Peralta Community College District

Datacom Infrastructure Standards

Information Technologies 333
East 8th Street Oakland
CA   94606

Issuance Log

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Table of Contents

1.0   INTRODUCTION

1.1   Purpose

This purpose of this document is to describe the minimum requirements and establish the design guidelines for datacom infrastructure that will support information systems.

This document is not intended to replace a Designer. Rather, the requirements and criteria of this document shall guide the Designer and the other Design Team members (electrical, mechanical, and other disciplines) to provide the minimum infrastructure and support for information systems.

1.2   Scope

The scope of this document includes the following:

- Datacom Room build-out/fit-up, including power and cooling requirements

- Outside Plant Underground Pathways and Building Pathway Service

- Building Pathways

- Backbone Cabling

- Horizontal Cabling

1.3   Application

The requirements and criteria herein apply to the District Office complex and each campus within the District – College of Alameda, Laney College and Merritt College.

All construction projects – both renovation and new construction – shall follow the guidelines of this standard.

1.4   Systems Supported

The datacom infrastructure is intended to support data network communications from the equipment in the datacom room (e.g., switch) to the work area equipment (e.g., desktop computer) and between equipment in datacom rooms (e.g., core switch in MDF to access switch in IDF).

The data network will support, at a minimum, IP-based host-client protocols and voice-over-IP (VoIP) protocols.

The datacom infrastructure, particularly the fiber optic backbone, can support additional building systems such as security systems, building control systems, fire alarm systems, etc.

2.0   PROCEDURES

2.1   Designer Qualifications

The datacom infrastructure shall be designed by an IT Design Professional. The IT Design

Professional:

- Shall be thoroughly familiar with PCCD's Datacom Infrastructure Standards.

- Shall be thoroughly familiar with referenced Codes and Standards.

- Shall be an accredited Registered Communications Distribution Designer (RCDD).

- Should be a professional electrical engineer licensed in the state of California.

- Should be authorized by Panduit in the Certified Design Program.

2.2 Design Approvals

The Designer shall be responsible for all District standards to be met. If variances to District standards are necessary, the Designer shall obtain written approval from the District IT Project Liaison in writing for such variances.

The Designer or Design Team Lead shall issue contract documents to District IT Project Liaison for review, comment, and approval prior to completion of 50% CD, if not before.

2.3 Installer Qualifications

The structured cabling system installer shall have a current and active contractor's license, either C7 or C10 level, in the state of California.

The structured cabling system installer shall be a current and active Panduit Certified Installer (PCI).

The structured cabling system installer shall be certified by Panduit for coverage under the Panduit Certification Plus System Warranty Program.

2.4 Construction Approvals

The design and installation shall comply with local and state building codes and with national standards, including but not limited to the following.

A. Codes

The design and installation shall comply with local and state building codes, including but not limited to:

1. California Electric Code / CEC (California Code of Regulations, Title 24, Part 3)

B. Standards

The design and installation shall comply with national standards, including but not limited to:

1. Telecommunications Industry Association (TIA):

   a) ANSI/TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard; Part 1, Part 2, and Part 3, with addenda.

   b) ANSI/TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces, with addenda.

   c) ANSI/TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

   d) ANSI-J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications.

2. Underwriter's Laboratories (UL):

   a) UL 444: Communications Cables

   b) UL497: Protectors for Paired-Conductor Communication Circuits

   c) UL 1651: Optical Fiber Cable

   d) UL 1690: Data-Processing Cable

   e) UL 1963: Communications-Circuit Accessories

   f) UL 2024A: Optical Fiber Cable Routing Assemblies

3. Insulated Cable Engineers Association (ICEA):

   a) ANSI/ICEA S-83-596-1994 Fiber Optic Premises Distribution Cable

   b) ANSI/ICEA S-87-640-1999 Fiber Optic Outside Plant Communications Cable

   c) ANSI/ICEA S-90-661-2002 Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cable for Use in General Purpose and LAN Communication Wiring Systems

   d) ICEA S-104-696-2001 Standard for Indoor-Outdoor Optical Cable

C. References

The design shall comply with references, including but not limited to:

1. Building Industry Construction Services International (BICSI):

   a) Telecommunications Distribution Methods Manual (TDMM)

   b) Customer-Owner Outside Plant Design Manual

2.5   Owner-Provided Equipment

A. Datacom Network Equipment

PCCD District IT Department will design, procure, and install the data network equipment (e.g., switches).

Space in the racks shall be designed to allow for the network equipment and patch cords to be installed. Obtain from PCCD IT rack space requirements.

B. Telecom and VoIP Equipment

PCCD District IT Department will design, procure, and install the telecom equipment (e.g., IP telephones).

3.0   DATACOM ROOMS

3.1   Room Classifications

The datacom rooms shall fall into one of the following room classifications:

CLASSIFICATION NAME	CLASSIFICATION DESCRIPTION
Entrance Facility / EF or Main Point of Entry / MPOE	The EF/MPOE shall be a room dedicated to datacom, and shall not be shared with other building services, unless authorized in writing by the District.
	Campus/interbuilding conduits should enter the building into the EF/MPOE.
	Datacom equipment may or may not be deployed in the EF.
	If applicable, the telecom utilities should demarcate/establish MPOE for their services in the EF.
Main Distribution Facility / MDF	The MDF shall be a room dedicated to datacom, and shall not be shared with other building services, unless authorized in writing by the District.
	The core network equipment serving data communications to the main building should be deployed in the MDF.

	If applicable, the WAN interface to the District office should be deployed in the MDF, in direct connection to the network core.
	The MDF may also act as a BDF and/or an IDF.
Building Distribution Facility / BDF	The BDF shall be a room dedicated to datacom, and shall not be shared with other building services, unless authorized in writing by District.
	The distribution network equipment serving data communications within a single building should be deployed in the BDF.
	If there are/will be additional datacom rooms (IDFs) within the building, the backbone cabling shall originate in the BDF to each IDF.
	The BDF may also act as an IDF.
Intermediate Distribution Facility / IDF	The IDF shall be a room dedicated to datacom, and shall not be shared with other building services, unless authorized in writing by the District.
	The access network equipment serving data communications within a service area shall be deployed in the IDF.
	If applicable, the backbone cabling from the BDF will terminate in the IDF.
	UPSs will be deployed into the IDFs to support PoE applications such as VoIP (i.e., keep telephones powered).
Satellite Distribution Facility / SDF	The SDF shall be an equipment enclosure or cabinet dedicated to datacom, and shall not be shared with other building services, unless authorized in writing by the District.
	Where no room/space can be programmed and allocated as a dedicated datacom room **and** the quantity of links is 96 or less **and** the service area is 10,000 square feet or less, access network equipment and cable terminations may be located into a service cabinet.
Equipment Room / Server Room	The Equipment Room/Server Room shall be a room dedicated to datacom, and shall not be shared with other building services, unless authorized in writing by the District.
	The equipment/server room shall be fit up with equipment racks to house network equipment (switches, routers, etc.) and server cabinets to house processing systems (servers, storage systems, etc.).

3.2   Room Sizes

A. New Construction:

Size the datacom rooms based on the following criteria:

Room	Sizing Criteria – Minimum Dimensions
EF	10'-0" W x 8'-6" D x 9'-0" H
MDF	10'-0" W x 16'-0" D x 9'-0" H

EF & MDF Combined	10'-0" W x 18'-6" D x 9'-0" H, or
	16'-0" W x 11'-0" D x 9'-0" H
BDF	10'-0" W x 14'-6" D x 9'-0" H
IDF	10'-0" W x 11'-0" D x 9'-0" H
SDF	Not applicable
Equipment/Server Room	As required per project

B. Renovation:

This Document acknowledges that datacom rooms are often located within existing spaces and may not meet the aforementioned minimum sizing criteria. Under these circumstances, determine the feasibility of the space based on the following criteria:

Minimum size for MDF/BDF/IDF rooms shall be as follows.

1. Width: 8'-10", including equipment and working clearances.

2. Depth: 6'-0" (3'-0" for the rack with 3'-0" for end clearance) for the first rack plus 28 inches for each additional rack.

3.3   Room Adjacencies

A. New Construction:

For new construction, the datacom rooms shall be vertically stacked, shall either encompass or be immediately adjacent to the vertical riser, and should be in close proximity to the electrical room.

B. Renovation:

For renovation construction, the datacom rooms should be vertically stacked, shall either encompass or be immediately adjacent to the vertical riser, and should be in close proximity to the electrical room.
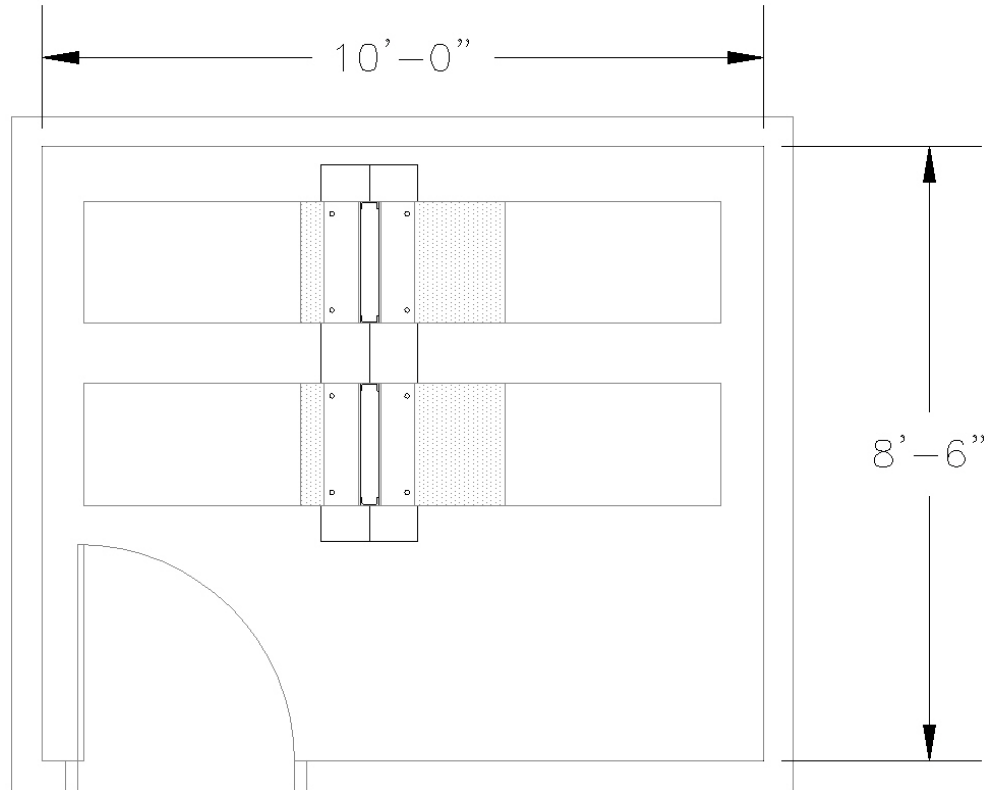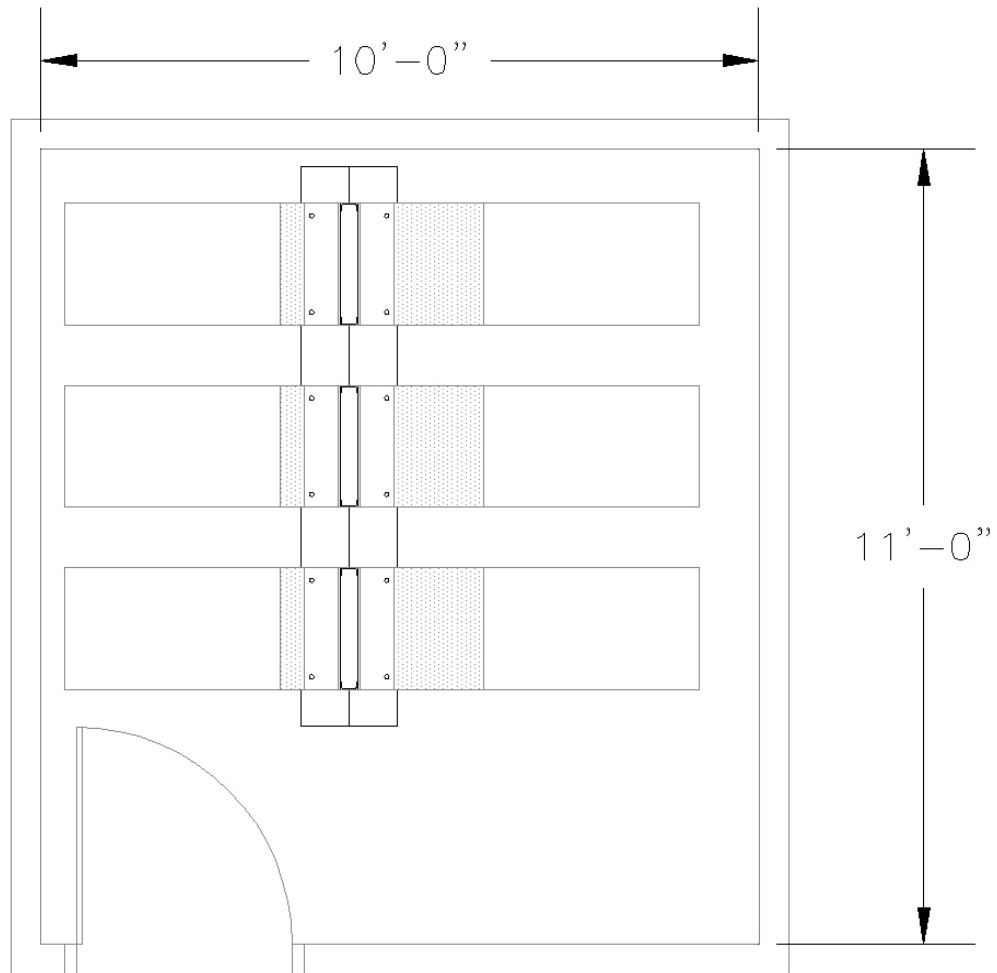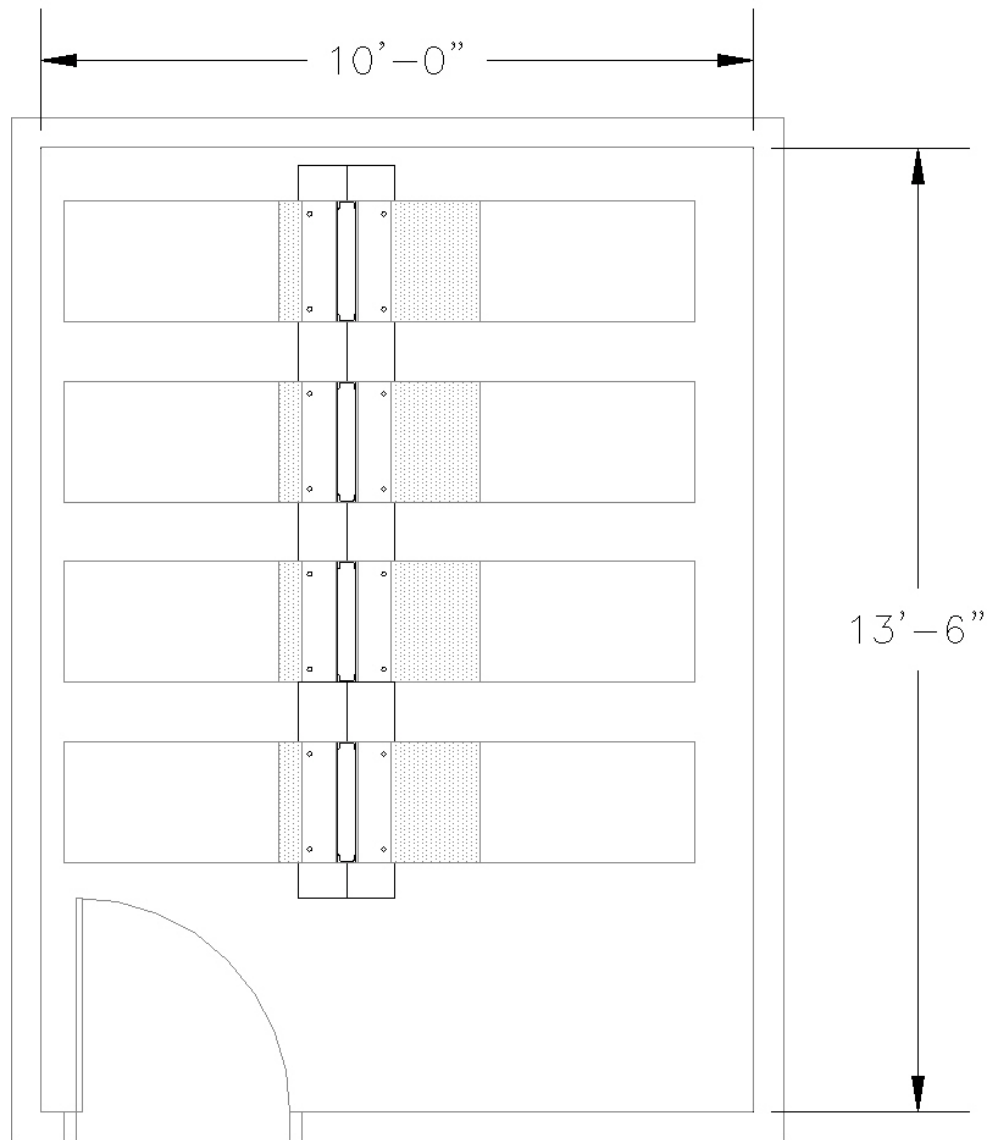
3.4   Room Configurations

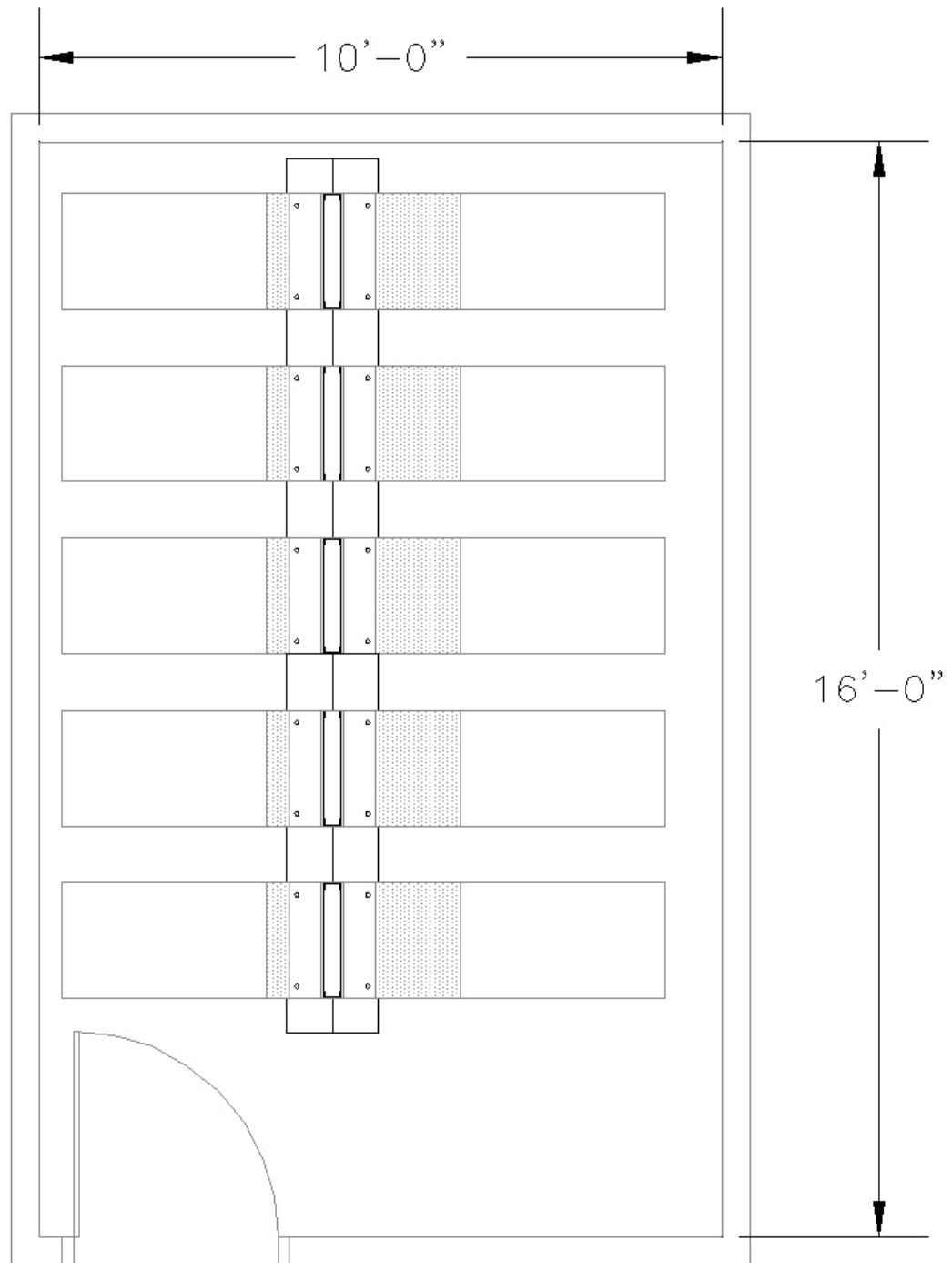The following room configurations are examples of configurations based on rack quantity per room.

2-Rack Configuration

3- Rack Configuration

4-Rack Configuration

5-Rack Configuration

3.5 Architectural Finishes

The room finishes shall be as described in the following table:

Room	Floor	Wall	Ceiling
EF	SD-VCT[1], or sealed concrete	Plywood backboard[2], all walls	Open (i.e., no ceiling)
MDF	SD-VCT, or sealed concrete	Plywood backboard, all walls	Open (i.e., no ceiling)
BDF	SD-VCT, or sealed concrete	Plywood backboard, all walls	Open (i.e., no ceiling)
IDF	SD-VCT, or sealed concrete	Plywood backboard, all walls	Open (i.e., no ceiling)]
SDF	No applicable – as existing	No applicable	No applicable – as existing
Equipment/ Server Room	SD-VCT, or sealed concrete – The flooring shall be determined per project. There may be instances where a raised floor would be required.	Wallboard – The wall finish should match typical building wall finishes (to control costs).	Lay-in acoustical tile – The ceiling shall be determined per project.

1 - SD-VCT = static-dissipating vinyl composition tile

2 - Plywood shall be ¾" thick and shall be fire treated. Plywood backboard shall be painted with white paint and shall have the fire rating stamp masked prior to painting.

3.6 Doors

The doors to datacom rooms shall be as described in the following table (minimum dimensions):

Room	Size	Quantity	Swing
EF	36"W x 7'H	1	Outward
MDF	36"W x 7'H	1	Outward
BDF	36"W x 7'H	1	Outward
IDF	36"W x 7'H	1	Outward
SDF	Not applicable	Not applicable	Not applicable
Equipment/ Server Room	72"W - double 36"W doors - x 7'H	Door quantity will be defined per project.	Outward

3.7 Structural

A. Floor Loading

The floor loading shall be 150 pounds per square-foot, minimum, in all datacom rooms.

B. Floor Anchoring for Racks and Cabinets

Floor-standing racks and cabinets shall be anchored to the structural floor via devices pre-approved by DSA. Examples of such devices include Hilti Kwik-Bolt 3.

The structural engineer shall determine the applicability of the anchoring device set in the floor system, including minimum embedment depth.

C. Wall Anchoring for Racks and Cabinets

Wall-mounted racks and cabinets shall be anchored to the wall via fasteners pre-approved by DSA. Examples of such fasteners include woods screws into plywood backboard and expansion anchors into concrete wall.

The structural engineer shall determine the applicability of the fasteners depending upon the mounting substrate, including minimum embedment depth.

3.8   Electrical

A. Convenience Outlets

Convenience outlets shall be 120V. Convenience outlets shall be circuited from a normal power panel.

On walls adjacent to the rack bay (where the rack bay butts up against the wall), provide one duplex outlet in front of the rack bay and one duplex outlet behind the rack bay.

On the other walls, provide one duplex outlet per wall up to 15 feet. On walls longer than 15 feet, provide two duplex outlets.

B. Rack Bay Power Service

Each rack shall receive one duplex outlet. Each duplex outlet shall be circuited as 120V 20A separately breakered.

Each duplex outlet shall be installed between racks at the vertical management section facing down. Refer to the following figure for an example of the overhead power service at a rack bay.
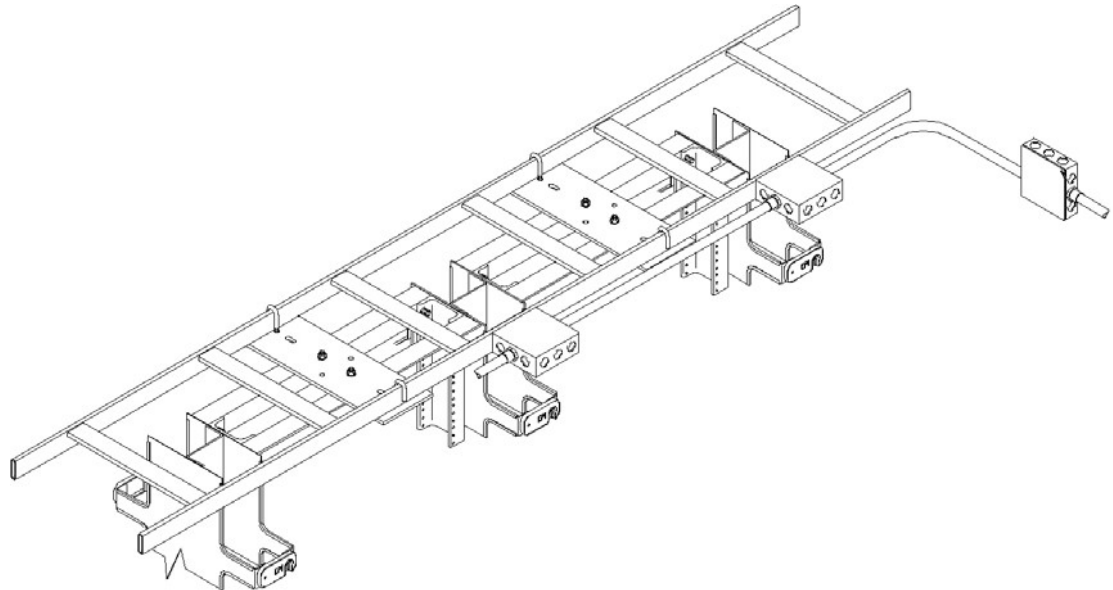
Example Overhead Power Distribution at Rack Bay

C. Lighting

Lighting shall be overhead in front of and behind rack bay, and should be dual-lamp fluorescent type.

Luminance shall be 50 foot-candles measured at 3 feet above finished floor, minimum.

3.9 Mechanical

A. Cooling Criteria

For MDFs, BDFs, and IDFs, assume a load of 40 watts per square foot. For

Equipment/Server Rooms, assume a load of 75 watts per square foot.

The aforementioned criteria include the following sources: equipment, lighting, occupants, ambient.

B. Operation

The cooling shall operate 24 hours per day, 7 days per week.

C. Temperature Range

The rooms shall be controlled at 68 degrees Fahrenheit, +/- 5 degrees.

D. Dedicated Controls

Cooling controls (thermostat) shall be dedicated to the datacom room and shall not be shared with any other space.

E. Humidity Control

For MDFs, BDFs, and IDFs, no humidity control is required.

For Equipment/Server Rooms, humidity control is required. Humidity shall be controlled between 10% and 55%, non-condensing within the specified temperature range.

F. Installation

For MDFs, BDFs, and IDFs, the cooling unit (fan coil unit or other) shall be installed either hung from the structure above or high on the wall.

For Equipment/Server Rooms, the cooling unit (CRAC, other) shall be coordinated throughout the Design Team. To minimize floor area, the cooling unit is suggested to be hung from the structure above.

The location of the cooling unit shall be coordinated with the equipment plan as not to have wet components above the equipment racks or other equipment that could be damaged by leaks. The piping to the cooling units shall be routed as not to pass over the rack bay and the equipment clearance of the rack bay. Piping connections shall not be installed over where equipment may be installed.

G. Ducting Through Datacom Rooms

Ducting unrelated to datacom shall not be routed through datacom rooms.

3.10 Plumbing

A. Piping Through Datacom Rooms

Piping and plumbing unrelated to datacom shall not be routed through datacom rooms.

3.11 Security

A. Access Control

Datacom rooms shall have access control, even if the room is shared with other services. The access control

should be a card reader, but shall be confirmed per instance.

B.   Video Surveillance

Datacom rooms do not require video surveillance.

4.0   OSP UNDERGROUND PATHWAYS

### 4.1   Underground Pathways Infrastructure

A.   The minimum burial depth shall be 36 inches.

B.   The following conduit types will be accepted for the different circumstances:

Circumstance	Acceptable Conduit Types
Straight Sections, no vehicular traffic	• Non-Metallic Schedule 40 PVC, concrete encasement not required • Non-Metallic Schedule 80 PVC, concrete encasement not required • Galvanized Rigid Steel / GRS
Straight Sections, under vehicular traffic	• Non-Metallic Schedule 40 PVC, with concrete encasement • Non-Metallic Schedule 80 PVC, with concrete encasement • Galvanized Rigid Steel / GRS
Sweeping Bends	• Non-Metallic Schedule 40 PVC, with concrete encasement • Non-Metallic Schedule 80 PVC, concrete encasement suggested • Galvanized Rigid Steel / GRS
Factory Bends/Elbows	• Non-Metallic Schedule 40 PVC, with concrete encasement • Non-Metallic Schedule 80 PVC, with concrete encasement • Galvanized Rigid Steel / GRS, with concrete encasement
Building Entrance (with	• Galvanized Rigid Steel / GRS, with concrete encasement

C.   The maintenance holes shall have the following features:

1.   For split cover-type maintenance holes/pull boxes, the minimum size shall be 36-inches wide by 48-inches deep by 60-inches long. For vault-type maintenance holes/pull boxes, the minimum size (interior clearances) shall be 48-inches wide by 84-inches deep by 60-inches long.

2.   The maintenance hole shall be equipped with a sump, corrosion-resistance pulling irons, corrosion- resistance cable racks, and grounding.
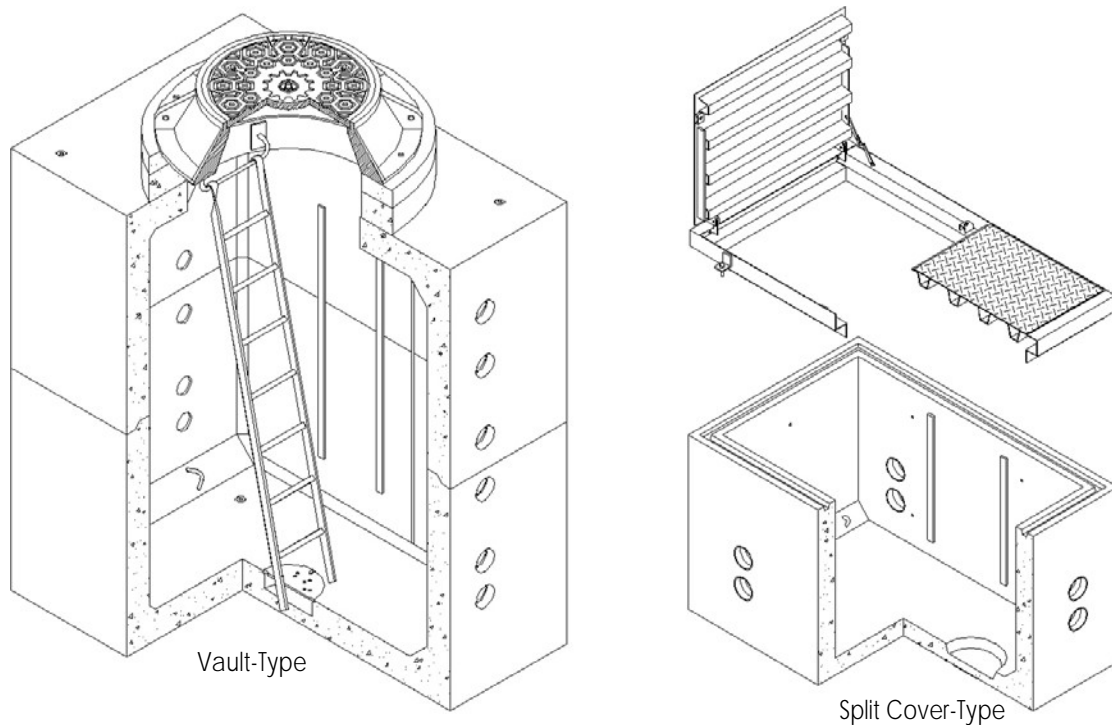
Maintenance Holes Examples

D. At buildings, install the conduit sloping toward away from the building with no less than 0.125 inches per linear foot of slope

E. Between maintenance holes, install the conduit sloping towards maintenance holes with no less than 0.125 inches per linear foot of slope.

4.2 Service Per Building

Each building shall receive two 4-inch trade size conduits, minimum, from the campus' telecommunications underground pathways infrastructure.

4.3 Building Connection

Within 15 feet of the point where the conduit enters the building, the conduit type shall be GRS. Non- metallic / PVC conduit will not be accepted.

4.4 Innerduct

At least one of the service conduits shall contain four 1-inch trade size innerducts. Each innerduct shall be uniquely colored. The innerducts should be corrugated type and should be extruded of high-density polyethylene.

4.5 Separation

Datacom conduits shall be separated from other underground structures as follows:

Structure	Separation
Power, concrete-encased	3 inches
Power, buried	12 inches

Power, on poles	Separate poles if possible; if not possible, 90 degrees, minimum

5.0   BUILDING PATHWAYS

5.1   Backbone Pathways

The building pathways for backbone cabling should be either conduit or cable basket. The pathway component will depend on the project requirements, constraints, and coordination with the other building systems.
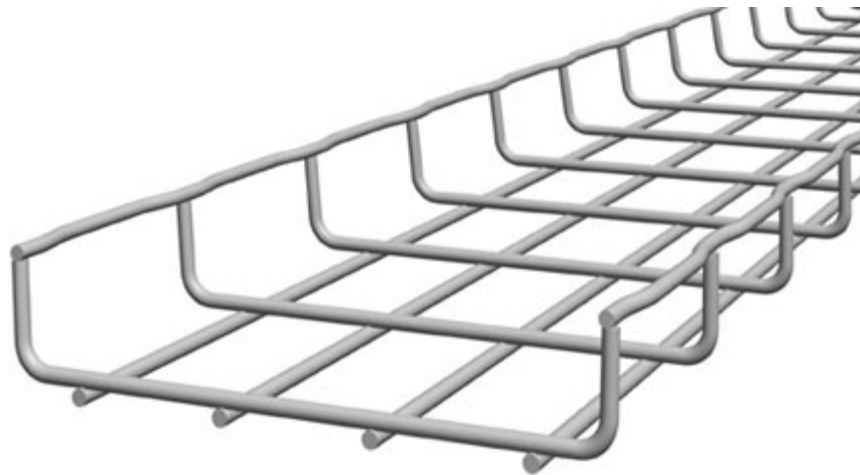
Image of Cable Pathway Component

5.2   Horizontal Pathways

The horizontal pathways shall be defined as those pathway components that support horizontal cabling. These pathways are generally limited to a single floor from a datacom room or riser system.

A.   Primary Pathways: The primary horizontal pathways shall be defined as those directly from the datacom room serving a section (a wing or side) of the building. The primary pathway components can be cable basket, or – if the total quantity of cables is less than 50 – cable hangers.

B.   Secondary Pathways: The secondary horizontal pathways shall be defined as those from the primary pathways serving an area of a section or to specific devices. The secondary pathway components can be cable hangers or, as an alternative, "Snake Tray" (by Cable Management Solutions).

5.3   Device Pathways

The device pathways shall be defined as the pathway supporting a single compliment of cabling to a single device.

A.   Minimum conduit stub, or equivalent area, shall be 1-inch trade size.

B.   Device box shall be 4-square and deep.

C.   Framed Wall: For both new construction and renovation, the device pathway at framed walls shall be conduit stub from an accessible space (such as acoustical tile ceiling) to a device box within the wall interstitial. The device box should be installed at +18 inches for typical outlets.

D. Concrete Wall:

1. New Construction: The device pathway at concrete walls shall be buried (cast within the forms) into the wall.

2. Renovation: The device pathway at concrete walls shall be either conduit surface-mounted to a device box surface-mounted, or shall be surface raceway to a device box surface-mounted.

E. CMU Wall: For new construction and renovation, the device pathway at CMU walls shall be either conduit surface-mounted to a device box surface-mounted, or shall be surface raceway to a device box surface-mounted.

6.0 BACKBONE CABLING

6.1 Backbone Fiber Optic Cabling

A. Cable Type

1. Outdoor Cables

Backbone fiber optic cables installed outdoors shall be loose buffered – either multitube or core tube type.

Backbone fiber optic cables installed outdoors should have a sheath consisting of a polyethylene jacket over the inner cable components (buffer(s), strength element, etc.).

2. Indoor Cables

Backbone fiber optic cables installed indoors shall meet the rating required by the authority having jurisdiction.

Backbone fiber optic cables installed indoors shall be tight buffered.

Backbone fiber optic cables installed indoors should have a sheath consisting of a thermoplastic jacket over the inner cable components (buffered fibers, strength element, etc.), an interlocking armor, and overall thermoplastic jacket. This cable does not require to be installed in innerduct.

B. Fiber Type

1. Multimode

Multimode fibers shall be 50/125□m laser-grade, with a minimum bandwidth of 500/1000 MHz-km at 850/1300 nm.

2. Singlemode

Singlemode fibers shall be 8.3/125□m, with a maximum dispersion of 3.5 ps/nm□km at 1285- 1330 nm, and a cutoff wavelength of 1260 nm.

C. Cable Capacity / Conductor Count

1. Interbuilding Cabling (MDF to MPOE)

Interbuilding cabling links should contain twelve multimode strands and twenty-four singlemode strands. Additional twelve strands for each additional IDF room within the building.

2. Intrabuilding Cabling (IDF to MDF)

Intrabuilding cabling links should contain twelve multimode and twelve singlemode strands.

D. Termination

1. Connectors

Multimode fibers shall be terminated via multimode LC connectors. LC connectors shall be 568LC type, and shall meet all requirements of TIA/EIA-568-B.3, section 5.0 including references. The connector housing and the boot shall be beige in color.

Singlemode fibers shall be terminated via singlemode LC connectors. LC connectors shall be 568LC type, and shall meet all requirements of TIA/EIA-568-B.3, section 5.0 including references. The connector housing and the boot shall be blue in color.

Patch Panel

The patch panels shall be rack-mount type and shall be installed into an equipment rack.

2. Adapters

Adapters within the patch panels shall meet all requirements of TIA/EIA-568-B.3, section 5.0 including references.

Multimode adapter housing shall be beige in color and shall be duplex. Singlemode

adapter housing shall be blue in color and shall be simplex.

E. Testing

Each fiber shall be tested as follows:

	Passive Link Insertion Loss	Characterization
Multimode	Uni-directional, 850nm and 1300nm	Bi-directional, 850nm and 1300nm
Singlemode	Uni-directional, 1310nm and 1550nm	Bi-directional, 1310nm and 1550nm

Passive Link Insertion Loss testing for multimode fibers shall comply with TIA/EIA-526-14A ("OFSTP-14") "Test Method B: One Jumper Reference". Passive Link Insertion Loss testing for singlemode fibers shall comply with TIA/EIA-526-7 ("OFSTP-7") "Test Method A.1: One Jumper Measurement".

6.2   Backbone Twisted Pair Cabling

A. Cable Type

1. Outdoor Cables

Backbone twisted pair cables installed outdoors shall be gel-filled and should be AMNW type.

2. Indoor Cables

Backbone twisted pair cables installed indoors shall meet the rating required by the authority having jurisdiction.

Backbone twisted pair cables installed indoors should be ARMM type.

B. Cable Capacity / Conductor Count

1. Interbuilding Cabling

Interbuilding twisted pair cabling links should contain 50 pairs.

2. Intrabuilding Cabling

Intrabuilding twisted pair cabling links should contain 25 pairs.

C. Termination

1. Interbuilding Cabling

Interbuilding twisted pair cabling links shall be terminated to building entrance protection terminals, wall-mounted, with a splice between the OSP cable and the BEP's input stub. See following example.
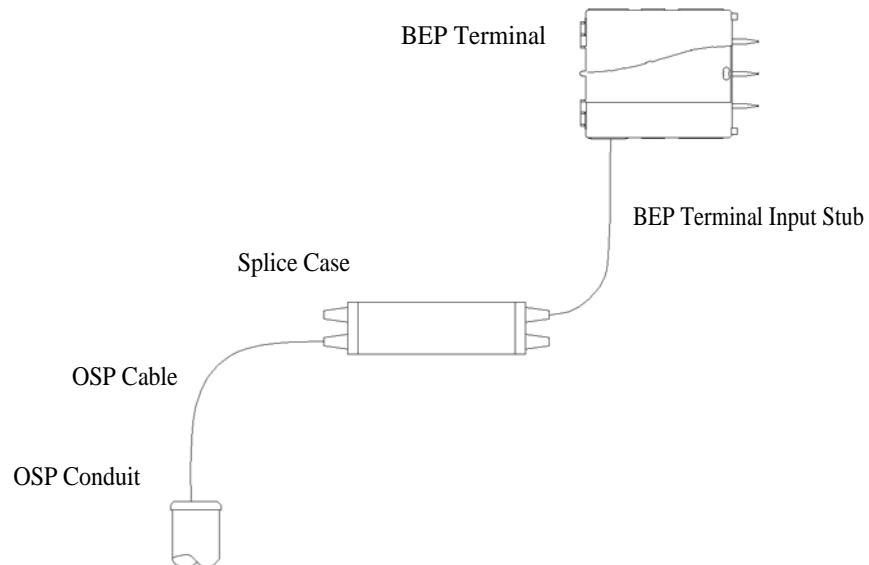
Backbone OSP Twisted Pair Cable Termination Example

2. Intrabuilding Cabling

Intrabuilding twisted pair cabling links should be terminated onto 110 blocks on rack-mount bracket.
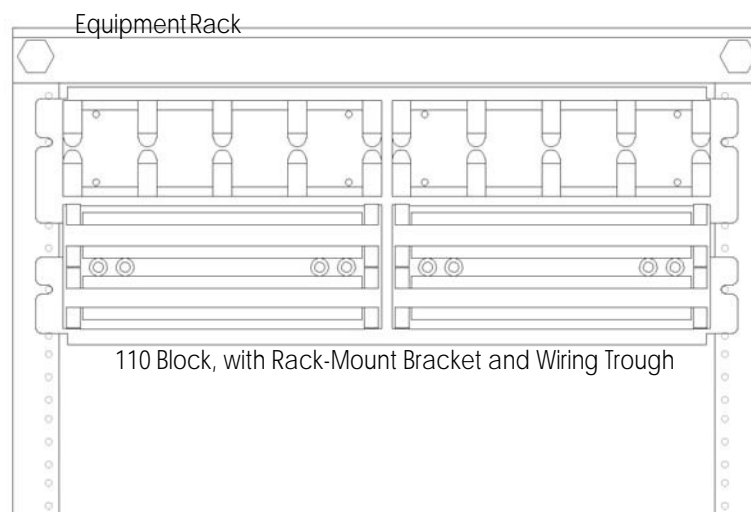
Backbone OSP Twisted Pair Cable Termination Example

D. Testing

Backbone twisted pair cabling links shall have 100% of the pairs tested for wire map and one pair from each 25-pair binder group tested for length.

7.0   HORIZONTAL CABLING

7.1   Link Performance

Link performance shall be Category 6a.

7.2   Datacom Room Termination

In the datacom rooms, links shall be terminated via a rack-mounted modular patch panel. Modular patch panels should be either discrete port type (snap-in modular connectors) or pre-assembled 110 termination type. If discrete port type, also refer to "Modular Jacks" following.

7.3   Workstation Termination

Links shall be terminated via modular jacks – refer to "Modular Jacks" following.

7.4   Modular Jacks

Modular jacks shall be 8-position 8-conductor type connectors, compliant with T568B wiring.

7.5   Service, Per Work Area

A standard device shall consist of two links to a single device. A link shall consist of a single cable, termination in the datacom room and termination at the work area. The device shall consist of one faceplate and two modular jacks

A. Fixed Office: Fixed offices shall receive at least two standard devices generally on separate walls. If the fixed office is large enough and intended to support multiple workstations, add one standard device per additional workstation.

B. Open Office: Generally, open offices shall receive one standard device per workstation.

C. Classroom: Generally, classrooms shall receive two standard devices – one at the front of the room and one at the back of the room.

D. WLAN Access Point: Access points shall receive two links. The deployment shall be determined per project as the coverage area is building-specific. Also, the installation shall very per instance (wall mount, ceiling mount, . etc.).

8.0   ADMINISTRATION / LABELING

8.1   Identifier Assignment

A. General: Separate all label fields of the identifier with a hyphen.

B. Equipment Racks: Example: "AD1.1-R01"

  1. First field: the MDF/BDF/IDF room identity; for example: "AD1.1".

  2. Second field: the sequential rack number; e.g., "R01".

C. Backbone Cables: Example: "AD1.1-AD3.1-F6-01-12"

  1. First field: the originating MDF/BDF room identity; for example: "AD1.1".

  2. Second field: the destination BDF/IDF room identity; for example: "AD3.1".

  3. Third field: the cable type; for example: "F6" (fiber optic, 62.5/125 multimode).

4. Fourth field: beginning strand count served from originating room; for example: "01".

5. Fifth field: ending strand count served from originating room; for example: "12".

D. Horizontal Cables:　　　Example:　　　"AD1.1- D107-01-D1-CAT5E"

1. First field: the originating MDF/ BDF/IDF room identity; for example: "AD1.1".

2. Second field: the destination room number; for example: "D107".

3. Third field: a unique sequential outlet number; for example: "01" (1st outlet in the room).

4. Fourth field: a unique port number; for example: "D1" ("D" for data service, 1st port of the outlet).

5. Fifth field: the cable type; for example: "CAT5E".

E. Outlets:　　　Example:　　　"AD1.1- D107-01"

1. First field: the originating MDF/BDF/IDF room identity; for example: "AD1.1".

2. Second field: the destination room number; for example: "D107".

3. Third field: a unique sequential outlet number; for example: "01" (1st outlet in the room).

F. Individual Ports at the Outlets:　　　Example:　　　"D1" (data service, 1st port of the outlet)

1. First field: the cable's intended service type followed by a unique sequential number.

G. Individual Ports at the Modular Patch Panels:　　　Example:　　　"D107-D1"

1. First field: the End User Room Number; for example: "D107".

2. Second field: outlet port number; for example: "D1" ("D" for data service, 1st port of the outlet).

H. Wireless AP Label:　Example: "AD107-AP1-9AFF"

1. First field: the End User Room Number; for example: "AD107".

2. Second field: wireless AP number AP1, AP2, etc...

3. Third filed: last 4 digit of the AP Ethernet port MAC address.

DESCRIPTION	COLOR	MFG.	PART NUMBER
Category 6A - LANmark-SST, CMP, Small Diameter 0.250" $$$ NEW	Blue	Berk-Tek	11101842
Category 6 Premium - LANmark 2000, CMP, Reel	Blue	Berk-Tek	10163222
Category 6A - LANmark-XTP CMR, Reel $$$	Blue	Berk-Tek	11082063
Category 6 Premium - LANmark 2000, CMR, Reel	Blue	Berk-Tek	10167476
Category 6A OSP - LANmark 10G OSP, Reel $$$	Black	Berk-Tek	11094458
Category 6 Enhanced OSP - LANmark 1000 OSP, Reel $$	Black	Berk-Tek	11072213
Category 6A, 48-Port Flat 110-Style Panel, 2RU (rear cable mgmt bar included)	Black	Leviton	6A586-U48
Category 6A, 24-Port Flat 110-Style Panel, 1RU (rear cable mgmt bar included)	Black	Leviton	6A586-U24
Category 6, 48-Port Flat 110-Style Panel, 2RU (rear cable mgmt bar included)	Black	Leviton	69586-U48
Category 6, 24-Port Flat 110-Style Panel, 1RU (rear cable mgmt bar included)	Black	Leviton	69586-U24
Rear Cable Management Clip Bar - (accommodates 24 cables)	Silver	Leviton	49005-CMC
Category 6A, Atlas-X1™ Tooless Jack (component rated)	*	Leviton	6AUJK-R*6
Category 6, Atlas-X1™ Tooless Jack (component rated)	*	Leviton	61UJK-R*6
Category 6A, eXtreme Jack (channel rated)	*	Leviton	6110G-R*6
Category 6, eXtreme Jack (component rated)	*	Leviton	61110-R*6
Category 6A, High-Flex Small OD 3' Patch Cord - dual rated CM/LSZH, 28 AWG, 60W POE	*	Leviton	H6A10-03*
Category 6A, High-Flex Small OD 5' Patch Cord - dual rated CM/LSZH, 28 AWG, 60W POE	*	Leviton	H6A10-05*
Category 6A, High-Flex Small OD 7' Patch Cord - dual rated CM/LSZH, 28 AWG, 60W POE	*	Leviton	H6A10-07*
Category 6A, High-Flex Small OD 10' Patch Cord - dual rated CM/LSZH, 28 AWG, 60W POE	*	Leviton	H6A10-10*
Category 6A, High-Flex Small OD 15' Patch Cord - dual rated CM/LSZH, 28 AWG, 60W POE	*	Leviton	H6A10-15*
Category 6A, High-Flex Small OD 20' Patch Cord - dual rated CM/LSZH, 28 AWG, 60W POE	*	Leviton	H6A10-20*
Category 6, High-Flex Small OD, 3' Patch Cord - dual rated CM/LSZH 28 AWG, 60W POE	*	Leviton	6H460-03*
Category 6, High-Flex Small OD, 5' Patch Cord - dual rated CM/LSZH 28 AWG, 60W POE	*	Leviton	6H460-05*
Category 6, High-Flex Small OD, 7' Patch Cord - dual rated CM/LSZH 28 AWG, 60W POE	*	Leviton	6H460-07*
Category 6, High-Flex Small OD, 10' Patch Cord - dual rated CM/LSZH 28 AWG, 60W POE	*	Leviton	6H460-10*
Category 6, High-Flex Small OD, 15 Patch Cord - dual rated CM/LSZH 28 AWG, 60W POE	*	Leviton	6H460-15*
Category 6, High-Flex Small OD, 20' Patch Cord - dual rated CM/LSZH 28 AWG, 60W POE	*	Leviton	6H460-20*
1-port Faceplate with ID window	White	Leviton	42080-1*S
2-port Faceplate with ID window	White	Leviton	42080-2*S

3-port Faceplate with ID window	White	Leviton	42080-3*S
4-port Faceplate with ID window	White	Leviton	42080-4*S

6-port Faceplate with ID window	White	Leviton	42080-6*S
2-port Quickplate® TEMPO Faceplate with ID window	White	Leviton	42090-2*S
4-port Quickplate® TEMPO Faceplate with ID window	White	Leviton	42090-4*S
1-port Surface Mount Box with ID window "Plenum Rated"	White	Leviton	41089-1*P
2-port Surface Mount Box with ID window "Plenum Rated"	White	Leviton	41089-2*P
4-port Surface Mount Box with ID window	White	Leviton	41089-4*P
6-port Surface Mount Box with ID window	White	Leviton	41089-6*P
QuickPort® In-Ceiling Bracket	Galv	Leviton	49223-CBC
Category 6, 100-pair, 110 block w/legs & C4 clips Kit		Leviton	41AB6-1F4
6-strand I/O Plenum Fiber Cable Single-Mode, OS2	Yellow	Berk-Tek	PDP006AB0707-I/O-C4(YEL)
12-strand I/O Plenum Fiber Cable Single-Mode, OS2	Yellow	Berk-Tek	PDP012AB0707-I/O-C4(YEL)
24-strand I/O Plenum Fiber Cable Single-Mode, OS2	Yellow	Berk-Tek	PDP024AB0707-I/O-C4(YEL)
6-strand I/O Plenum Fiber Cable 50/125, OM4............ARMORED	Aqua	Berk-Tek	PDPK006FB3010/F5-I/O-C4(AQU)
12-strand I/O Plenum Fiber Cable 50/125, OM4............ARMORED	Aqua	Berk-Tek	PDPK012FB3010/F5-I/O-C4(AQU)
24-strand I/O Plenum Fiber Cable 50/125, OM4............ARMORED	Aqua	Berk-Tek	PDPK024FB3010/F5-I/O-C4(AQU)
6-strand I/O Plenum Fiber Cable Single-Mode, OS2....ARMORED	Yellow	Berk-Tek	PDPK006AB0707-I/O-C4C5(YEL)
12-strand I/O Plenum Fiber Cable Single-Mode, OS2....ARMORED	Yellow	Berk-Tek	PDPK012AB0707-I/O-C4C5(YEL)
24-strand I/O Plenum Fiber Cable Single-Mode, OS2....ARMORED	Yellow	Berk-Tek	PDPK024AB0707-I/O-C4C5(YEL)
Opt-X 2000i SDX - 1RU Fiber Enclosure, sliding tray, accepts 3 adapter plates, (72 LC's)	Black	Leviton	5R1UH-S03
Opt-X 2000i SDX - 2RU Fiber Enclosure, sliding tray, accepts 6 adapter plates, (144 LC's)	Black	Leviton	5R2UH-S06
Opt-X 2000i SDX - 4RU Fiber Enclosure, sliding tray, accepts 12 adapter plates, (288 LC's)	Black	Leviton	5R4UH-S12
Opt-X 1000i SDX - 1RU Fiber Enclosure, sliding tray, accepts 3 adapter plates, (72 LC's)	Black	Leviton	5R1UM-S03
Opt-X 1000i SDX - 2RU Fiber Enclosure, sliding tray, accepts 6 adapter plates, (144 LC's)	Black	Leviton	5R2UM-S06
Opt-X 1000i SDX - 3RU Fiber Enclosure, fixed tray, accepts 12 adapter plates, (288 LC's)	Black	Leviton	5R3UM-F12
Opt-X 1000i SDX - 4RU Fiber Enclosure, fixed tray, accepts 15 adapter plates, (360 LC's)	Black	Leviton	5R4UM-F15
NEW Opt-X SDX - MED Wall Mount holds 4 adapter plates, dual door, no lock, (96 LC's)	Black	Leviton	5WMED-04C
Fiber Adapter Plate - 24 Fiber LC 50um, OM3/4	Aqua	Leviton	5F100-4QL
Fiber Adapter Plate - 12 Fiber LC 50um, OM3/4	Aqua	Leviton	5F100-2QL
Fiber Adapter Plate - 12 Fiber LC Single-Mode, OS2	Blue	Leviton	5F100-2LL
Fiber Adapter Plate - Blank	Black	Leviton	5F100-PLT
LC-LC Fiber Patch Cord, 50mm, OM4, 1 meter	Aqua	Leviton	54DLC-M01

Description	Color	Manufacturer	Part Number
LC-LC Fiber Patch Cord, 50mm, OM4, 3 meter	Aqua	Leviton	54DLC-M03
LC-LC Fiber Patch Cord, 50mm, OM3, 1 meter	Aqua	Leviton	5LDLC-M01
LC-LC Fiber Patch Cord, 50mm, OM3, 3 meter	Aqua	Leviton	5LDLC-M03
LC-LC Fiber Patch Cord, Single-Mode, OS1, 1 meter	Yellow	Leviton	UPDLC-S01
LC-LC Fiber Patch Cord, Single Mode, OS1, 3 meter	Yellow	Leviton	UPDLC-S03
1-Fiber 50/125 µm, OM4 LC, 3 meter	White	Leviton	54PLC-M03
1-Fiber 50/125 µm, OM3 LC, 3 meter	White	Leviton	5LPLC-M03
1-Fiber Single-Mode, OS2 LC, 3 meter	White	Leviton	UPPLC-S03
12-Fiber OM4, MTP Female, Low Loss, 3 meter	Aqua	Leviton	4J2PL-03M
12-Fiber OM4, MTP Female, Standard Loss, 3 meter	Aqua	Leviton	4J2PS-03M
12-Fiber Single-Mode, MTP Female, Low Loss, 3 meter	Yellow	Leviton	UJ2PL-03M
12-Fiber Single-Mode, MTP Female, Standard Loss, 3 meter	Yellow	Leviton	UJ2PS-03M
Fiber Storage Ring 24" - Wall Mount	Black	Leviton	48900-OFR
7' x 19" Equipment Rack, 2 Post Black	Black	B-Line	SB556084XUFB
4-post 19" Equipment Rack, square hole rails for cage nuts 7ft, adjustable depth 24-30"	Black	B-Line	SB837084BFB
4-post 19" Equipment Rack, square hole rails for cage nuts 7ft, adjustable depth 30-36"	Black	B-Line	SB838084CFB
4-post 19" Equipment Rack, square hole rails for cage nuts 7ft, adjustable depth 36-42"	Black	B-Line	SB838084DFB
19"w x 54"h x 18"d Wall Swing Rack, Black	Black	B-Line	SB708195418FB
19"w x 43"h x 18"d Wall Swing Rack, Black	Black	B-Line	SB708194418FB
19"w x 30"h x 18"d Wall Swing Rack, Black	Black	B-Line	SB708193018FB
RS Series Server Cabinet 45U x 24"w x 42"d, Locking Vented Doors, Sides and Top	Black	B-Line	RSV4561B
RS Series Server Cabinet 45U x 24"w x 48"d, Locking Vented Doors, Sides and Top	Black	B-Line	RSV4562B
RS Series Server Cabinet 45U x 31"w x 42"d, Locking Vented Doors, Sides and Top	Black	B-Line	RSV4581B
RS Series Server Cabinet 45U x 31"w x 48"d, Locking Vented Doors, Sides and Top	Black	B-Line	RSV4582B
24"w x 25"h x 24"h Wall Mount Cabinet, Plexi door, black	Black	B-Line	VLWM2425PB
24"w x 36"h x 24"d Wall Mount Cabinet, Plexi door, black	Black	B-Line	VLWM3625PB
Vertical Front & Rear Fingers 5" wide x 80" Wire Manager w/cover	Black	Leviton	4980L-VFR
Vertical Front & Rear Fingers 8" wide x 80" Wire Manager w/cover	Black	Leviton	8980L-VFR
Horizontal Front & Rear Duct Wire Manager, 1U - Double Sided	Black	Leviton	491RUHFR
Horizontal Front & Rear Duct Wire Manager, 2U - Double Sided	Black	Leviton	492RU-HFR
Horizontal Angled Patch Cord Organizers, 2U	Black	Leviton	4W006AMB
Vertical Cable Manager, 3" Double Sided Wide w/ covers 7ft…..RCM+	Black	B-Line	SB86083D084FB
Vertical Cable Manager, 6" Double Sided Wide w/ covers 7ft…..RCM+	Black	B-Line	SB86086D084FB

Vertical Cable Manager, 10" Double Sided Wide w/ covers 7ft…..RCM+	Black	B-Line	SB860810D084FB
Vertical Cable Manager, 12" Double Sided Wide w/ covers 7ft…..RCM+	Black	B-Line	SB860812D084FB
Vertical Cable Manager, 6" Double Sided Wide w/ covers 7ft…..RCM	Black	B-Line	SB86166DFB
Horizontal Cable Manager, 1U - Double Sided	Black	B-Line	SB87019D1FB
Horizontal Cable Manager, 2U - Double Sided	Black	B-Line	SB87019D2FB
Runway - 12" x 1 1/2" stringer x 10' - UL Classified	Black	B-Line	SB17U12BFB
Runway - 18" x 1 1/2" stringer x 10' - UL Classified	Black	B-Line	SB17U18BFB
Runway - 24" x 1 1/2" stringer x 10' - UL Classified	Black	B-Line	SB17U24BFB
Rack to Runway Top Plate Kit - 12"	Black	B-Line	SB213312FB
Rack to Runway Top Plate Kit - 18"	Black	B-Line	SB213318FB
Rack to Runway Top Plate Kit - 24"	Black	B-Line	SB213324FB
Wall Angle Support Kit - 12"	Black	B-Line	SB211312FB
Wall Angle Support Kit - 18"	Black	B-Line	SB211318FB
Wall Angle Support Kit - 24"	Black	B-Line	SB211324FB
Triangular Suport Bracket - 12"	Black	B-Line	SB21312KFB
Triangular Suport Bracket - 18"	Black	B-Line	SB21318KFB
Cable Runway Horz Bend - 12"	Black	B-Line	SB17HRB12EB
Cable Runway Horz Bend - 18"	Black	B-Line	SB17HRB18FB
Cable Runway Horz Bend - 24"	Black	B-Line	SB17HRB24FB
Cable Runway Radius Drop - 12"	Black	B-Line	SB2129U12FB
Cable Runway Radius Drop - 18"	Black	B-Line	SB2129U18FB
Cable Runway Radius Drop - 24"	Black	B-Line	SB2129U24FB
Grounding Strap Kit	Green	B-Line	SB669¾x10½
End Caps - Neoprene	Black	B-Line	SB21B
3/8" ATR Threaded Rod - 10'	Galv	B-Line	ATR3/8X120
1 5/8" STRUT, Slotted Hole	Galv	B-Line	B22SHGALV120
3/8" Nut with Flat Washer	Galv	B-Line	3/8HN 3/8FW
Beam Clamps	Galv	B-Line	B444-3/8
J-Hook 3/4"	Galv	B-Line	BCH12
J-Hook 1.5"	Galv	B-Line	BCH21
J-Hook 2"	Galv	B-Line	BCH32
J-Hook 4"	Galv	B-Line	BCH64
J-Hook 3/4" w/wire clip	Galv	B-Line	BCH12-W2
J-Hook 1.5" w/wire clip	Galv	B-Line	BCH21-W2

J-Hook 2" w/wire clip	Galv	B-Line	BCH32-W2
J-Hook 4" w/wire clip	Galv	B-Line	BCH64-W2
Clip for Wire to Grid	Galv	B-Line	BA311-W2
Grounding Lug - 2 hole compression; #8 - #4awg, 5/8" hole spacing, 1/4"x20 bolt size	Galv	B-Line	SB47802
Wall Mounted Ground Bus Bar - 12" x 2" small	Copper	B-Line	SBTGB
Wall Mounted Main Ground Bus Bar - 12" x 4"	Copper	B-Line	SBTMGB12
Wall Mounted Main Ground Bus Bar - 20" x 4"	Copper	B-Line	SBTMGB20
19" Rackmount Horizontal Mount Ground Bar - Kit	Copper	B-Line	SB57903
20 AMP, 12 receptacle PDU w/15 foot cord, Horz./rack mount	Black	Leviton	5500-192
Eaton 9PX UPS, 2U, 2000 VA, 1800 W, 5-20P input, Outputs: (6) 5-20R, (1) L5-20R, 120V	Black	Eaton	9PX2000RT
Eaton 9PX UPS, 2U, 3000 VA, 2700 W, L5-30P input, Outputs: (6) 5-20R, (1) L5-30R, 120V	Black	Eaton	9PX3000RT
Brother PT-E550W labeler for patch panels, 110 blocks, wall plates, patch cords - Wireless	Black	Brother	PT-E550W
Brother P-Touch Labels - .13" / 3.5mm Black on White, "High-Density / 2U-48port" Patch Panels	White	Brother	TZeN201
Brother P-Touch Labels - .35" / 9mm Black on White, Patch Panel & Plates	White	Brother	TZe221
Brother P-Touch Labels - .50" / 12mm Black on White, 110 Blocks, fiber enclosures	White	Brother	TZe231
Brother P-Touch Labels - .75" / 18mm Black on White, Flex Tape - Cable Rapping	White	Brother	TZeFX241
Fiber Raceway Trough 4" x 8" x 6.5ft, hinged cover	Yellow	Leviton	S8DCT-DHC
Fiber Raceway Trough 4" x 4" x 6.5ft, hinged cover	Yellow	Leviton	S4DCT-DHC
Fiber Drop-Off kits, 4" x 4"	Yellow	Leviton	S4DRP-DRP
75' Velcro Roll	Black	Leviton	43115-75

Product	Purpose
Catalyst 9300	Access Switch
Catalyst 9400	Access Switch
Catalyst 9500	Core Switch
APC - UPS solutions	Power Backup

Note: APC model is dependent upon load. A load assessment is needed to determine the proper model.

Product	Category	Purpose
Cisco 5520 Wireless LAN Controllers	Controller	*Designed for medium and large networks *Optimized for 802.11ac Wave 2 networks *Supports up to 1500 access points *Supports up to 20,000 clients *Deployment: Centralized, Flex Connect, and mesh
Catalyst 9800-40	Wireless Controller	*For medium-sized campus deployments *Up to 2000 APs, 32,000 clients, and 40-Gbps throughput Hot patching, time saving and hitless upgrades Advanced, on-demand telemetry
Catalyst 9800-80	Wireless Controller	*For large-sized campus deployments *Up to 6000 APs, 64,000 clients, and 80-Gbps throughput *Hot patching, time saving and hitless upgrades *Advanced, on-demand telemetry
Cisco Aironet 4800 WAPs	WAP	*Theoretical connection rate of 2.6 Gbps per radio *802.11ac Wave 2 compliant *Dual radios: 2.4 and 5 GHz or dual 5 GHz with flexible radio assignment *4x4 MU-MIMO radio designs with three spatial streams *Supports channels up to 160 MHz wide with Dynamic Bandwidth Selection
Cisco Catalyst 9130	WAP	*Four radios: 2.4 GHz (4x4), 5 GHz (8x8 and 4x4), Cisco RF ASIC, and BLE/IoT *Cisco Flexible Radio Assignment and Cisco CleanAir Technology *Internal and external antenna *Wi-Fi 6 certified
Cisco Catalyst 9120	WAP	*Four radios: 2.4 GHz (4x4), 5 GHz (4x4), Cisco RF ASIC and BLE/IoT *Cisco Flexible Radio Assignment and Cisco CleanAir Technology *Internal and external antenna
Cisco Aironet Exterior AP 1540	Exterior WAP	*Compact, lightweight size: At just over 2.5 pounds (1 kg) and with a small footprint, the 1540 Series is one of the smallest outdoor access points with internal antennas *Low power consumption: Achieves full operation on standard 802.3af power (13.9W) *Integrated antenna options: The 1540 Series offers two models with different antenna patterns to address a variety of use cases

Cisco Aironet Exterior AP 1560	Exterior WAP	* Improved performance for multiple client devices: The 802.11ac Wave 2 access points use MU-MIMO technology, which allows different data streams to all flow at once from the access point to multiple 802.11ac Wave 2-supported devices. Now, multiple 802.11ac Wave 2 devices can connect at the same time, getting the information they need quicker *4G LTE Coexistence: The Cisco Aironet 1560 Series includes robust filtering around the 2.4 GHz unlicensed band to block out nearby licensed 4G LTE cellular signals. *Cisco Flexible Antenna Port technology uses software configurable for either single- or dual-band antennas. It allows you to use the same antenna ports for either dual-band antennas to reduce footprint or single-band antennas to optimize radio coverage. *Cisco Mobility Express: This solution is designed to bring enterprise-class wireless access to small and medium-sized networks. Easy to set up with low maintenance, Mobility Express includes advanced features from Cisco and does not require a physical controller appliance. *Cisco High Density Experience (HDX): Cisco HDX comes standard on the 1560, giving this access point top-of-the-line network efficiency over a large number of wireless clients. HDX uses customized chipsets to target the needs of high-density networks. It is built with best-in-class RF architecture and gives a better user experience for high-performance applications.
Cisco Aironet Exterior AP 1570	Exterior WAP	*Cisco High Density Experience (HDX): Cisco HDX comes standard on the 1560, giving this access point top-of-the-line network efficiency over a large number of wireless clients. HDX uses customized chipsets to target the needs of high-density networks. It is built with best-in-class RF architecture and gives a better user experience for high-performance applications. *Outdoor university and school campuses. *802.11ac support with 4x4 MIMO, three spatial streams *Maximum RF radiated power allowable on both 2.4 and 5 GHz radios *Cisco High-Density Experience (HDX) *Cisco CleanAir® Technology *Cisco ClientLink 3.0 *MIMO equalization