Telecommunications Infrastructure
Design Standard

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TELECOMMUNICATIONS INFRASTRUCTURE
Design Standard

PART 1 GENERAL

1.1   PURPOSE

This purpose of this document is to describe minimum requirements and establish design guidelines for telecommunications / network infrastructure that will support information   systems and other data-based systems. This document describes requirements and criteria to guide the Design Team (telecommunications, security, audio visual, architectural, electrical, mechanical, and other disciplines) and the Contractor to provide the minimum infrastructure and support for information systems.

This document is not intended for use as project specifications. Each project shall have technical specifications produced specific to said project.

1.2   SCOPE

The scope of this document includes the following:

A.   Architectural, Structural, Electrical, Mechanical, Plumbing, and Security requirements for Telecom rooms build-out/fit-up

B.   Outside Plant Underground Pathways

C.   Telecom rooms build-out/fit-up, including equipment and termination apparatus racking and cable support

D.   Building Pathways

E.   Structured Cabling

F.   Wireless LAN Deployment

G.   Instructional Technologies

H.   Audio Visual

I.   Special Systems

1.3   APPLICATION

Information technologies are a critical element in the design of virtually all new and renovation building projects. Whether voice, data, video, security, fire alarm systems, audio/visual systems, or other technology, it is important that a team of experienced professionals are involved in the design of these complex systems.

The requirements and criteria herein apply to the District Office and each campus within the District – Cañada College, College of San Mateo, and Skyline College.

A Structured Cabling Plant is a key concept in enabling Information Technology for each of the three College communities in the District. To maximize network functionality, minimize labor and material costs, and improve maintenance of information technologies infrastructure, ITS has developed standards and practices that projects shall comply to. These standards are managed and administered by the District's ITS Department.

1.4   ARRANGEMENT OF INFORMATION

This document is arranged by design discipline. Best practice has the Designer reading the entire document and related documents; however, the Designer may study the specific sections related to their discipline, and review the other sections.

1.5   SYSTEMS SUPPORTED

The Telecom infrastructure shall support data network communications from the equipment in the Telecommunications Room (e.g., switch) to the work area equipment

(e.g., desktop computer) and between equipment in Telecom rooms (e.g., core router switch in MPOE to access switch in TDs).

The data network supports multiple functions, including: data, voice (VOIP), security camera, access-control, building management, wireless, emergency public address system. Also support non-VOIP data communication for campus phones and elevator control panels (elevator car emergency phone).

1.6   PROCEDURES

A. ITS Contacts

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Bruce Griffin	Chief Technology Officer	(650) 358-6722	griffinb@smccd.edu
Darrell Lee	Network Analyst	(650) 358-6708	leed@smccd.edu
Aaron Soo	Network Engineer	(650) 358-6704	sooa@smccd.edu

B. Deviation from Design Standards

Any deviation from the Design standard or Specification must be approved by the Executive Director of Construction Planning or the Vice Chancellor of Facilities in writing prior to implementation in the Contract Documents.

C. Project Design

All projects shall have the telecommunications infrastructure designed by a Professional Telecommunications Engineer (as part of the Design Team or independent consultant) and approved by ITS. The Professional Telecommunications Engineer shall have the following minimum requirements:

1. Registered Professional Engineer on Staff

2. BICSI RCDD on Staff

3. CSI CDT on Staff

4. Revit trained personnel on Staff

5. BIM Modeling / Clash Detection trained personnel on Staff

This infrastructure shall include all pathways, cabling, terminations, testing and telecom room construction related to the telecommunications systems. The Designer shall provide services in accordance with these standards, and as directed by ITS.

The Design Team shall verify that all applicable portions of these standards are incorporated into the project's design, drawings, specifications and final construction. Requests for variances from these standards shall be submitted in writing to the Project Manager.

D. BIM Modeling / Clash Detection

The Design Team shall provide BIM modeling and clash detection design services and coordination including the following:

       1.   Development of the project design in Revit

       2.   BIM modeling and clash detection of the following systems:

          a.   Primary pathways

              1)   Cable trays

              2)   Conduits 3" diameter or larger

          b.   Telecom Rooms and Components

              1)   HVAC

              2)   Electrical

              3)   Equipment Racks

              4)   Wall Mounted Equipment

              5)   Vertical Pathways

              6)   Overhead Pathways

       3.   Review and coordination of other design team and contractor trade's BIM model to verify that only approved systems are allowed in the Telecom Rooms.

E.   Project Installation

The telecommunications installation contractor shall have the following minimum requirements:

       1.   Contractor shall be certified by the manufacturer to provide the cabling system (proposed, submitted, and approved) and to provide an extended warranty. Submit satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid.

       2.   A current, active, and valid and C7 or C10 California State Contractors License

       3.   Five, minimum, continuous years of experience

       4.   Five, minimum, completed projects similar to scope and cost

       5.   Evidence of technicians qualified for the work

F.   Scheduling

Prior to work commencing, contractor shall meet ITS to discuss the project scope.

Contractors shall develop construction schedule that allows adequate time for ITS to inspect the installation and perform equipment provisioning, as stated following, prior to the Owner's occupancy of each part of a project.*

Contractors shall be required to cooperate with ITS personnel and allow them equal access to the jobsite to complete their work, concurrent with other work underway by the Contractor.

Room Readiness Criteria:*

       1.   The following shall be met at a minimum of 30 days prior to substantial completion

          a.   Permanent Power

          b.   Permanent Cooling

          c.   Secured / Controlled Space

          d.   Dust Free Environment

*If the above permanent conditions are not available then temporary facilities with the same criteria shall be provided to support the ITS systems to support ITS installation requirements.

G. Demolition of Existing Cabling

If existing cabling must be demolished, coordinate with ITS the extent of the demolition work. ITS may choose to have some equipment recovered (such as cables, jacks, faceplates, racks, or other components). The demolition plans must be produced with this information expressly stating the components to be recovered and turned over to ITS.

1.7   OWNER-PROVIDED EQUIPMENT

ITS will furnish and install the networking equipment, telephone endpoint, and AV equipment. ITS shall perform the final patching between the networking equipment and horizontal field and the final cross-connect wiring between the backbone field and horizontal field.

Patch cords will be provided by ITS.

Refer to the Wireless LAN Service section for installation requirements specific to that system.

PART 2 ARCHITECTURAL

2.1   TELECOMMUNICATION ROOMS – NEW CONSTRUCTION

These standards are intended for an MDF/IDF excluding the Campus Main Point of Entry (MPOE)

Refer to section 8.2 for descriptions of the different types and functions of the Telecom rooms. "Telecommunications Room" covers service entrance room, main distribution room, and intermediate distribution room.

A. Size / Critical Dimensions (MDF/IDF)

Use the following dimensions as guidelines for the minimum size of a Telecommunications Room. The actual dimensions will vary depending upon Telecom and UPS equipment in the room and accommodating building elements.

These are the minimum critical dimensions for equipment and clearances for rooms to house floor-standing equipment racks (MDF/IDF):

1. Width: 10'-6"
2. Depth: 7'-0" for the first rack and UPS, 30" for each additional rack (recommend three racks for typical floor plate of approximately 50,000 square-feet) See diagram below for example.
3. Height: 9'-6" from finished floor to the lowest clearance (such as fireproofing on steel beam).
   If area is encroached by building elements such as columns, critical dimensions must still be adhered to and the room dimensions appropriately adjusted.
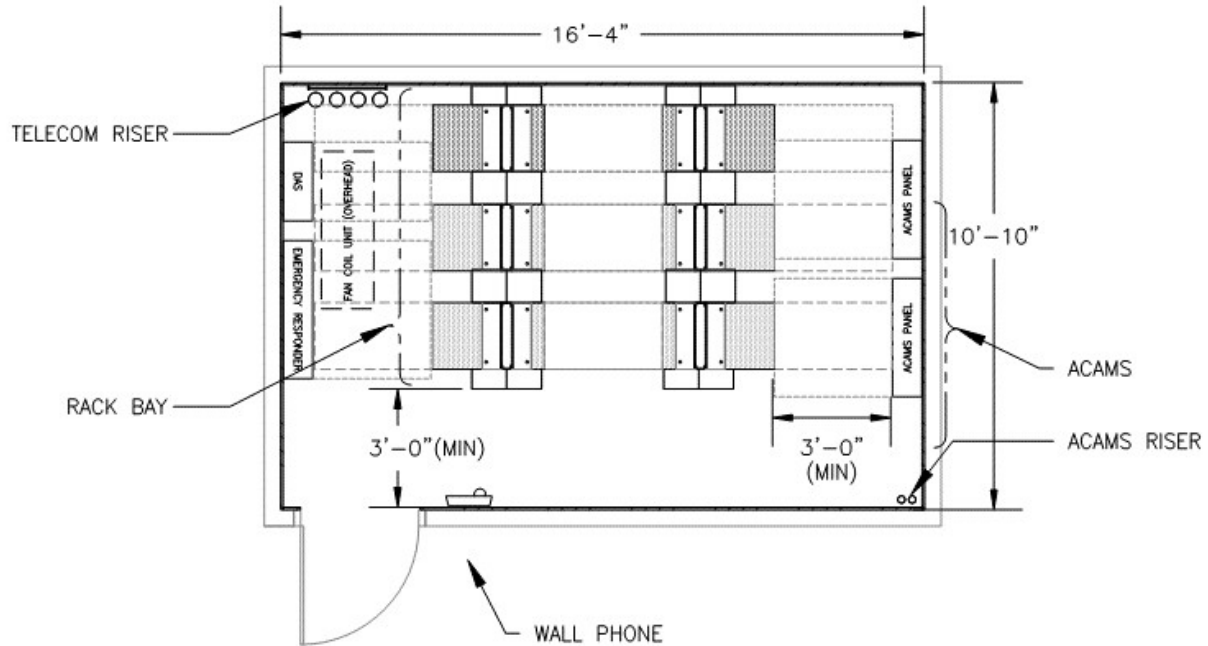
MDF Room Plan Example
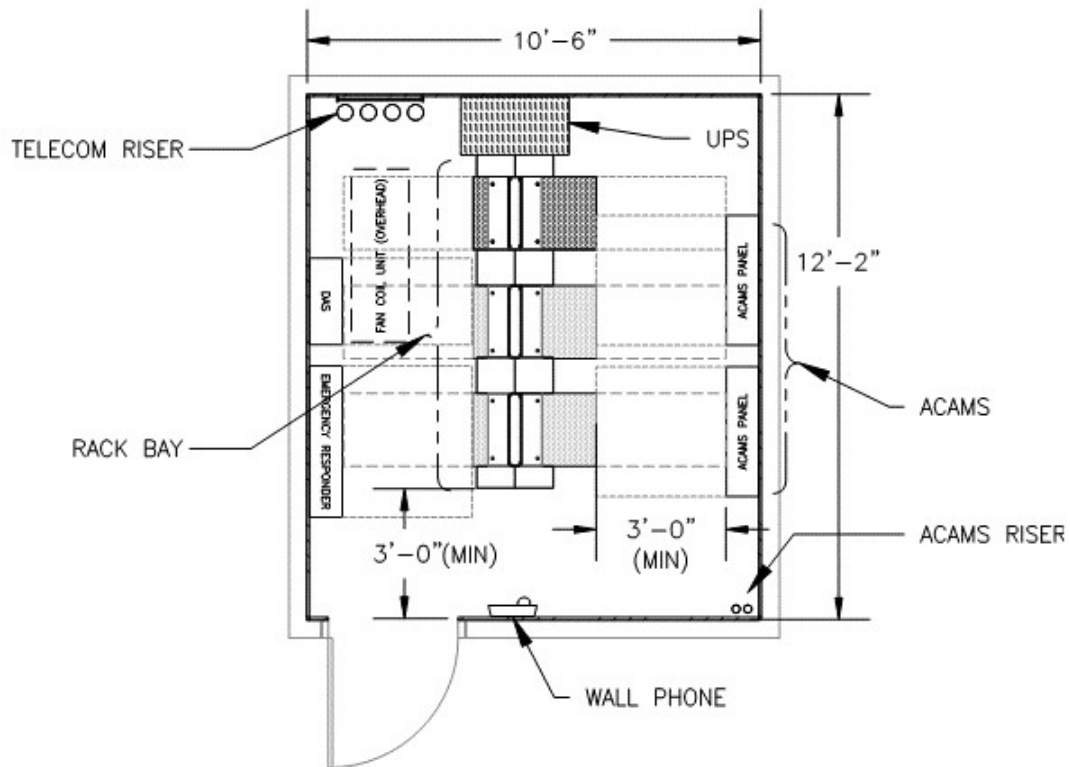
Telecom Room Plan Example

B.   Location and Adjacencies

Telecom rooms should be centrally located on the building floor plate within the parameters

listed below.

Telecom Rooms must be located where no station cable will exceed 300 feet from termination to termination.

In multi-story Buildings, Telecom Rooms shall be vertically adjacent / stacked floor- to-floor. This will improve long-term management and will result in lower construction costs for backbone pathways and backbone cabling.

C. Construction

Walls shall be typical metal-stud framed walls. Wall construction may vary depending on Building design.

Walls shall be full height construction to the structure above. Fire rated walls are not required unless mandated by applicable code.

D. Door

Swing: The door shall swing outward to maximize the usable area within the room unless restricted by egress path code. If the door swings into the room the door shall not interfere or obstruct any equipment or infrastructure and shall maintain the 36" working clearance require around the equipment or infrastructure.

Size: The door shall be 36" wide by 84" tall, minimum.

E. Finishes

1. Floors

Floors shall be either sealed concrete or anti-static VCT grounded to the telecommunications grounding system.

2. Walls

Concrete and/or CMU walls shall be sealed prior to plywood backboard installation.

Walls shall receive one layer ¾-inch plywood as backboard. The plywood shall be fire treated, in accordance with ASTM E 84.

The plywood shall be installed starting at 6-inches above the floor up to 8'-6", minimum.

The fasteners shall be designed per instance, and will depend on the substrate (wall type) and project requirements. Installation requirements will be coordinated with the architect and structural engineer for approved methodology.

The plywood shall be painted a bright color (such as white, to improve lighting/illumination) with a minimum two coats of a semi-gloss paint. Mask fire rating stamp prior to painting. Remove masking after painting so the rated stamp is visible.

3. Ceilings

The ceilings shall be left open to the deck above. No ceiling or grid is required.

F. Accessibility / ADA Compliance

1. Unless otherwise required by code or jurisdiction, ADA Compliance and Accessibility is not required for telecommunication spaces.

2.2   TELECOM ROOMS – RENOVATION

To the extent possible, renovation projects shall meet the criteria detailed in the New Construction requirements above.

Any deviations from these standards will require the ITS CTO or designated representative review and concurrence.

PART 3 STRUCTURAL

3.1   NEW CONSTRUCTION

A.   Floor loading, at Telecom rooms

Floor loading at Telecom rooms shall be 50 pounds per square-foot, minimum.

B.   Seismic Bracing of Equipment Racks, in Telecom rooms:

Floor mounted equipment racks require anchoring to the floor and shall be coordinated with the structural engineer of record for development of anchoring details and requirements specific to each project.

EQUIPMENT RACK NUT
LOCK WASHER AND FLAT
WASHER (TYP FOR 4)

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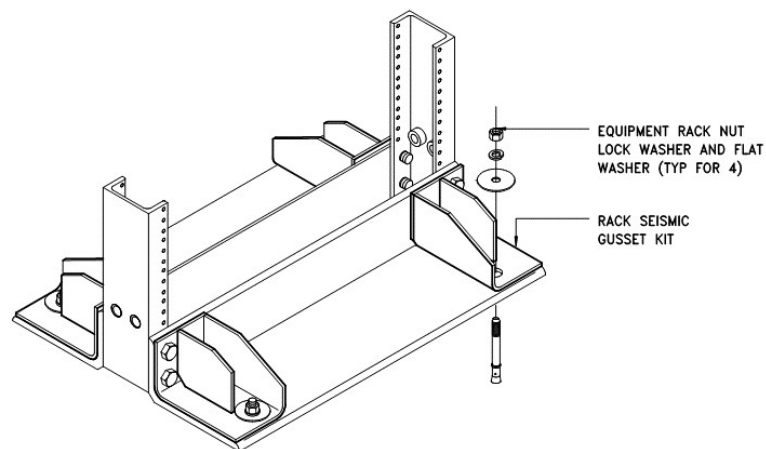
NOTE: REFER TO ROOM PLANS FOR EQUIPMENT RACK TYPE, SIZE, AND
        LOCATION(S).

3   2-POST GUSSET MOUNTING KIT
    SCALE: 12" = 1'-0"

Rack Base Anchor Example

The detail above is an example only of floor mounted equipment rack anchoring requirements.

3.2   RENOVATION CONSTRUCTION

To the extent possible, renovation projects shall meet the criteria detailed in the New Construction requirements above.

Any deviations from these standards will require the ITS CTO or designated representative review and concurrence.

PART 4 PLUMBING

4.1   PIPING COORDINATION THROUGH TELECOM ROOMS

Piping and plumbing shall not be routed through Telecom rooms or on the floor directly above the Telecom rooms (with exception to chilled water or refrigerant lines supporting the HVAC within the Telecom room).

Chilled water or refrigerant lines supporting the HVAC for the Telecom room shall not route over equipment racks, electrical panels, or active equipment. Condensate pans and drain lines shall be provided as required to prevent water leakage in room or on equipment.

Any deviations from this requirement will require the ITS CTO or designated representative review and concurrence.

PART 5 MECHANICAL

5.1   TELECOM ROOMS

A. General

Each Telecom room requires 24/7/365 environmentally controlled cooling.

B. Preferred Cooling Solutions:

The most cost effective and efficient method for cooling is to utilize the building or campus chilled water system. However the chilled water system must provide cooling capacity 24/7/365.

If a chilled water loop meeting the criteria above is not available then the preferred solution is a dedicated split system.

C. Environmental Control Requirements

Mechanical equipment within Telecom rooms shall be controlled and monitored by SMCCCD's Building Management System. Refer to Section 25 55 00 Building Management System design standard.

The temperature in Telecom rooms shall not exceed 80 degrees Fahrenheit. Average operating temperature is between 75-80 degrees Fahrenheit. Temperature readings that exceed 80 degrees Fahrenheit shall initiate a BMS system alarm that will trigger a SNMP alarm to alert ITS of an over-temperature status.

D. Power/Cooling Loads

The typical recommended power/cooling load requirements for a Telecom room is 50 watts per square foot. The designer shall validate the final load requirements for each telecom room in coordination with ITS and the MEP design team.

E. Air Changes

Telecom rooms require one air change per hour, minimum.

F. Spatial Coordination

The Telecom room equipment layout will be based on a standardized design approach. The mechanical design and mechanical equipment layout shall follow the telecom/network equipment layout. In general, locate the cooling unit in front of the rack bay to provide cool air to the front side of the equipment.

Coordinate final placement of the equipment with the Mechanical Engineer.

G. Installation

The cooling unit shall be wall mounted or suspended from the ceiling above.

Chilled water or refrigerant lines supporting the HVAC for the Telecom room shall not route over equipment racks, electrical panels, or active equipment. Condensate pans and drain lines shall be provided as required to prevent water leakage in room or on equipment.

HVAC ducting unrelated to the Telecom Room shall not be routed through the Telecom room.

PART 6 ELECTRICAL

6.1   GROUNDING FOR TELECOMMUNICATIONS/DATACOM

A. Telecommunications Grounding Backbone

A grounding backbone is required for each building with a ground terminal presented in each Telecommunications Room.

The Telecommunications Grounding Backbone shall be designed in compliance with ANSI-J-STD-607-A.

1. Bonding Conductor for Telecommunications (BCT)

    A BCT is required from the TMGB to the main building ground reference. The conductor shall be insulated, green. Size the conductor as 1,000 circular-mils per foot up to 3/0 AWG.

2. Telecommunications Main Grounding Busbar (TMGB)

    A TMGB is required in the Service Entrance and Termination Room / MDF. Refer to ANSI-J-STD-607-A for busbar size and requirements.

3. Telecommunications Bonding Backbone (TBB) Conductor

    A TBB is required from the TMGB to each TGB. The conductor shall be insulated, green. Size the conductor as 1,000 circular-mils per foot up to 3/0 AWG.

4. Telecommunications Grounding Busbar (TGB)

    A TGB is required in the Equipment Room / MDF or IDF, and in each per-floor Telecommunications Room / IDF. Refer to ANSI-J-STD-607-A for busbar size and requirements.
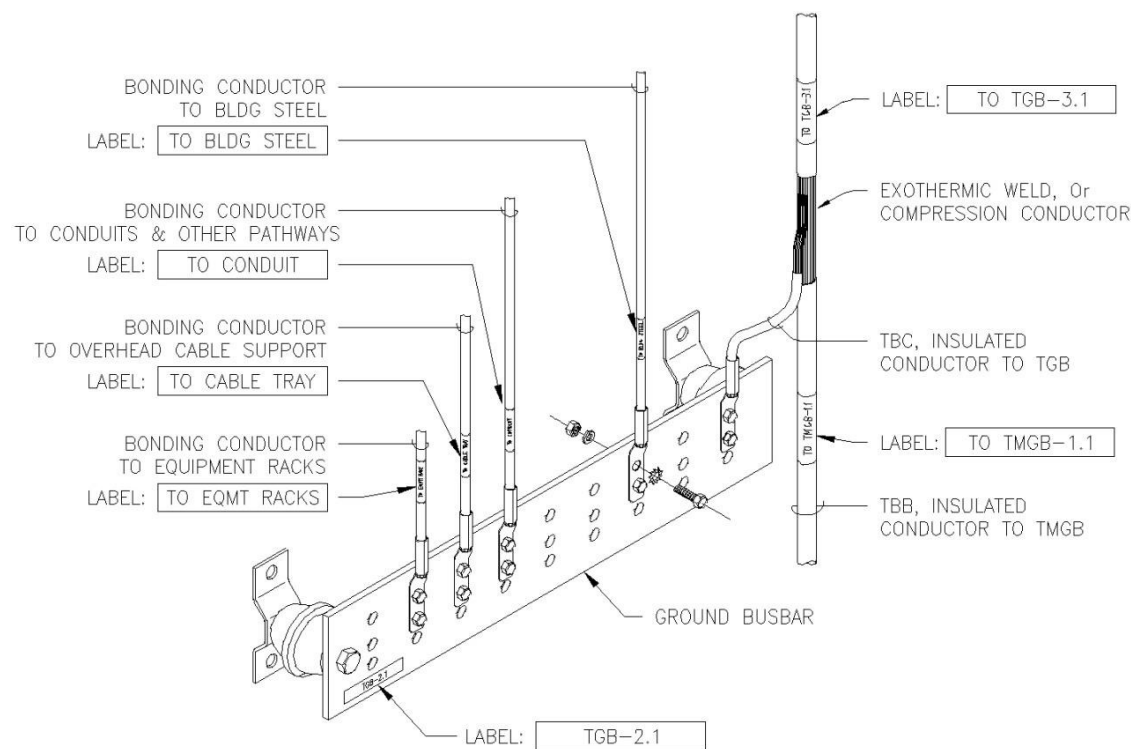
Grounding Busbar Example

B. Telecommunications Bonding to Grounding Backbone

    Metallic components, such as pathways (conduit), overhead cable support, rack bays, etc., within a Telecom room shall be bonded to the respective TGB.

6.2   ELECTRICAL SERVICE IN TELECOMMUNICATION ROOMS (MDF/IDF)

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 quadplex outlet approximately 12 inches in front of the rack bay and one quadplex outlet approximately 30 inches behind the rack bay.

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

B.   Rack Bay Service

The rack bay will receive power from a UPS system and Power Distribution Unit (PDU) (*see next item*).

C.   UPS Service

At least one dedicated electrical circuit shall be provided for the UPS system. Additional circuits may be required depending on circumstances. The service shall consist of one 120V 20A breaker to a 5-20R receptacle above the rack bay in close proximity to the intended location of the UPS system. The Telecom Designer and Electrical Designer shall coordinate the electrical service with the network equipment rack layout.

The UPS system with the PDU for rack service will be provided by ITS.

D.   Security System (ACAMS) Service

Coordinate the service requirements with the Security Designer, as the security/ACAMS system will require a dedicated 120V 20A circuit with special termination requirements.

E.   Lighting

Lighting shall be overhead both in front of and behind the rack bay. Lighting should be dual-lamp fluorescent type, lens not required.

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

6.3   PATHWAYS COORDINATION

Pathways shall be shown on the telecom drawings. For joint systems (i.e. surface raceway, floor boxes), the Electrical Engineer and Telecom Engineer shall carefully   coordinate the pathway requirements to avoid missed and/or duplicated requirements,   and to ensure component compatibility.

Electrical conduits unrelated to the Telecom Room shall not be routed through the Telecom room.

PART 7 SECURITY

Refer to SMCCCD Physical Access Controls and Security Management Design Standard for additional information.

7.1   ACCESS CONTROL FOR TELECOMMUNICATION ROOMS

A.   All Telecom rooms require access control. MPOE, MDF and IDF rooms shall have electric locks with card reader interface and connection to the access control system.

7.2   Security Equipment within Telecom Rooms

A.   The Telecom Designer and the Security Designer shall coordinate the equipment layout / wall elevation within the Telecom Room with ITS and the Electrical Engineer.

B.   Refer to section 2.1 for a room layout example indicating security equipment coordination within Telecom Room.

PART 8 TELECOMMUNICATIONS

8.1   OUTSIDE PLANT UNDERGROUND PATHWAYS

   A.   Conduit Types

        The following conduit types will be accepted for different circumstances:

Circumstance	Acceptable Conduit Types
Straight Sections, no vehicular or automobile traffic	Non-Metallic Schedule 40 PVC Minimum 24" cover/backfill (applies to all sections) Underground warning tape installed minimum 6" above conduits (applies to all sections)
Straight Sections, under heavy vehicular traffic (e.g. loading docks)	Non-Metallic Schedule 40 PVC, with concrete slurry
Sweeping Bends	Non-Metallic Schedule 80 PVC
Factory Sweeps	Non-Metallic Schedule 80 PVC
Building Entrance	PVC Coated Galvanized Rigid Steel

   B.   Maintenance Hole Types

        The maintenance holes shall have the following features:

   1.   Vault-type maintenance holes/pull boxes:

        a.   Minimum size (interior clearances) shall be 48-inches wide by 84-inches deep by 60-inches long

        b.   Equipped with pipe connection to a storm drain that is gravity drained and has a back-flow valve

        c.   Equipped with a sump pump, corrosion-resistance pulling irons, corrosion- resistance cable racks, and grounding.

   2.   Split cover-type maintenance holes/pull boxes:

        a.   Minimum size shall be 36-inches wide by 48-inches deep by 60-inches long.

        b.   Equipped with pipe connection to a storm drain that is gravity drained and has a back-flow valve

        c.   Equipped with a sump, corrosion-resistance pulling irons, corrosion-resistance cable racks, and grounding.

   3.   Hand hole-type pull boxes:

        a.   Minimum size should be 17-inches wide by 12-inches deep by 30-inches long, installed with a 12-inch deep (minimum) gravel base for drainage.

Vault-Type

Split Cover-Type

Hand Hole-Type
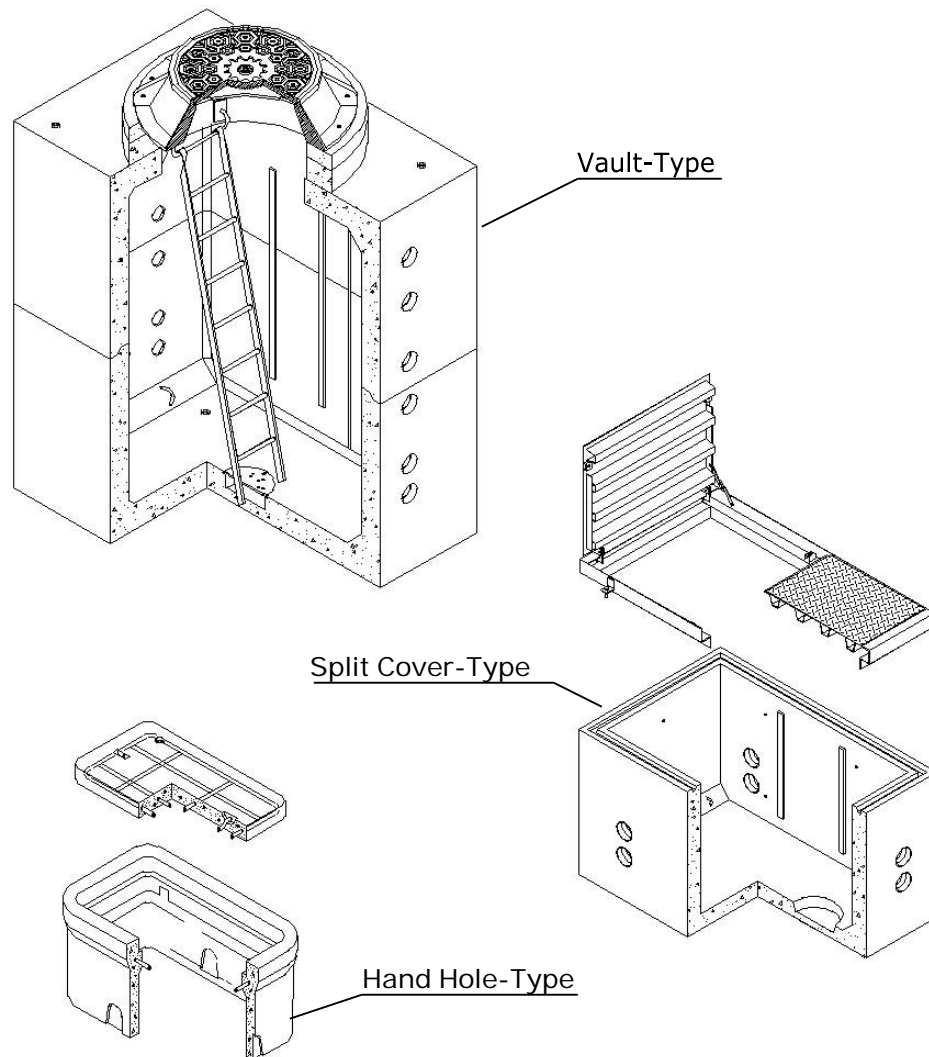
Maintenance Manholes Examples

C. Pathway Service per Building

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

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.

D. Installation

The minimum burial depth for conduits shall be 36 inches.

Duct banks shall not contain more than two 90-degree bends between pull points, and should exceed 300 feet between pull points.

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

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

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

Conduits shall be bonded to the grounding backbone within the Telecom rooms.

E. Subduct (and Innerduct)

At least one of the service conduits shall contain fabric subduct (Maxcell).

Alternatively, four 1-inch trade size innerducts. Each innerduct shall be uniquely colored.

8.2   TELECOMMUNICATION ROOMS

A. Telecom Room Types

The following descriptions summarize the typical telecom room types along with the room's associated functions.

1. Service Entrance and Termination Room (MDF)

The Service Entrance and Termination Room (MDF) is the main telecommunications building service entrance for a building. It is the location where the demarcation between the interbuilding and intrabuilding cabling systems is established. The MDF is typically found on the first floor.

This room may serve as the Telecom Room for the area of the building in lieu of providing two separate spaces.

This room is dedicated to this purpose with no other building services sharing the space.

2. Telecom Room (IDF)

This room provides for demarcation between the horizontal station cabling, building network and the building data backbone cabling. This room contains the electronic equipment that transitions between the building backbone and the end user endpoints.

This room is dedicated to this purpose with no other building services sharing the space.

8.3   INTERIOR BUILDING PATHWAYS

A. Backbone Pathway

Backbone pathway is the cable pathway from the MDF to each IDF. Each project is unique and the pathway may consist of conduit, riser path and/or cable tray. The minimum requirements are two 4-inch conduits from the MDF to each first level IDF room.

Conduits shall not contain more than two 90-degree bends between pull points, and should not exceed 295 feet between pull points. Pullboxes shall be readily accessible (for example, in a corridor versus a classroom). Pull boxes shall be straight through and shall not be used for turns. Bends for conduits 3-inch and larger shall be factory sweeps. Conduits shall have continuous pull strings installed end-to-end.

The backbone pathway may also be shared with the Horizontal Primary Pathway (e.g. cable tray/basket tray) throughout the building.

In no instance shall cables lay directly on suspended ceilings or attached to suspended ceiling support wires.

B. Horizontal Pathways

Horizontal pathways are the pathway components that support horizontal station cabling. Horizontal pathways include the pathway from the Telecom room to the individual outlet.

Conduits shall not contain more than two 90-degree bends between pull points. Pullboxes shall be readily accessible (for example, in a corridor versus a classroom). Pull boxes shall be straight through and shall not be used for turns. Conduits shall have continuous pull strings installed end-to-end.

In no instance shall cables lay directly on suspended ceilings or attached to suspended ceiling support wires.

1. Primary Pathways: The primary horizontal pathways shall be defined as those directly from a Telecom room serving a section (a wing or side) of the building or an entire floor. The primary pathway component used shall be a cable tray system. Primary pathways should be located in easily-accessible non-user spaces, such as over corridor ceilings. This will minimize disruption to user spaces during future   cable adds/changes.

Cable Tray

Image of Typical Primary Pathway

Note: "Secondary pathways" may be used as primary pathways when the total cable counts are low enough to allow a lower capacity system. Lower cable counts are approximately 50-100 cables, maximum, throughout an IDF's service area.

2. 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.
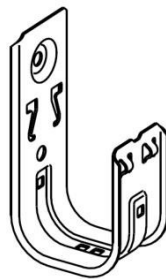
Cable Hanger
Image of Typical Secondary Pathway

C. Device Pathways

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

For all installation configurations requiring a conduit stub, the conduit shall be 1-inch trade size, minimum. Stubs shall be continued to the first accessible location.

For all installation configurations requiring a device box, the box shall be 4-11/16" square and shall be deep (2-1/8" min).

The following descriptions shall be used to plan the configuration of telecom devices throughout the building. These descriptions are for planning purposes and the exact configuration shall be finalized per instance.

1. Framed Wall, for both New Construction and Renovation:

2. 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.

3. The device box should be installed at +18 inches for typical outlets or as coordinated by the architect.

4. Concrete Wall, for New Construction:

5. The device pathway at concrete walls should be buried (cast within the forms) into the wall.

6. Concrete Wall, for Renovation:

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

8. CMU Wall, for both New Construction and Renovation:

9. 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.

10. Floor Devices, for both New Construction and Renovation:

11. The device pathway for in-floor type instances shall be buried (cast within the forms) into the floor.

12. For poke-thru type instances, no special device pathway is required as the cables will be routed within standard building pathways on the floor below to the poke-thru device.

13. In-Ceiling Devices, for both New Construction and Renovation:

14. The device pathway for in-ceiling devices shall be a device box installed either on the structure above or onto a channel at an accessible height above an accessible ceiling.

15. The cables will be routed within standard building pathways to the device box.

16. Pathways within Classroom for AV

17. Refer to Instructional Technologies section for requirements on pathways.

8.4   Backbone Fiber Optic Cabling
    A. Cabling Deployment
       Buildings shall receive interbuilding backbone fiber optic cabling and interbuilding backbone twisted pair copper cabling from the campus MPOE.
       Fiber cable color designations will be as follows:
       1. Single Mode Fiber: Yellow
       2. Multimode Fiber (10G): Aqua
    B. Outdoor Backbone Fiber Optic Cable Type
       Backbone fiber optic cables installed outdoors shall be loose tube buffered type cable.
       Outdoor backbone fiber optic cable shall be a dielectric cable installed in innerduct from the nearest manhole to the cable entrance of the building.
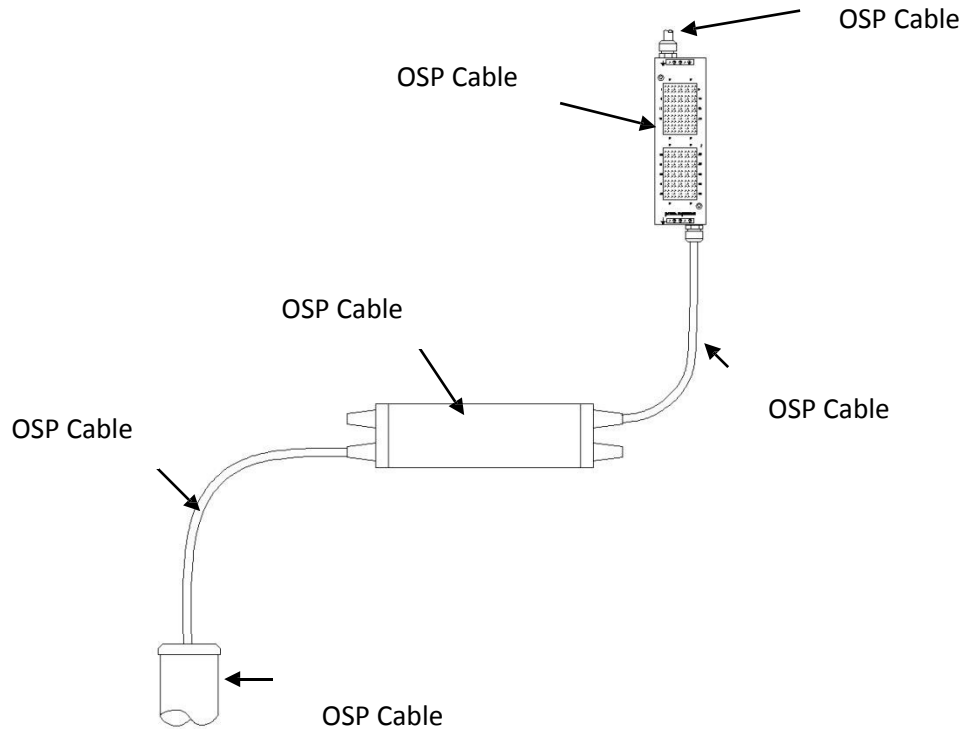   C. Indoor Backbone Fiber Optic Cable Types

Backbone fiber optic cables installed indoors shall meet the following:
1. Cable rating required by the authority having jurisdiction.
2. Tight buffered.
3. A sheath consisting of an integral strength element with a thermoplastic outer jacket over the inner cable components (buffered fibers, strength element, and other components).

D. Fiber Type
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.

E. Cable Capacity / Conductor Count
1. Campus Backbone Fiber Optic Cabling
   a. Minimum of 24 strands of singlemode fiber.
2. Intrabuilding Backbone Fiber Optic Cabling
   a. Minimum of 12 strands of multimode fiber.

F. Splicing
Splicing of fiber optic cable is prohibited.

G. Termination
1. Connectors
   Singlemode fibers shall be terminated via singlemode SC connectors. SC connectors shall be 568SC 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.

   If existing multimode 62.5/125 m fiber requires retermination these fibers shall be terminated via multimode SC connectors.

2. Patch Panel

   Patch panels shall be 1RU rack-mount type and shall be installed in the 2nd rack position at the top of the rack (leaving 1RU open for growth).

   Provide separate fiber panels for singlemode and multimode terminations. Refer to diagram on page 29 for rack-mount fiber optic termination example.

3. Adapters

   Adapters within the patch panels shall meet all requirements of TIA/EIA-568-B.3, section 5.0 including references.
   Multimode 50/125 adapter housing shall be aqua in color and shall be duplex.
   Singlemode adapter housing shall be blue in color and shall be simplex.

H. Backbone Fiber Optic Cabling Testing

   Each fiber strand requires testing. The testing shall be bi-directional characterization testing (via OTDR) and passive link insertion loss test (via light source and power meter). Test results must be reviewed and approved by ITS prior to network equipment installation.

8.5   BACKBONE TWISTED PAIR CABLING

A. OSP Backbone Twisted Pair Cable Type

   Backbone twisted pair cables installed outdoors shall be outdoor rated gel-filled and should be ANMW type, with an ASP sheath.

B. OSP Backbone Twisted Pair Cable Capacity / Conductor Count

   OSP backbone twisted pair cabling links should contain either 50 pairs or 100 pairs. Confirm conductor count with ITS per Project

C. OSP Backbone Twisted Pair Cabling Entrance Termination

   Backbone twisted pair cabling links entering from underground from the Campus shall be spliced to building entrance protection terminals, wall-mounted. BEP shall include fuses.

   See following diagram.

Backbone OSP Twisted Pair Cable Termination Example

D. Indoor Backbone Twisted Pair Cable Types

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

Backbone twisted pair cables installed indoors should ARMM type.

E. Indoor Backbone Twisted Pair Cable Capacity / Conductor Count

Indoor backbone twisted pair cabling links should contain either 25 pairs or 50 pairs to each IDF. Confirm conductor count with ITS per Project

F. Backbone Twisted Pair Cabling Termination

Backbone twisted pair cabling links, including output stubs from BEP terminals (see prior paragraph), shall be terminated to modular patch panels on an equipment rack. Refer to Horizontal Cabling for modular patch panel specifications. The following diagram depicts the intent for the backbone twisted pair cable termination.

42 U

Leave 1 usable 1U space (Top)

1U Fiber Panel – Muti or Single mode

1U x 24 port patch panel

Leave 1 usable 1U space for Cisco Switch 1U x 24 port patch panel

1U x 24 port patch panel

Leave 1 usable 1U space for Cisco Switch

1U x 24 port patch panel
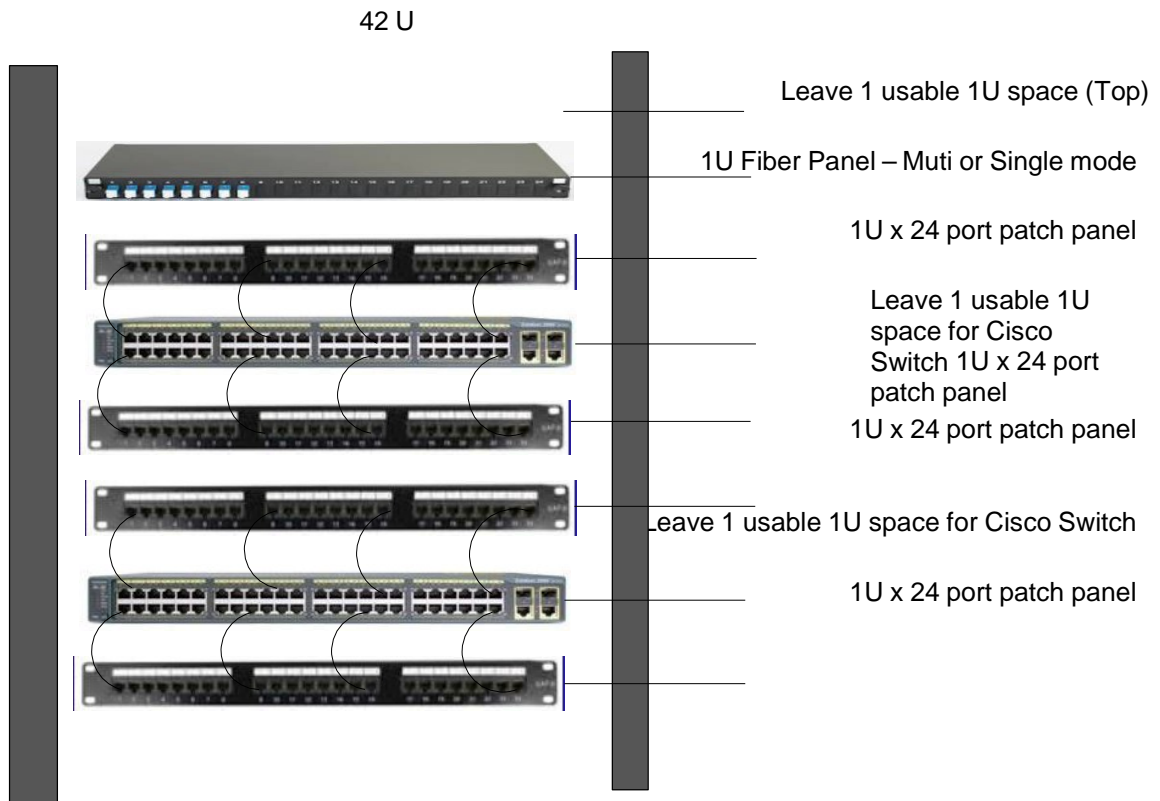
Backbone Twisted Pair and Fiber Optic Cable Rack-Mount Termination Example

G. Backbone Twisted Pair Cabling 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.

8.6   HORIZONTAL CABLING

A. Horizontal Cable Type

Horizontal cables shall meet the rating required by the authority having jurisdiction. Assume that all cables shall be CMP (plenum) rated unless otherwise approved by the AHJ.

Horizontal cable shall be unshielded twisted pair type, with four twisted pairs, and should have a CMP rated sheath.

B. Cable Type

Cable type shall be Category 6 or better.

C. Telecom Room Termination

In the Telecom rooms, cables shall be terminated via modular jacks in a rack- mounted modular patch panel.

Modular patch panels shall be discrete port type (snap-in modular connectors).

Coordinate layout of patch panels and equipment in rack with ITS**.**

D. Workstation Termination

At the workstations, cables shall be terminated via modular jacks.

E. Modular Jacks

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

F.   Service, Per Work Area

A link shall consist of a single cable terminated in the Telecom room and at the work area. Termination in the Telecom room shall consist of one port on a patch panel. Termination at the work area shall consist of one modular jack (one per cable) into a wall faceplate within appropriate device pathways.

Standard device: shall consist of three links, minimum, to a single device.

Classroom device: shall consist of two links, minimum, to a single device.

Wallphone device: shall consist of one link to a single device.

1. Fixed Office: Fixed offices shall receive at least two standard devices, generally on opposing walls. If the fixed office is large enough and intended to support multiple workstations, add one standard device per additional workstation.
2. Open Office: Generally, open offices shall receive one standard device per workstation.
3. Conference Rooms: Conference rooms shall receive at least two standard devices, generally on opposing walls. Conference rooms shall additionally prepare for one standard device in the vicinity of the conference table, depending on furniture type or center of the room.
    a. If the conference rooms have video projection or are intended to support multiple workstations, add two class room devices in the ceiling to support the projector and wireless access point.
    b. If the conference room is intended to support a wall mounted monitor, add one standard device behind the monitor and one class room device in the ceiling to support the wireless access point.
4. Classroom: Generally, classrooms shall receive four classroom devices – two inside media cabinet (within podium or instructor lectern) and two in the ceiling. Classroom podiums or instructor's lectern shall also require one classroom device (terminated at cable cubby). In larger classrooms additional data drops may be required.
5. Computer Lab: Computer labs shall receive four classroom devices – two inside media cabinet (within podium or instructor lectern) and two in the ceiling. Classroom podiums or instructor's lectern shall also require one classroom device (terminated at cable cubby). Additionally, computer labs shall receive one link per student station and printer.
6. WLAN Access Point: Access points shall receive two links. The deployment shall be determined per project as the coverage area is building-specific (*refer to Wireless LAN Service article following*). Also, the installation shall vary per instance (wall mount, ceiling mount etc.)
7. Telecom Room (TD): Telecom rooms shall receive one wallphone device, located adjacent to the door.
8. Elevator: Elevators shall receive one link to the elevator control panel.
9. Multifunctional Printer (MFP): MFPs shall receive two standard devices total, one standard device on opposite walls, wall-mounted behind the equipment. This should apply to common share spaces such as pods or faculty or staff break areas.
10. Schneider Facility Management System shall receive two links, located within the management system panel.
11. ACAMS Panel: ACAMS (access control and monitoring system) control panels shall receive two links located within the panel.
12. IP Camera: IP cameras shall receive one link, usually located within the camera housing but as approved by ITS.

8.7   ADMINISTRATION / LABELING

A. General

Labels, tags, and straps shall be high quality that will endure over the life of the cable plant. Hand written labels are not acceptable.

Cable labels shall be self-laminating. Cable labels shall be provided at both ends of the cable and installed on the cable jacket ten inches of the termination ends

B. Identifier Assignment

Apply the following criteria to assign identifiers to the components of the telecommunications infrastructure.

1. Telecom Rooms

Assign identifiers to each Telecom room using sequential letters prefixed with "TD" (i.e. TDA, TDB, TDC).

2. Cables

Labeling shall begin with the room number. For example, <closet-room number- cable number-port identifier>

TDA 101-1A, 1B, 1C TDA 101-2A, 2B, 2C

The cable identifier shall be prefixed with the telecom room number – for example: "TDA-22".

C. RJ45 Modular Jack Color

RJ45 modular jacks shall be color coded for specified services. They should match in color on either side of the category-6 network cable (i.e. in the patch panel and in the faceplate/room).

Data/Phone – Orange

1. Audio/Visual Media – Black (shielded Cat6A)
2. Security Camera – Green
3. Access Point – Yellow
4. BMS Data Cable - Purple
5. EAS System - Blue

D. Network Patch cable color

Network patch cables shall be color coded for specified services.

1. Data/Phone – Black
2. AV – Gray (shielded Cat6A)
3. Security Camera – Green
4. Access Point – Yellow
5. BMS Data Cable - Purple

E. Patch Panel Labeling

Each used port of a modular patch panel shall be labeled with the cable number. Example:
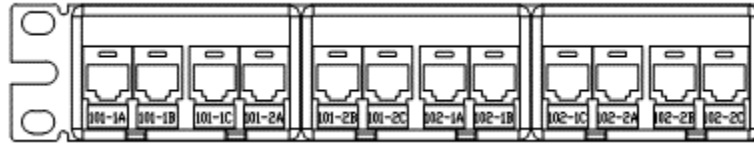
Modular Patch Panel Labeling Example

F. Outlet Labeling

Each faceplate shall be labeled with the serving telecom room number. Each used port of a faceplate shall be labeled with the cable number.
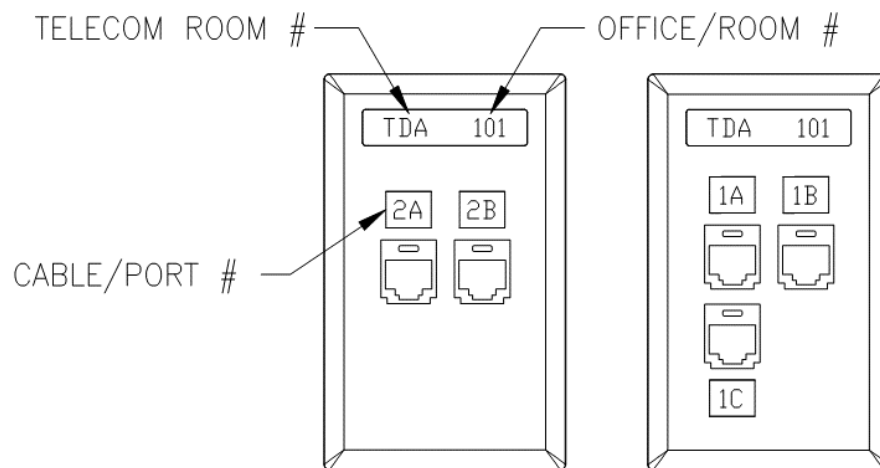
Outlet Labeling Example

PART 9 WIRELESS LAN SERVICE

9.1   GENERAL INFORMATION

ITS has established Cisco wireless access points as the exclusive standard for wireless networks throughout the District.

Wireless access point placement requires the development of a wireless heat map. ITS will provide the wireless heat map as part of the design criteria for each project. The designer shall utilize the provided heat for placement of wireless access point cabling on the project.

9.2   ACCESS POINTS

A. Enclosures

The use of ceiling-mount enclosures is predominantly required whenever the building has suspended (dropped) ceilings. Wall-mount enclosures should only be used as a second choice only when there is an open ceiling design or when the ceiling is too high to be reached safely (for example, Gymnasiums, Theater Stage, etc.).

Enclosures may not be necessary in all locations.

B. Internal Placement Guidelines

All plans for placement of wireless access point devices and enclosures **MUST** be approved by ITS before the plans are submitted for bid.

C. External Placement Guidelines

Placement and coverage for exterior Wireless coverage will be determined on a project by project basis.

Coordinate device type and placement with ITS if exterior coverage is a program requirement.

Placement of exterior Wireless devices and cabling requires detailed coordination with ITS, the Architect and Landscaping designer.

9.3   INSTALLATION COORDINATION

A. Cabling Service

Telecom contractor shall provide two cables from the serving IDF/MDF to the access point enclosure location, including testing. In the IDF/MDF, the cables shall be terminated in the patch panel on the rack used for the VoIP voice/data network switches with Power-over-Ethernet ports. At the enclosure, the cables shall be terminated in an outlet installed above suspended ceilings located as close as possible to the enclosure.

The Telecom contractor shall install one patch cord from the outlet into the enclosure (for final connection by ITS).

B. Enclosure Installation

ITS shall furnish the enclosure if needed (either ceiling and/or wall mount) to the project site.

The Telecom contractor shall install the enclosures, per the manufacturer's instructions as shown on the approved plans.

C. Access Point / Antenna Installation

ITS shall furnish the access point (either ceiling and/or wall mount) to the project site.

The Telecom contractor shall install the access point, per the manufacturer's instructions as shown on the approved plans.

The Telecom contractor shall provide a label indicating MAC address (located on the back of the access point) and Hostname. If access point is in a room, hostname should be labeled "classroom/office number". If in the hallway, it should be labeled "hallway" and closest classroom/office number. Label shall use largest font size available.

If the access point is in an enclosure, information should be placed visibly on the exterior of the enclosure.

PART 10 SPECIAL SYSTEMS

10.1   TWO-WAY COMMUNICATION SYSTEM

A. The following requirements for two-way communications shall be designed for projects that meet the applicable code criteria:

1. CBC - Two-Way Communication; A two-way communication system shall be provided at the elevator landing on each accessible floor that is one or more stories above or below the story of exit discharge complying with.

2. NFPA 72 - Two-way emergency communication system for accessible means of egress, including related infrastructure and functional requirements.

10.2   EMERGENCY RESPONDER RADIO COVERAGE

A. An Emergency Responder Radio Coverage system shall be provided for all projects based on the following code criteria:

       1.   California Code of Regulations (CCR), Title 24, Part 9, "California Fire Code"

       2.   NFPA-72 "National Fire Alarm and Signal Code Regulations":

          a.   Part 24.5.2 Two-Way Radio Communication Enhancement systems

          b.   Part 14.4.12 In-Building Emergency Radio Communication systems

       3.   International Fire Code (IFC), section 510

10.3   DISTRIBUTED ANTENNA SYSTEM

A. A Distributed Antenna System shall be designed for all buildings where the current availability and strength of Cellular/PCS services is limited due to building location or building construction type.

B. The Distributed Antenna System will consist of the following system criteria:

1. The in-building distributed antenna system shall reliably distribute wireless services throughout the specified frequency ranges and throughout the specified coverage spaces. The System shall be implemented based on proven state-of-the-art technology that can seamlessly integrate with the rapid evolution of wireless technologies and business applications. The System shall be flexible and shall easily accommodate additional wireless services within the System's frequency bands without requiring significant upgrades or system modifications.

2. The DAS shall include a head end subsystem. The head end shall include a wideband transceiver and be a common interface node. The head end may be co- located with Base Station systems from multiple cellular common carriers.

3. Frequency Range: The System shall support all frequencies between 700 MHz to 2100 MHz.

4. Coverage areas shall include the following:
   a. Floor areas
   b. Classrooms
   c. Instruction Labs
   d. Basement
   e. Stairwells
   f. Elevators
   g. General Use spaces (break rooms, staff rooms)
   h. Mechanical/Electrical Rooms
   i. IT Rooms
   j. Restrooms

5. The System shall be able to simultaneously support the following wireless services, applications, and/or technologies:

6. Wireless Operators, such as Nextel/Sprint, Verizon, AT&T, T-Mobile, MetroPCS:
   a. 4G - SISO
   b. LTE (700 MHz) - Verizon (4G)
   c. Cellular (850 MHz) - AT&T, Verizon (2.5G & 3G)
   d. PCS (1900MHz) - Verizon, Sprint (2.5G & 3G)
   e. iDEN (800/900MHz) – Nextel/Sprint
   f. AWS (1700/2100 MHz) - AT&T, T-Mobile, MetroPCS (3G /4G LTE)

7. The System shall have the capability for separate control over each service (or wireless operator) to allow the ability to adjust and control power levels without disturbing other services.

8. The System shall support multiple services in a modular architecture so services can be added or removed without requiring new infrastructure, without readjustment of signal power levels, or disturbing existing services/operators.

9. The system shall support expansion to adjacent buildings and campus to provide a single cohesive distributed antenna system for the client.

10. The System shall enable services to be added without requiring additional cabling plant or antennas.

11. The System shall not impede any management features or functionality of any attached network and/or device management system. The System shall allow for proactive management and end-to-end alarming of active electronics. The System shall be able to engage with 3rd party SNMP-based element management systems and provide fault management information.

10.4   EVENT ANNUNCIATION SYSTEM

A. Refer to SMCCCD Section 27 51 13 Event Annunciation System Design Standard and Construction Specification for speaker and cabling work to be performed by Contractor.

The EAS is a SMCCCD voice public address system at each college & the district office to notify the college & district office community of emergencies.

The EAS system serves two functions:

1. Emergency voice public address system (EAS)

2. Hourly college chimes

The Voice side of EAS system is both an indoor and outdoor sound while chimes annunciated outdoor only. This system is a public address (PA) system with two functions and SMCCCD references to the total system as the EAS system. The EAS system is designed, maintained and installed by ITS staff, with the aid of contractors for infrastructural and low voltage run installs which are listed below. The EAS system primary user is the District & College's Public Safety Department. This standard outlines equipment and wiring needed for the system.

General Guidelines:

3. Substitution or design modification shall be approved by ITS staff

4. Install a speaker (1 each) in each classrooms, computer labs, stairwells and other enclosed areas. Install several speakers in the halls as needed

5. Connect all speakers in parallel

6. Use "J" hooks or existing hangers to follow existing wiring paths as much as possible above suspended ceilings

7. Install proper race way in areas where there is no suspended ceilings

8. Follow existing wiring paths as much as poss. in wiring closets

B. Contractor Supplied & Installed via Project Funds:

EAS Wiring Indoor from IDF/MDF where EAS amp will be located:

a. Use 14/2 gage two conductor shielded wire for speakers.

b. Use one line per floor as home run.

EAS Wiring Outdoor from IDF/MDF where EAS amp will be located to external speaker:

c. Use 14/2 Aqua Seal Shield cable.

EAS Wiring from MPOE EAS amp location to building's EAS amp location:

d. Use 16/2 Aqua Seal Shield cable.

e. Run 2ea lines from MPOE EAS rack to each build EAS amp location. One for use now & one as a spare.

C. Speakers for suspended ceilings (70V):

Bogen HFCS1LP ceiling speaker is preferred as it is a lower profile speaker that will fit in tight places in ceilings. The following three units must be installed at each location. Set tap to 8 watts.

  a. 1ea Bogen HFCS1LP Ceiling speaker

  b. 1ea Bogen TBCR Tile Bridge Support Ring

  c. 1ea Bogen CK10 Safety cable kit

D. Speakers for wall mount (70V):

Wall mount speaker shall be installed where suspended ceiling speakers are not possible. Set tap to 4 watts.

  a. 1ea Bogen MB8TSLVR

E. Speakers for wall mount in light duty areas (70V):

In lighter duty areas, where ceiling speakers cannot be installed, use the following wall mount speaker in light duty areas :(

  a. 1ea Bogen SM4T

F. Speakers Horns (70V):

  a. Bogen BDT30A indoor Duel horn

  b. Bogen SPT30A Indoor single horn

  c. Bogen KFLDS30T Outdoor horn (Small coverage areas)

  d. Atlas Sound CJ-46 Horn & PD60AT Driver (Large coverage areas)

G. Supplied and Installed by ITS via Project Funds:

Important: *The following list of equipment do not apply to contractor work or installation. These equipment will be purchased and installed by ITS once confirmed all contractual work has been completed.*

MDF/IDF locations: In Building equipment (Note: 1ea per build as supplied & installed by ITS staff):

H. Amplifiers

  1. Large Rooms: Crown's CTs Series Amplifiers
     a. 1ea Crown CTs600 or
     b. 1ea Crown CTs 1200 for large buildings
  2. Smaller Rooms: Bogen Gold Seal Series
     a. GS100 for 100W or
     b. GS250 for 250W

  o 1ea Ebtech HE-2-XLR Hum Eliminator with XLR per amplifier.

Head End: (Note: Only one each of the following per college)

1. 1ea Shure #M367 portable microphone mixer…...$584.00

2. 1ea Shure A367R Rack Panel for above mixer……$40.98

3. 1ea Shure #522 Desktop
     Microphone Or

     Shure SCM268

     (Note: Includes rack mount
     hardware) Or

1ea Shure SCM262

(Note: Includes rack mount hardware)

4. 1ea Shure **A95UF** - Line Matching Transformer………………$33.95

5. 1ea Atlas Sound 410-15 (400-17-962) Table Top Rack……$181

6. 1ea Bogen UTI1 *(CPC Pulse needs to be enabled on each UTI line. This allows the system to hang up properly when the user hangs up the handset.)*

I. Main feed DA in MPOE

Drawmer DA-6 six channel stereo (or twelve channel mono) distribution amplifier http://www.drawmer.com/products/signal-distribution/da6.php

PART 11 INSTRUCTIONAL TECHNOLOGIES

The District is committed to providing a consistent, high quality teaching and learning environment for its students and faculty. The use of technology to support instruction is integral to achieving this goal. Whether it be audio/visual systems, communication technologies, or network technologies, it is important that a team of experienced instructional professionals are involved in the design and specifications of instructional classrooms and laboratories.

The technology used to support instruction is to be determined based on the unique instructional needs and utilization of each room or laboratory. **No facility should be designed or specified without consultation of the instructional faculty that will use the technology and the ITS staff responsible for the support of the technology.** The ITS staff responsible for ongoing support of the technology shall be included in all discussions of technology and room layout prior to and during design and construction work of classrooms and or building.

The goals for establishing Instructional Technology Standards and Guidelines are to:

1. Serve as a planning and design reference for architects, engineers, and furniture coordinators.

2. Assist with budget planning and cost estimation.

3. Facilitate service and maintenance by having consistent technology throughout the District.

4. Insure that the room is designed, laid out and oriented correctly for best use of the technology. This includes but not limited to teaching position location, HVAC duct locations, lighting, soffit, white board or other surfaces, etc.

The specific requirements for each instructional facility will depend on the unique instructional use of that facility. Therefore, these standards are guidelines and are subject to change based on the introduction of new technologies or to meet unique instructional needs.

11.1 GENERAL GUIDELINES FOR INSTRUCTIONAL TECHNOLOGY

Equipment specified by make and model shall not be substituted without written approval of ITS.

New instructional technology installations must reflect current technology at the time of opening and be designed to be easily upgraded as technology and pedagogy change over time.

New or remodeled classroom shall be a Smart Classroom.

Where appropriate, new or remodeled instructional laboratories shall be a Smart Classroom.

Instructional facilities shall have wireless access so that students and faculty may connect to the Internet.

11.2 SMART CLASSROOMS INFRASTRUCTURE

A. Construction Standards

The minimum standard for all new or modernized classrooms is to include a projector mount, projector power, projector data connections, teaching position data connections, teaching position power, pathway for cables from the projector to the teaching position, a projection screen, a mounted controller for the projector, speakers, controlled room lighting, and a teaching station or a lectern equipped with secure media cabinet.

1. Ceiling Mount for Projector Pole

    Mount shall be centered relative to projection screen 15'+/-6" distance from front of screen.

    For flat ceilings, use Chief CMA-110 8" x 8" - 1 ½" NPT fitting

    For angled ceilings, use Chief CMA-395 Angled Ceiling Adapter 4 1/4" H x 3" W x 7 1/2" L

    Locate projector mount centered with the projection screen 15' +/-6" from front of screen.

    The contractor shall install the ceiling mount.

2. Projector Pole

    Chief Extension Column. Column length is to be determined by screen mounting height. The threaded bottom end of the pole is to be at the same height as the top of the screen housing.

    The contractor shall install the pole.

3. Projector Mount

    Chief RPMA027 Custom Projector Mount with (A) Key Lock. Where xxx is the specific Chief RPM that installed by the **ITS staff**.

4. Power for Projector

    Non Suspended Ceiling:

    Each projector requires one duplex 120VAC 20A circuit, located 12" +/- 6" behind or a side the projector.

    Suspended Ceiling:

    Each projector requires one duplex 120VAC 20A circuit, located above the suspended ceiling.

5. Data for Projector

    Non Suspended Ceiling:

    Each projector requires one 4-Port telecom outlets, or two classroom devices, located 12" +/- 6" behind or a side the projector.

    Suspended Ceiling:

    Each projector requires one 4-Port telecom outlets, or two classroom devices, located above the suspended ceiling.

B. Teaching Position Location and Infrastructure

The teaching position will be the location where the instructor will base their laptop during instruction. The teaching position will also be the location for the permanent DVD/Blu-ray player in addition to technology equipment that will support the Smart Classroom technology. The technology equipment area (media cabinet) shall be locked and only accessible ITS staff. The ITS staff shall get the master key after furniture installation has been completed.

The teaching position is typically located in the front of the room, on the side of the room, on opposite side of entry way, and generally 5 ft. from the side of the projection screens:

Along the wall:

If along the wall, power is via a typical wall outlet and cable access via a conduit or raceway stub out.

Off the wall.

If off the wall, the teaching position should be generally 5-6 feet from the front wall with power and cable access from the floor via a floor box.

1. Power for Teaching Position

    The teaching position infrastructure shall include the following:

    On The wall:

    Each Teaching Position requires one duplex 120VAC 20A circuit, located along the wall perpendicular to the front of the room, 3 feet from the corner and 18" above finished floor. This allows a lateral connection into the Teaching Position fixture.

    Off The Wall:

    The teaching position should be generally 5-6 feet from the front wall with power and cable access from the floor via a floor box.

2. Data for Teaching Position On The wall:

    Each teaching position requires three classroom devices or 6 individual telecom outlets -- four data lines inside media cabinet (within podium or instructor lectern) and two on instructor's lectern (terminated at cable cubby). In larger classrooms additional data drops may be required.

    Off The Wall:

    Each teaching position requires three classroom devices or 6 individual telecom outlets --- four data lines shall be terminated inside media cabinet (within podium or instructor lectern) and two on instructor's lectern (terminated at cable cubby). In larger classrooms additional data drops may be required.

3. Pathways for Teaching Position

    Each Teaching Position requires one pathway for Audio/video signal and one pathway for projection control.

    On The Wall:

    The audio/video signal pathway shall consist of two 1.0" conduits within the wall from a 4" x 4" box routed up and turning above the ceiling. Alternatively, the pathway may be a surface-mounted raceway – this requires written approval from ITS. The device box shall be installed adjacent to the Teaching Position data port (along the wall perpendicular to the front of room, approximately 3' from the corner, and shall come equipped with a cover plate with a 1.25" diameter opening.

    A projector control pathway shall consist of one ½" conduit within the wall from a 4-square device box routed to within 12" of the projector. The device box shall be installed 48" above finished floor no more than 2' away from teaching position.

4. Floor Box Mount Pathways for Teaching Position

The audio/video pathway shall consist of two 1.0" conduits within the wall from a floor box & under the floor routed up and turning above the ceiling. The device box shall be installed under the Teaching Position and should include data ports as well as power. The source (power and data) for the device box shall be coming through the floor box, through the furniture cutout at bottom of the combination media cabinet/teaching table. This floor box shall be directly over the power and data outlet and reachable from the chair side of the teaching position. Moreover, the combination media cabinet/teaching table will be 5-6 feet from the front wall.

A separate projector pathway/conduit is not needed for a floor box system as we will run that cable through the floor box conduits.

Typically, cable hangers will support the cables above ceilings.

5. Teaching Position Fixtures

Fixtures vary according to the specific program of the classroom.

a. Fixture options include, but are not limited to:

1) One-piece lectern and media cabinet with a freestanding table.

The one-piece lectern and media cabinet was designed to SMCCCD specifications by Krueger International (KI). It includes a wide fixed-angled top with pop-up power for the laptop, all steel carcass for durability, locked lower cabinet for the audio amplifier, an open fixed middle shelf to contain the permanent DVD/VCR, a fixed upper shelf for instructor convenience, and 3 cable access ports (lower left, lower right, and bottom) for positioning flexibility.

2) Off the wall Combination media cabinet/teaching table

This fixture was designed to SMCCCD specifications by Krueger International (KI). It ranges in size from 5-6 feet in length. One side of the fixture contains a lockable enclosure for the amplifier with an open shelf above it for the combination DVD/VCR. The opposite side of the fixture contains a lockable equipment enclosure or computer bay. The fixture may have an integral lectern top to one side or may be specified with a portable lectern. The fixture is all steel construction and a modesty panel is provided across the front of the unit to conceal the center knee space.

6. Tethering fixtures

Teaching position fixtures located in rooms wider than 26 feet shall be fixed to the floor to allow for cabling access. Teaching positions fixtures located in rooms 26 feet or narrower shall be tethered.

Typically, connection whips between the wall ports and the fixtures are 36" long. A 24" long nylon coated steel strain cable is fastened to the wall to reduce the risk of damaging the whips

C. Projections Screens:

Ceiling conditions or light fixtures may require a modification to optimize the projection. Contact ITS for a variance.

For non-conforming rooms size and or shape, screen TBD my ITS staff on an individual basis.

1. Standard Rooms Without Suspended Ceiling: (Small to Medium size)

    The projection screen shall be Da-Lite Model C with CSR (Controlled Screen Return), 16:9 screen, 65"x116" (133" Diag) Matt White.

    (79886), with Da-Lite Model No. 6 installation brackets (40932).

    Screen shall be installed between 10 and 11 feet high from the floor.

    The screen location shall be determined based on instructional needs.

2. Standard Rooms With Suspended Ceiling: (Small to Medium size)

    The projection screen shall be Da-Lite Advantage Manual with CSR (Controlled Screen Return) 16:9 screen, 65"x116" (133" Diag) Matt White. (85739).

    Screen shall be installed in the ceiling between 11 and 13 feet high from the floor.

    The screen location shall be determined based on instructional needs.

3. Large Rooms with Suspended Ceiling Two Projectors: (Large Size)

    There shall be two projections screens. The projection screens shall be Da-Lite Tensioned Advantage Deluxe Electrol 16:9 screen, 78"x139" (159" Diag) Da-Mat (88307).

    Screens shall be installed in the ceiling between 11 and 13 feet high from the floor.

4. Large Rooms With Suspended Ceiling One Projector: (Large Size)

    Contact ITS Staff if a smart classroom is thought to be better suited with one large screen. The screen, projector and sound system will be of a unique nature to warrant special consideration and design by ITS staff.

D. Lighting Controls

Ceiling lighting that occurs between the projector and screen shall be switched on/off independent of other ceiling lights. The switch shall be of a different color that other switches for easy identification.

E. Speakers

For any room type, consult ITS for speaker layout.

1. Smart Classrooms without Suspended Ceilings

Rooms without suspended ceilings require wall-mount speakers. Typical room installation will include 2 speakers on either side of the projection screen, though speaker quantities and locations shall be determined according to room purpose, room size, and seating orientation. The speakers shall be installed at the same height as the screen equally spaced on either side 18" +/- 6 inches.

The speakers shall be JBL Control 1. Contractor shall install all speakers.

2. Smart Classrooms with Suspended Ceilings (Small to medium Size)

Rooms with suspended ceilings require ceiling-mount speakers. Typical room installation will include 4ea 8 ohm speakers, though speaker quantities and locations shall be determined according to room purpose, room size, and seating orientation.

The speakers shall be JBL Control 26C. Contractor shall install all speakers.

3. Smart Classrooms without Suspended Ceilings (Large Size)

Larger rooms with suspended ceilings require ceiling-mount speakers. Typical room installation will include 6 or more 70v speakers, though speaker quantities and locations shall be determined according to room purpose, room size, and seating orientation.

The speakers shall be JBL Control 26T. Contractor shall install all speakers.

4. Speaker Wiring

Speakers require #14 stranded wire (14/2 shielded) from the teaching position with a 10-foot tail coiled at the teaching position. The color scheme is to be red (+) white (-).Smart Classrooms Equipment. There shall be one home run speaker line from each speaker to the teaching station.

Contractor shall install all speaker wires.

F. Sound System / Audio Amplifier

The sound system shall consist of an audio amplifier and an appropriate quantity of loudspeakers. Due to the number of variables that can effect sound in a classroom, contact ITS for appropriate sound solution.

The Project shall fund the audio amplifier and loudspeakers. Contractor shall install all speakers.

SMCCCD ITS shall install the amplifier.

G. Cabling Bundle

The cabling bundle is from teaching position (media cabinet) to projector and loudspeakers. The cabling bundle shall consist of the following:

1. 4 Shielded Cat6A Audio/Visual Media cables.

    a. Terminated to one 4-Port Faceplate on each end

        1) Non Suspended Ceiling:

            a) Located 12" +/- 6" behind or beside the projector.

        2) Suspended Ceiling

            a) Located above the suspended ceiling.

        3) Teaching Station

            a) Located inside the cabinet beside the power and data connections.

    b. Each port on the faceplate shall be labeled with the cable number.

    c. Black shielded Cat6A modules. e.g. Panduit CJS6X88TGY

2. 2 to 6 (dependent on # of speakers), 14 AWG stranded speaker wires (14/2 shielded).

3. 1ea 3.5mm stereo plug M/M cable

4. ~~Twisted pair of AWG #24 (24/2 shielded) stranded wire.~~

    The Project shall fund the cabling and all equipment.

    Contractor shall install all screens, projector mount, pole, speakers, data lines, and all addressed wiring between teaching station and projector.

    SMCCCD ITS staff shall install the projector, amplifier, blue-ray player, and video signal processor and extenders.

PART 12 PRODUCTS

12.1   APPROVED MANUFACTURERS

Refer to Appendix A

PART 13 EXECUTION

13.1   SUBSTITUTES ALLOWED?

No substitutes allowed.

Pursuant to Section 3400 of the Public Contract: Certain telecommunications systems are now in use on the particular public improvement described as San Mateo County Community College District. At each instance in Appendix A that a designated material, product, thing or service is designated by a manufacturer's name and product number, that manufacturer's name and product number is designated to support the existing telecommunications systems that are in place at Skyline College, College of San Mateo, Cañada College and the District Administration Building. The Contractor will furnish and install only those products as required, and no substitutions shall be deemed to be "or equal" or allowed.

13.2   ASSOCIATED DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS

    A.   Physical Access Controls and Security Management Design Standard

B. Space Design Standard – Academic Spaces
C. Space Design Standard – Instructional Spaces
D. Space Design Standard – Circulation and Public Spaces
E. Division 27 Design Standards and Construction Specifications
F. Section 33 00 00 Utilities Design Standard

End of Document

Appendix A – Approved Products List					
	Primary Products Listing			**Alternate Products Listing**	
Product/Description	**Mnfr**	**Product Number**	**Comment**	**Mnfr**	**Product Number**
27 05 28 - TELECOMMUNICATIONS BUILDING PATHWAYS					
Hangers and Straps	CEAS Eaton B-Line Erico Panduit	"Stiffy" BCH21-W2, BCH32-W2, BCH21, BCH32 CAT12, CAT21, CAT32, CAT425 JMJH2-X20	Low voltage supports	Allowed	-
Drop Wire	Hilti Armstrong Dottie Garvin Industries Oregon Wire Products	CC27 X-AL-H22P8T 7891 CWC	-	Allowed	-
Drop Rod	CEAS	01014801	"Stiffy" straight rod	Allowed	-
Fire Rated Sleeve	Hilti STI	236323, 236324	-	Allowed	-
Spiral Wrap	Panduit		Black	Allowed	-
27 05 33 - TELECOMMUNICATIONS CONDUITS AND BOXES					
Electrical Metal Tubing (Type EMT) Conduit	Allied Tube and Conduit Co Cal Conduit Products Republic Conduit Western Tube and Conduit Corp	"EZ-Pull" "CalBrite"	EMT conduit EMT condiut		
Fittings for EMT	Appleton Electric Co O-Z Gedney Thomas & Betts Corp		-		
Deflection/Expansion Sleeve for EMT	Cooper Crouse-Hinds O-Z Gedney	"XD" series "DX" series	-		

Expansion Sleeve for EMT	Cooper Crouse-Hinds O-Z Gedney	"XJG-EMT" series "TX" series			
Intermediate Metal Conduit (Type IMC) Conduit	Allied Tube and Conduit Co Western Tube and Conduit Corp	"Kwik-Couple" conduit	-		
Fittings for IMC	Appleton Electric Co O-Z Gedney Thomas & Betts Corp		-		
Deflection/Expansion Sleeve for IMC	O-Z Gedney Thomas & Betts Corp	"DX" series "XD" series	-		
Expansion Sleeve for IMC	Cooper Crouse-Hinds O-Z Gedney	"XJG" series "TX" series	-		
Expansion Sleeve at Box Termination for IMC	O-Z Gedney	"EXE" series	-		
Rigid Metal Conduit (Type RMC) Conduit	Allied Tube and Conduit Co Western Tube and Conduit Corp	"Kwik-Couple" conduit	-		
Fittings for RMC Conduit	Appleton Electric Co O-Z Gedney Thomas & Betts Corp		-		
Deflection/Expansion Sleeve for RMC	O-Z Gedney Thomas & Betts Corp	"DX" series "XD" series	-		
Expansion Sleeve	Cooper Crouse-Hinds O-Z Gedney	"XJG" series "TX" series	-		
Expansion Sleeve at Termination Box	O-Z Gedney	"EXE" series	-		
Rigid Nonmetallic Conduit (Type RNC) and Fittings – Electrical PVC Conduit (EPC) – Schedule 40 and Schedule	Allied Tube & Conduit Carlon JM Eagle Ridgeline Pipe Manufacturing		-		

Liquid-Tight Flexible Metal Conduit (Type LFMC) Conduit	AFC Cable Systems, Inc. (Atkore) ANAMET Electrical Electri-Flex Company Southwire Company		-		
Fittings for LFMC	Appleton Electric Co O-Z Gedney Cooper Industries Thomas & Betts Corp		-		
Pull Tape	Neptco Inc. Pacific Strapping Inc.	MULTETAPE ® HERCULINE ®	-		
Pull String	Ideal Industries Inc. Klein Tools	Powr-Fish ® or Valu-Line ™ poly pull line 56110 poly pull line	-		
Duct Plugs	Tyco	"JACKMOON"	-		

Pull Boxes	Cooper B-Line (Eaton) Hoffman (Pentair) Hubbell Wiegmann		-		
Steel Outlet Boxes and Covers, Square Box and Cover/Rings- 5"	Randl Industries		-		
Steel Outlet Boxes and Covers, Square Box – 4-11/16", Extra Deep	Garvin Industries RACO (Hubbell)		-		
Steel Outlet Boxes and Covers, Square Box – 4-11/16", Deep	Appleton Electric Co O-Z Gedney Garvin RACO (Hubbell) Steel City		-		
Box Support Accessories – Stud-Mount Single-Box Bracket, Stud-Mount Multi-Box Bracket, Floor-Mount Box Mounting Bracket	Erico Garvin RACO		-		
Box Support Accessories – T-Bar Bracket	Erico	510HD	-		
Box Support Accessories – T-Bar Support	Erico	4ACS	-		
Multi-Service Floor Boxes	FSR Inc. Wiremold		8 gangs, minimum		
Multi-Service Poke-Thrus	Wiremold	"Evolution" 8AT series "Evolution" 6AT series	-		
Multi-Service Wall Boxes for Flat Panel Displays	FSR Wiremold Chief Manufacturing		Capacity for power, telecom, AV, and conduit connections		
Weatherproof (Outdoor) Outlet Boxes and Covers	Bell (Hubbell) Garvin		-		

27 05 36 - TELECOMMUNICATIONS CABLE TRAYS					
Cable Tray – Wire Mesh Type	Chalfant Manufacturing Chatsworth Products Cooper B-Line Cope Legrand Mono-Systems MP Husky WMT	Wire mesh cable tray system "OnTrac" series wire mesh cable tray "Flextray" series wire mesh cable tray "Acroba" series wire mesh cable tray "Cablofil" series wire mesh cable tray "Mono-Mesh" wire mesh cable tray "Techtray" wire mesh cable tray	-		
Cable Tray – "Redi-Rail" (Ladder Type) for IDF Rooms	Cooper B-Line	"Redi-Rail" series aluminum ladder type tray	-		
Cable Tray – "Redi-Rail" (Runway Type) for IDF Rooms	Cooper B-Line

Cooper B-Line | "Redi-Rail" series aluminum: -SB13AL12; straight section, 9" rungs -SB2107BZ; cable runway butt-splice clamp -9ZN-R238; 3/8" hanger rod bracket -9ZN-R220; 1/2" hanger rod bracket -SB13ALDO12FB; Drop Out -SB227R6FB; 6" runway standoff, two-post rack -SB227E6FB; 6" standoff for enclosure cabinet Cable Runway (for support of Redi-Rail above) -SB2101ABZ; 90-degree junction splice kit -SB21312KFB; triangle support kit -SB213312FB; rack-to-runway attachment kit -SB211312; runway wall angle support kit | - | | |

27 11 00 – COMMUNICATION EQUIPMENT ROOMS

Sheet Hardwood/Plywood (as Backboard)			-		
Fasteners, for Plywood	Phillips Drill Co. Wej-It Expansion Products Inc.	"Red Head" masonry anchors "Wej-It" concrete anchors	-		
Equipment Rack, 2-Channel, Black	CPI Cooper B-Line	46353-703 SB556084XUFB	-		
Seismic Gusset, for 2-Channel Equipment Rack, 7'0" Black	CPI Cooper B-Line	11592-701 SB556	-		
Vertical Mgmt Section, 7'-0"H x 6"W, Double Sided, Black	CPI	30162-703	-		
Horizontal Mgmt Panel, 1 RMU, Doubled Sided	CPI	30529-719	-		
Cable Tray – Refer to Section 27 05 36 for requirements			-		

27 13 13 – BACKBONE ISP TWISTED PAIR CABLING

Unshielded Twisted Pair Cables – Plenum	General Cable		-		-
Label Plates, for Equipment Racks	Superior Essex SYSTIMAX		-		
Unshielded Twisted Pair Cables – Non-Plenum	General Cable Superior Essex SYSTIMAX		-		-
Termination Equipment – Twisted Pair Cabling Patch Panel		Refer to 27 15 13 for product requirements	-		-

Labels	Panduit	S200X400YAJ; labels for 25-100 pair cables S200X650YAJ; labels for 100-400 pair cables			
27 13 23 – BACKBONE ISP FIBER CABLING					
Cable, ISP/Riser OFNR, 12-strand multimode 50/125	Corning	12C81-33131-24	-		
Cable, ISP/Riser OFNR, 12-strand singlemode	Corning	12E81-33131-24	-		
Cable, ISP/Plenum OFNP, 12-strand multimode 50/125	Corning	12C88-33131-29	-		
Cable, ISP/Plenum OFNP, 12-strand singlemode	Corning	12E88-33131-29	-		
Fiber Optic Patch Panel, 4U, 12 adapter modules	Corning	CCH-04U, Connector Closet Housings	-		
Fiber Optic Patch Panel, 2U, 4 adapter modules	Corning	CCH-02U, Connector Closet Housings	-		
Fiber Optic Patch Panel, 1U, 2 adapter modules	Corning	CCH-01U, Connector Closet Housings	-		
Adapter Plate - 3 SC/Duplex adapters, aqua (MM 50/125)	Corning	CCH-CP06-G7	-		
Adapter Plate - 6 SC/Simplex adapters, blue (SM)	Corning	CCH-CP06-3C	-		
Connector, SC multimode, black	Corning	95-050-48	-		
Connector, SC Singlemode, blue	Corning	95-250-08	-		
Labels	Panduit	S200X225YAJ S200X400YAJ S200X650YAJ			
Fiber Slack Storage Reel	Leviton	48900-OFR			
Velcro Cable Ties, black, 15' roll	Panduit	HLS-15R-0			

Product/Description	Mnfr	Primary Products Listing		Alternate Products Listing	
		Product Number	Comment	Mnfr	Product Number
27 13 14 – BACKBONE OSP TWISTED PAIR CABLING					
Cable, OSP, Underground Cables – Duct/Conduit	Superior-Essex General Cable Belden	Filled ASP-type series	-		
Splice Closure, Underground/Vault	3M Telcom	"Better Buried" series 4460; shield bond connector for cables 4460-D; shield bond connector for cables 25T; ground brain w/ or w/o eyelets	-		
Encapsulant	3M Telcom	4442; "High Gel" re-enterable encapsulant			
Splice Module, 710-Type, 25-pair, Filled	3M Telcom	3M710-SC1-25	-	Allowed	-
Splice Closure, Building Entrance	3M Telcom	5-26; solid closure, up to 600 pair 5DS-26; split closure, up to 600 pair C5-100-6; end caps 4460; shield bond connector for cables 4460-D; shield bond connector for cables 25T; ground braid w/ or w/o eyelets	-	Allowed	-
Splice Module, 710-Type, 25-pair, Dry	3M Telcom	3M710-SD1-25	-	Allowed	-
BEP Terminal, Swivel Stub Input & Output	Circa SYSTIMAX	1900A1-100, 100-pair BEP terminal 489ACC1-100, 100-pair BEP terminal			

BEP Module, With Sneak Current Protection	Porta Systems Circa SYSTIMAX	115SCG-240V; solid-state module, 220V 4B1FS-240l solid-state module, 240V 4C1S; solid-state module, 220V-300V			
Termination Apparatus, "66 Block" Type	Siemon	S66M1-50; 66 block, 'split 50' S89B; mounting bracket for 66 block S89D; mounting bracket for 66 block SA1; bridging clip MC4LH-x, 2-9	"x" represents the color (default color is white ("2"))		
Termination Equipment – Twisted Pair Cabling Patch Panel – Refer to Section 27 15 13 for product requirements					
Labels	Panduit	S200X400YAJ; labels for 25-100 pair cables S200X650YAJ; labels for 100-400 pair cables			
Duct Plugs	Tyco Carlon				
27 13 24 - BACKBONE OSP FIBER OPTIC CABLING					
Outside Plant Innerduct – "Corrugated", orange, black, blue, and yellow	A-D Technologies Carlon Endot				
Cable, OSP, 12-strand multimode 50/125, dielectric sheath	Corning			Allowed	-
Cable, OSP, 12-strand singlemode, dielectric sheath	Corning			Allowed	-
Fiber Optic Patch Panel, 4U, 12 adapter modules	Corning	CCH-04U, "Connector Closet Housings"	-	Allowed	-
Fiber Optic Patch Panel, 2U, 4 adapter modules	Corning	CCH-02U, "Connector Closet Housings"	-	Allowed	-

Fiber Optic Patch Panel, 1U, 2 adapter modules	Corning	CCH-01U, "Connector Closet Housings"	-	Allowed	-
Adapter Plate - 3 SC/Duplex adapters, aqua (MM 50/125)	Corning	CCH-CP06-G7	-	Allowed	-
Adapter Plate - 6 SC/Simplex adapters, blue (SM)	Corning	CCH-CP06-3C	-	Allowed	-
Connector, SC multimode, black	Corning	95-050-48	-	Allowed	-
Connector, SC Singlemode, blue	Corning Panduit	95-250-08	-	Allowed	-
Labels	Panduit	S200X225YAJ S200X400YAJ S200X650YAJ			
Duct Plugs	Carlon Tyco	Refer to Specification Section 27 15 13 for specific information			
Breakout Kits	Corning	Refer to Specification Section 27 15 13 for specific information			
Fiber Slack Storage Reel	Leviton	48900-OFR			
Velcro Cable Ties, Black, 15' roll	Panduit	HLS-15R-0			
27 15 13 - HORIZONTAL CABLING					
Cable, CAT6 4-pair, CMP (plenum), blue	Panduit Berk-Tek General Cable Belden	-	-		
Horizontal Cable Support Bar	Panduit	SRBCT; straight strain relief bar			

Modular Connector/Jack, CAT6 8-position	Panduit	Refer to specification section 271513 for specific information			
Patch Panel, 24 Discrete Ports	Panduit	CPPL24M6BLY			
Faceplate, "Mini-Com" line "Executive" series	Panduit	CFPExyy	"x" represents the port count; "yy" represents the color (default color is white ("IW")	None	-
Faceplate, Wall-phone faceplate, with "Keystone" line jack	Panduit	CFPExyy	"x" represents the port count; "yy" represents the color (default color is white ("IW")	None	-
Frame for GFCI / "Decora"-style coverplate, "Mini-Com" line	Panduit	CFGxyy	"x" represents the port count; "yy" represents the color (default color is white ("IW")	None	-
Frame for "106"-style coverplate, "Mini-Com" line	Panduit	CF106xyy CFGxyy	"x" represents the port count; "yy" represents the color (default color is white ("IW")	None	-
Faceplates for Modular Furniture Mount Outlets	Panduit	CFFP4BL; fourplex furniture faceplate MFFPHMBL; adapter for Hermin-Miller			
Surface outlet box, "Mini-Com" series, white	Panduit	CBX1WH-A; 1 port CBX2WH-AY; 2 ports			
Poke-Thru Floor Outlet, for Keystone mount connectors	Wiremold	CM2-U2KEYA; 2 mount connectors CM2-U1KEYA; 1 mount connector			

Bezel Adapter, for Wiremold devices and Panduit Mini-Com connectors	Panduit	CHI2MEI-X; 2 port CH02MEI-X; 2 port			
Faceplate for Furniture Feeds	Levitron	80704-4; 1.4" round opening			
Wireless LAN Access Point Enclosure, Ceiling-Mount	Oberon	1057	-	None	-
Wireless LAN Access Point Enclosure, Indoor Wall-Mount	Oberon	1023	-	None	-
Wireless LAN Access Point Enclosure, Outdoor Wall-Mount	Oberon	1026			
Labels	Panduit	S100X150YAJ; labels for cables C125X030FJJ; Equipment Room Identifier C061X030FJJ; Unique Cable Number CPPLF-5; for modular patch panels			
Velcro Cable Ties	Panduit	"Tak-Ty" series HLS-15R-0			
Plenum Cable Ties	Panduit	PLT1M-xxxx PLT2S-xxxx PLT3S-xxxx			

END OF APPENDIX A