIFORNIA
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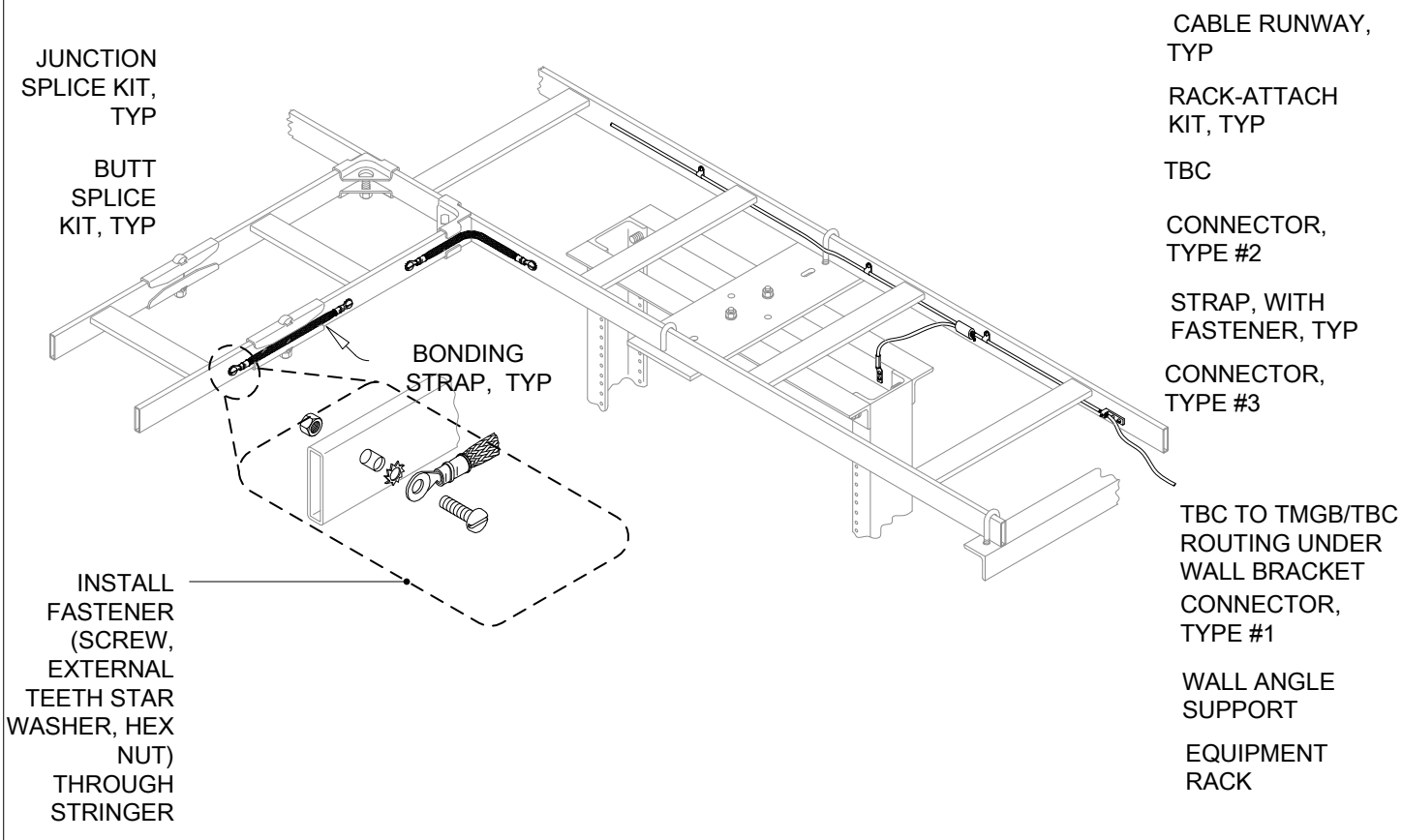
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
RISER CONDUIT BONDING
BETWEEN FLOORS

SKETCH No:	SK802
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



NOTES:
1. PROVIDE BONDING STRAPS AT ALL RUNWAY SPLICES.
2. PROVIDE BOND (CONNECTOR #2, TBC, & CONNECTOR #3) FOR EACH RACK.
3. CONNECTOR, TYPE #1: TBC-TO-RUNWAY CONNECTOR, SINGLE BARREL LUG.
4. CONNECTOR, TYPE #2: TBC TAP CONNECTOR, C-TYPE COMPRESSION TAP.
5. CONNECTOR, TYPE #3: TBC-TO-RACK CONNECTOR, BARREL LUG, 1-BOLT/2- HOLE.
6. FASTENER FOR STRAP SHALL CONSIST OF SELF-TAPPING SCREW WITH LOCK WASHER. FASTENER LENGTH SHALL NOT IMPEDE ON OPPOSITE SIDE OF STRINGER.

UNIVERSITY OF CALIFORNIA
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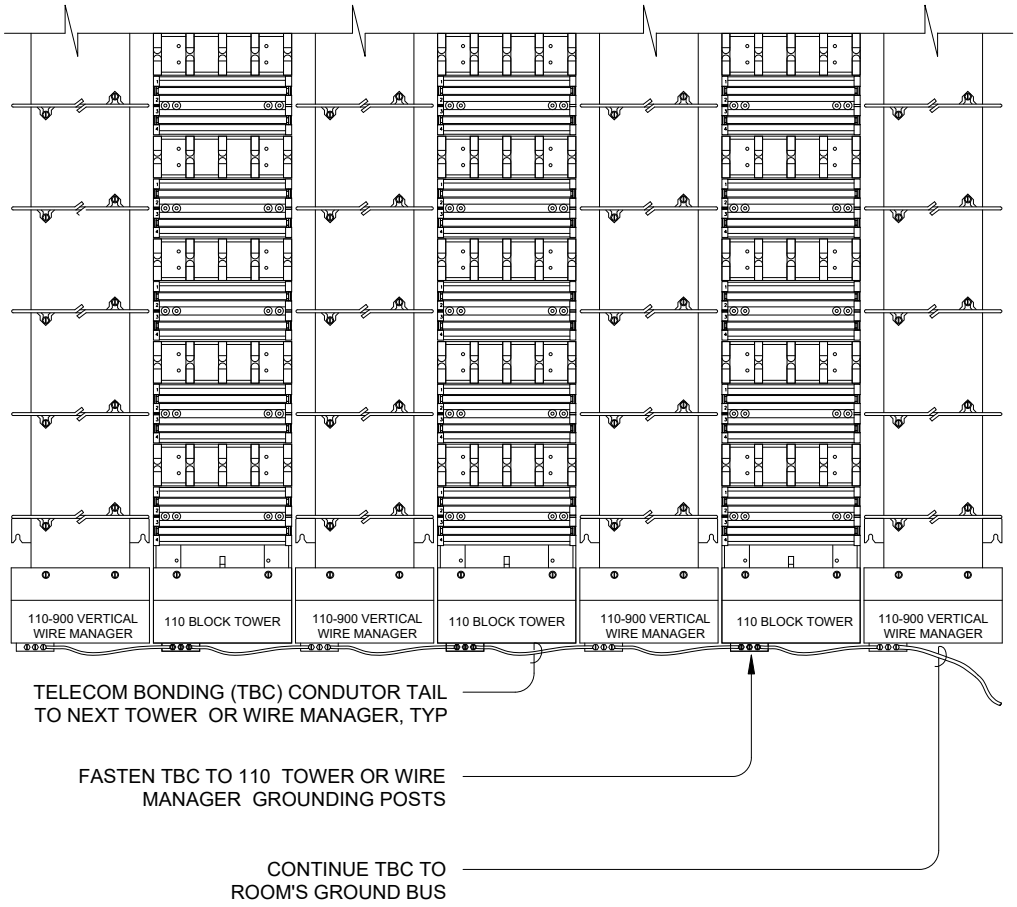
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
CABLE RUNWAY BONDING

SKETCH No:	SK804
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



UNIVERSITY OF CALIFORNIA
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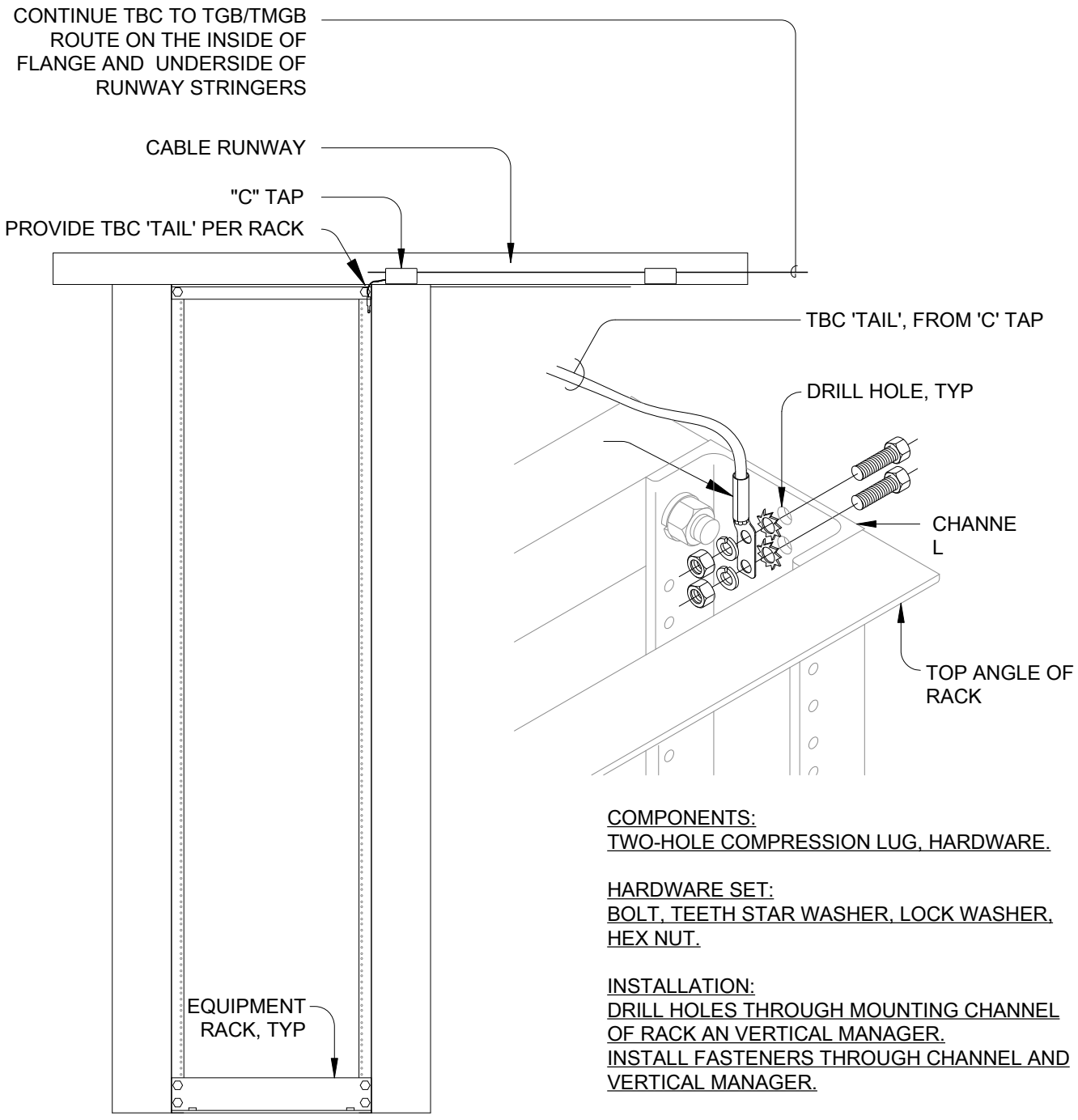
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS
110 TOWER - BONDING

SKETCH No:	SK805
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



COMPONENTS:
TWO-HOLE COMPRESSION LUG, HARDWARE.

HARDWARE SET:
BOLT, TEETH STAR WASHER, LOCK WASHER, HEX NUT.

INSTALLATION:
DRILL HOLES THROUGH MOUNTING CHANNEL OF RACK AN VERTICAL MANAGER.
INSTALL FASTENERS THROUGH CHANNEL AND VERTICAL MANAGER.

NOTE: DO NOT BOND EQUIPMENT RACK IN SERIES

UNIVERSITY OF CALIFORNIA
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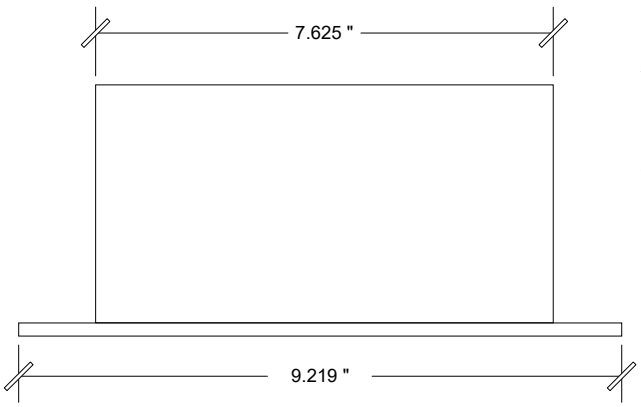
IT Infrastructure Standards

DESCRIPTION:

TELECOMMUNICATIONS EQUIPMENT RACK BONDING

SKETCH No:	SK807
DATE:	7/22/19
REVISION:	3
SCALE:	NONE

906 ENCLOSURE WITH BEZEL - FLUSH MOUNT



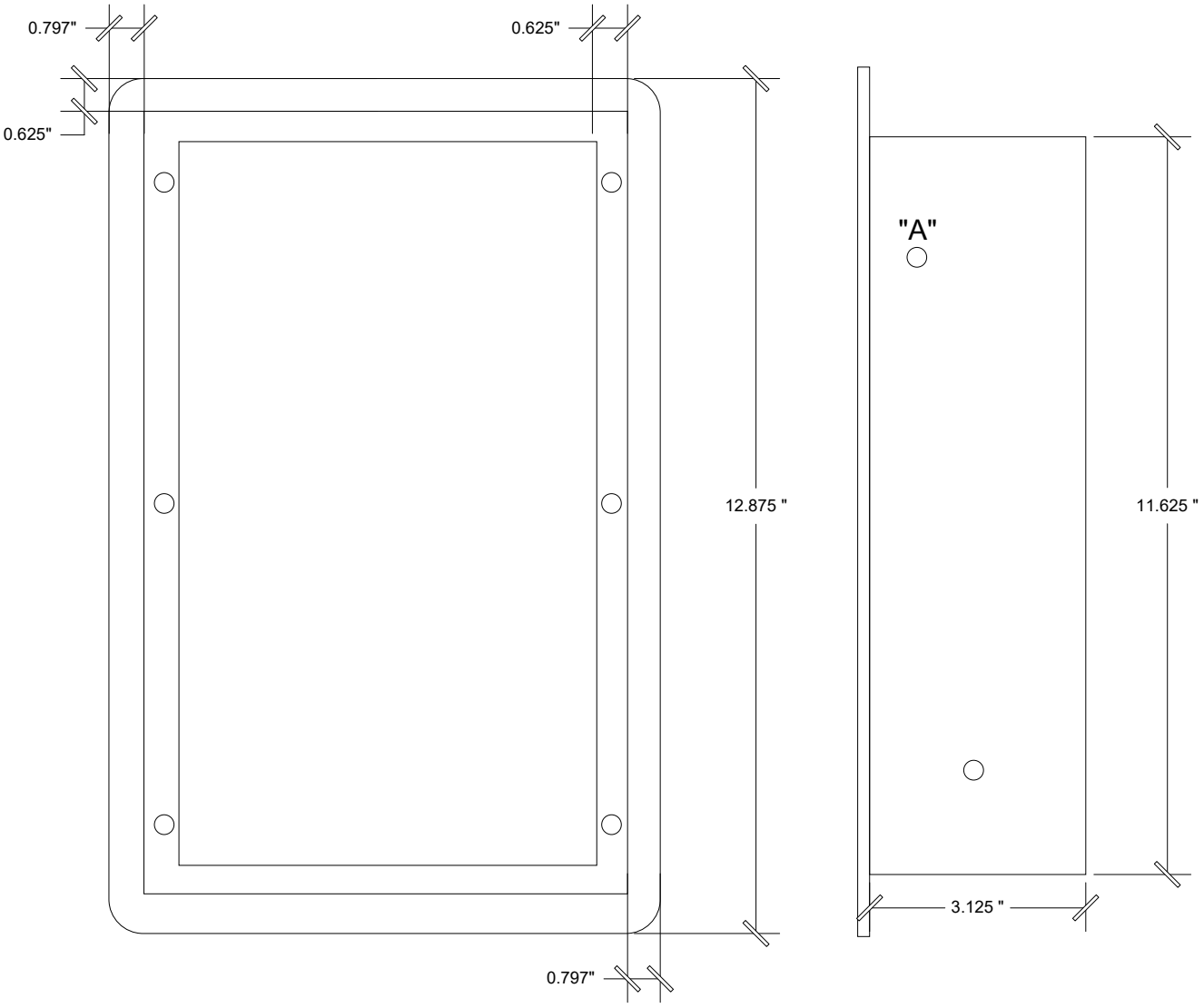
"A" HOLES 1/4 INCH (TWO EACH SIDE USED FOR MOUNTING.

ASSEMBLY:

1. CUT OPENING TO FIT PHONE BOX 7-5/8"w X 11-5/8"h.

2. FOR WOOD MOUNTING, USE (4) 3/16" X 5/8"L LAG SCREWS WITH WASHERS

3. FOR CONCRETE, BRICK, MASONARY, USE PLASTIC FLANGED INSERTS FOR SIZED FOR 3/16 " SCREWS WITH WASHERS.



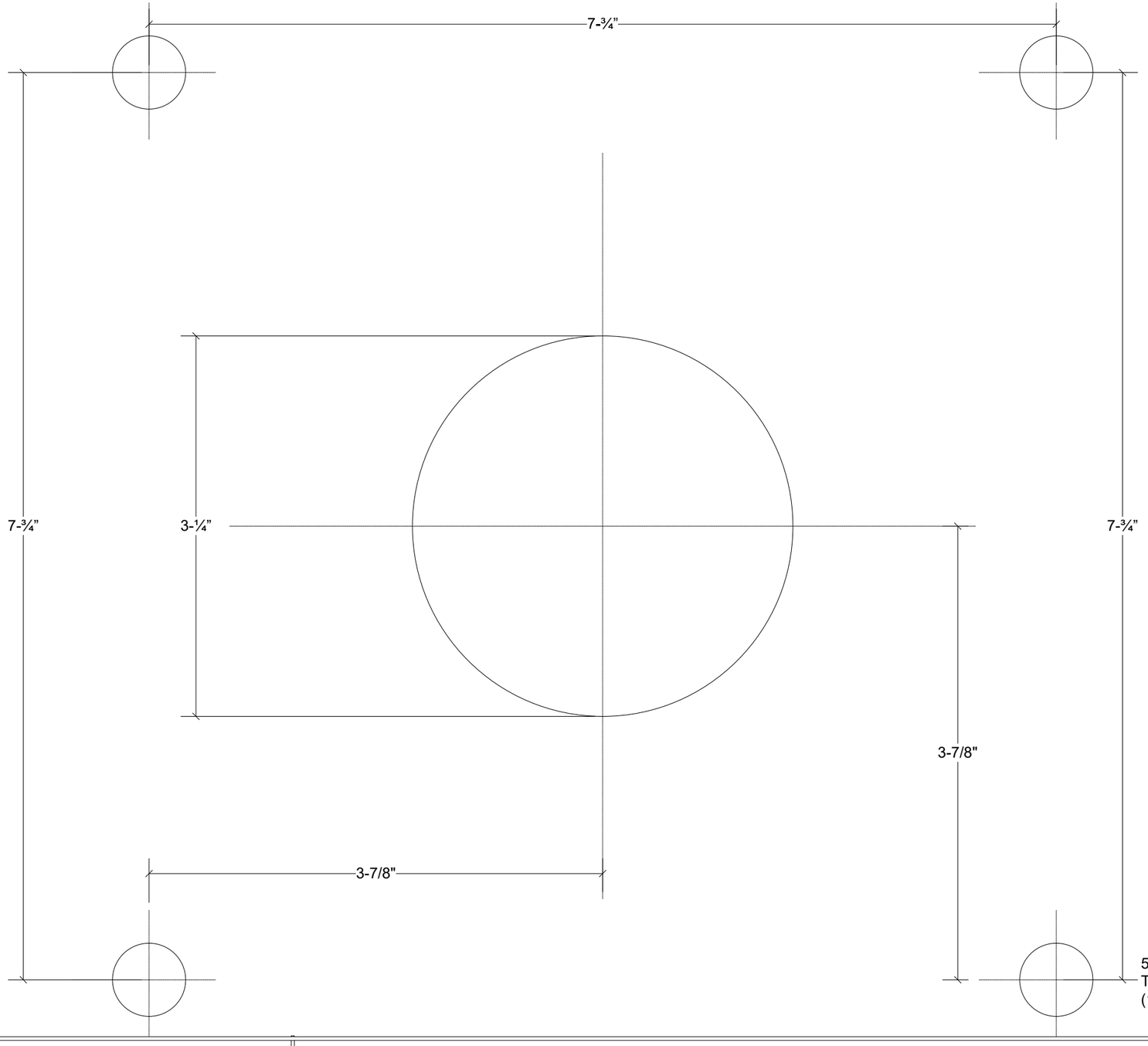
UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

IT Infrastructure Standards

DESCRIPTION:

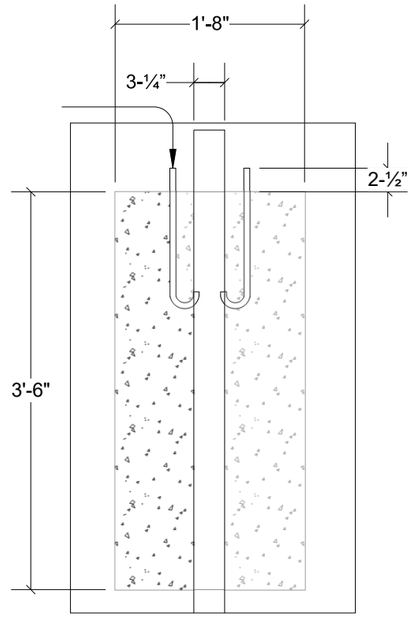
TELECOMMUNICATIONS
WALL MOUNTED BLUE LIGHT
PHONE INSTALLATION
INFORMATION

SKETCH No:	SK900
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



BLUE LIGHT PHONE - PEDESTAL BASE

SURROUNDED BY UNDISTURBED EARTH, OR BACKFILL COMPRESSED AT 95% DENSITY,



UNIVERSITY OF CALIFORNIA
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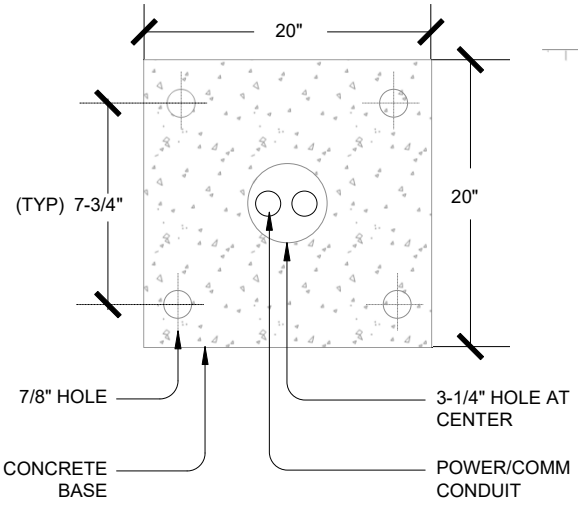
BERKELEY INFORMATION TECHNOLOGY
IT Infrastructure Standards

DESCRIPTION:

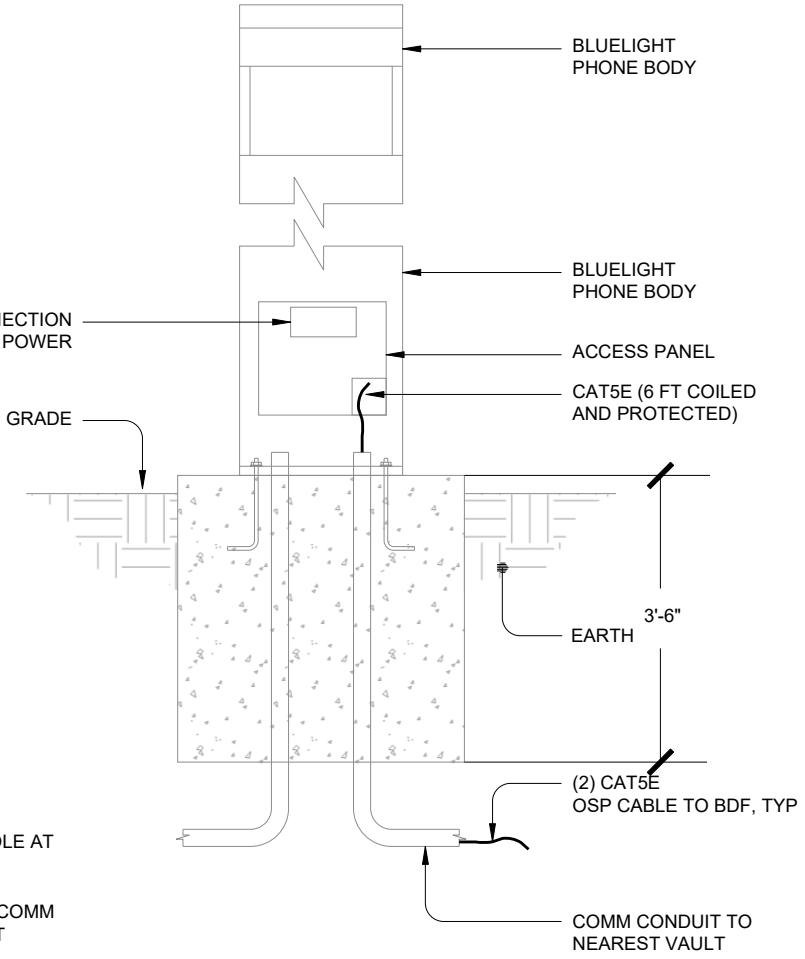
TELECOMMUNICATIONS

EMERGENCY PHONE - BOLT LAYOUT TEMPLATE AND OSP CONCRETE BASE.
TEMPLATE FOR BOLT PLACEMENT IS ACTUAL SCALE IF PRINTED AT 11/17

SKETCH No:	SK901
DATE:	3/4/2022
REVISION:	
SCALE:	NONE



BASE - PLAN VIEW



BASE - ELEVATION VIEW

UNIVERSITY OF CALIFORNIA
BERKELEY
BERKELEY INFORMATION TECHNOLOGY

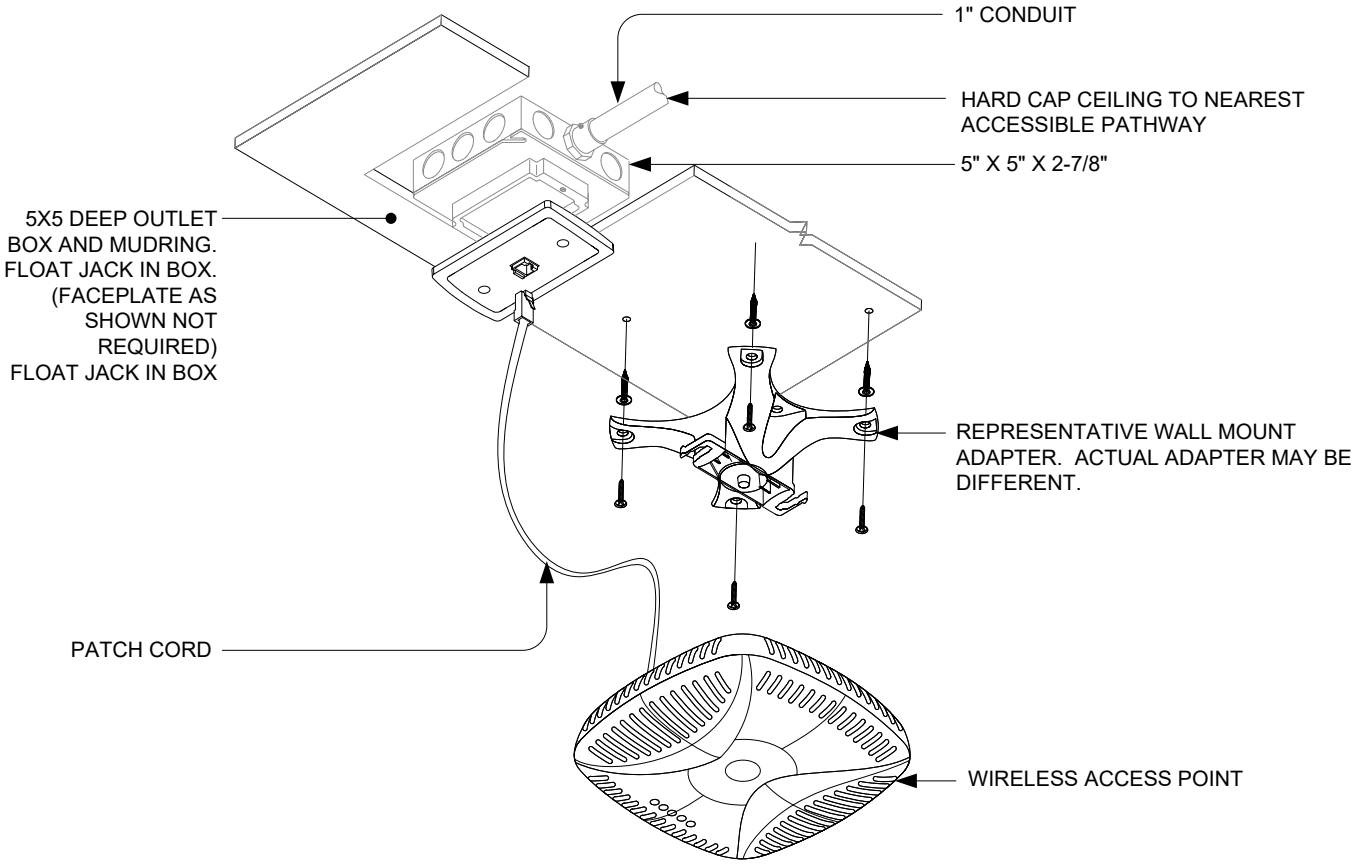
IT Infrastructure Standards

DESCRIPTION:

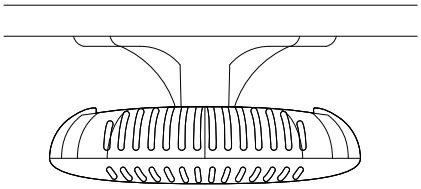
TELECOMMUNICATIONS

BLUE LIGHT PHONE - OSP INSTALLATION INFORMATION

SKETCH No:	SK902
DATE:	6/15/14
REVISION:	3
SCALE:	NONE



ISOLATION VIEW



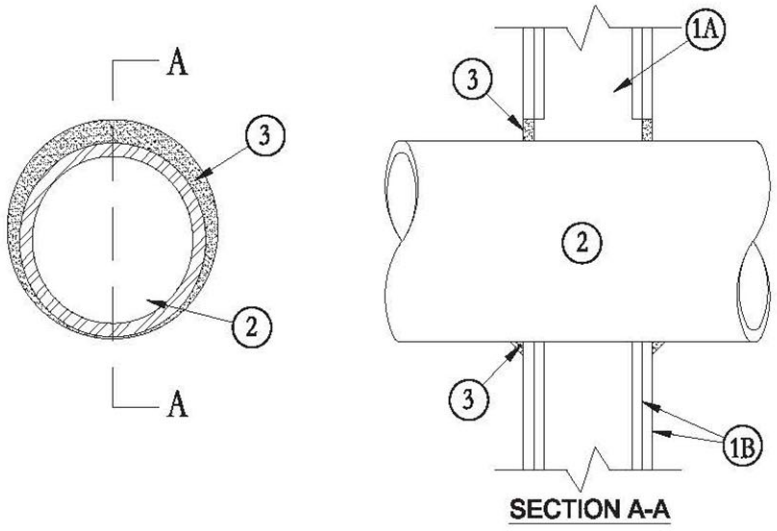
SECTION VIEW

UNIVERSITY OF CALIFORNIA BERKELEY BERKELEY INFORMATION TECHNOLOGY IT Infrastructure Standards	DESCRIPTION: TELECOMMUNICATIONS WIRELESS ACCESS POINT MOUNTED IN HARD CAP CEILING	SKETCH No: SK903 DATE: 11/25/14 REVISION: 4 SCALE: NONE

System No. W-L-1524

May 20, 2016

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0 Hr	FT Rating — 0 Hr
	FH Ratings — 1 and 2 Hr (See Item 1)
	FTH Rating — 0 Hr



SECTION A-A

1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300, U400, W400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

   A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC with nom 2 by 4 in. (51 by 102 mm) lumber end plates and cross braces. Steel studs to be min 3-1/2 in. (89 mm) wide by 1-3/8 in. (35 mm) deep channels spaced max 24 in. (610 mm) OC.

   B. **Gypsum Board*** — The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Design in the UL Fire Resistance Directory. Max diam of opening is 14 in. (356 mm)

   The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through-Penetrant** — One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min of 0 in. (point contact) to max 1-3/8 in. (35 mm). Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:

   A. **Steel Pipe** — Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. **Iron Pipe** — Nom 12 in. (305 mm) diam (or smaller) service weight (or heavier) cast iron soil pipe, nom 12 in. (305 mm) diam (or smaller) or Class 50 (or heavier) ductile iron pressure pipe.
   C. **Conduit** — Nom 6 in. (152 mm) diam (or smaller) steel conduit or nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing.
   D. **Copper Tubing** — Nom 4 in. (102 mm) diam (or smaller) Type L (or heavier) copper tubing.
   E. **Copper Pipe** — Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.

3. **Fill Void or Cavity Materials* — Caulk** — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. Min 1/2 in. (13 mm) diam bead of caulk applied to the penetrant/gypsum board interface at the point contact location on both sides of wall.

   3M COMPANY — FD-150+, IC 15WB+, CP 25WB+ or FB-3000WT Sealant.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

UNIVERSITY OF CALIFORNIA BERKELEY
BERKELEY INFORMATION TECHNOLOGY
IT Infrastructure Standards

DESCRIPTION:
TELECOMMUNICATIONS
OUTDOOR WALL PENETRATION

SKETCH No: SK904
DATE: 3/4/2022
REVISION:
SCALE: NONE