Computing and Communications

The Evergreen State College

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Olympia, WA 98505

Network Telecommunications Design Standards

Last Updated – October 2022 (rev. 2.2.4)

The Evergreen State College

Table of Contents

[Purpose of this Document 3](#_Toc484601112)

[Department Contacts 3](#_Toc484601113)

[Revision Control 3](#_Toc484601114)

[Applicable Standards 4](#_Toc484601115)

[Standards Hierarchy 4](#_Toc484601116)

[General Guidelines 5](#_Toc484601117)

[Materials and Installation Specifications 5](#_Toc484601118)

[Intelligent Electronics Requirements 5](#_Toc484601119)

[Horizontal Infrastructure 5](#_Toc484601120)

[Premise Wiring 5](#_Toc484601121)

[Outlet Jacks 5](#_Toc484601122)

[Conduit 6](#_Toc484601123)

[Network Drop Boxes 6](#_Toc484601124)

[Outlet Jack Labeling 8](#_Toc484601125)

[Communication Rooms 9](#_Toc484601126)

[Intermediate Distribution Room (IDF) 9](#_Toc484601127)

[IDF Sizes 10](#_Toc484601128)

[Campus Room Types 11](#_Toc484601129)

[General Classrooms 12](#_Toc484601130)

[Computer Laboratory or Networked Classroom 12](#_Toc484601131)

[Riser/Building Backbone Infrastructure 12](#_Toc484601132)

[AV/Media Infrastructure and Data Cabling 13](#_Toc484601133)

[Building Entrance Infrastructure 14](#_Toc484601134)

[Grounding and Bonding 14](#_Toc484601135)

[Construction Monitoring and Changes 14](#_Toc484601136)

[Telecommunication Submittals 15](#_Toc484601137)

# **Purpose of this Document**

This document provides design specifications for voice and data communications infrastructure at The Evergreen State College (TESC). The department of Computing & Communications is responsible for the communications infrastructure and should be involved in the design process.

## **Department Contacts**

These individuals should be consulted during the initial schematic design phase and engaged during the design and construction phases:

* Michael Partlow, (360) 867-6635, partlowm@evergreen.edu
* Abraham Guz, (360) 867-6182, Abraham.Guz@evergreen.edu

## **Revision Control**

May 2017 –

* Document created

April 2018 –

* Updates to power Documentation Requirements

February 2019 –

* Minor changes to conform language with current requirements

March 2020 –

* Minor changes to conform language with current requirements

October 2021

* Updates to office network drops to add requirement for wi-fi access points
* Updates to fiber infrastructure requirements for MDF and IDFs
* Updates to network drops to add requirements for mechanical rooms
* Updates to network drops for wi-fi access points for Classrooms

October 2022

* Update contacts to include Abraham Guz

## **Applicable Standards**

Telecommunications physical infrastructure as defined by the Telecommunications Industry Association/Electronics Industry Association (TIA/EIA), consists of six elements:

1. Building entrance
2. Building main telecommunications room, “building entrance,” or Main Distribution Frame (MDF)
3. Backbone cabling
4. Telecommunications closets or Intermediate Distribution Frames (IDF)
5. Horizontal cabling
6. Work area

These elements will be augmented by a seventh element, networking equipment, required to provide a minimum level of data/voice service for the building.

In general, the following standards at a minimum shall be observed for telecommunications infrastructure and are incorporated herein by reference:

* ANSI TIA/EIA 568B Commercial Building Telecommunications Cabling Standard
* ANSI TIA/EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces
* ANSI TIA/EIA 607-C Commercial Building Grounding and Bonding Requirements for Telecommunications
* Current edition NEC (National Electric Code)
* BICSI DD 120-Grounding Fundamentals for TELCO Facilities Chapter 4 Telecommunications Systems Grounding (as reference)
* IEEE 802.3

*This document provides an interpretation of the standards referenced in the previous paragraph and provides additional detail, in some cases superseding those standards. Should the contractor require additional interpretation of the design guidelines, the contractor should contact the designated department contacts.*

## **Standards Hierarchy**

**Type**  **System**

Grounding, Bonding, and Fire Stopping TIA/EIA, NEC, BICSI

Fiber Optics Systemax

Category 6a or higher Systemax, TIA/EIA

Data/Voice TIA/EIA

# **General Guidelines**

Integral to the telecommunications infrastructure in buildings are the secure communications rooms generally consisting of building entrance and one or more IDFs. These rooms must be secure, environmentally conditioned, and clean before Telecommunications can work in them, especially as fiber must be terminated in these rooms requiring a very clean environment. Expensive and delicate networking devices, requiring environmental conditioning, also are housed in these rooms. In this regard, the IDFs shall be completed including environmental conditioning and completed early in the project timetable. In particular, all penetrations shall be completed and sealed (e.g., capped), all walls and backboards painted, and any exposed concrete surfaces sealed before Telecommunications work can continue in these environments.

## **Materials and Installation Specifications**

Voice/data cabling installations shall be Systimax standards compliant. At least 1 (one) cable installer must be Systimax installation certified. If vendor team only has one certified member, that member must be present AT ALL TIMES, or work stops.

All Telecommunications systems designs will meet applicable ADA Accessibility requirements.

## **Intelligent Electronics Requirements**

The Evergreen State College leverages talent sets and knowledge pools, as a result the College only permits certain intelligent electronic equipment to be installed as part of the telecommunications infrastructure:

* Voice Telecommunications – Avaya/Nortel manufactured phone systems and end-stations
* Data Telecommunications - Aruba Systems LAN switches, routers, and wireless access points

## **Horizontal Infrastructure**

**Premise Wiring** – Plenum rated category 6a cable or greater, connectors, and fixtures shall be used for horizontal data cabling. Data cable runs shall be strictly limited to 90 meters in total length, according to standards. In particular, IDFs are to be located so as to maintain less than a total 100-meter full-channel cable run which will include the necessary patch cords.

The communications cable for the plenum shall be Systimax 2091B, CAT6a, orange jacket. Communications cable for non-plenum Systimax 1091B, CAT6a, orange jacket.

For a building retrofit project, the communications cable shall match the Systimax category level, jacket type, and color of the highest-grade cable being used on campus.

Outside the MDF and IDFs, cable trays are to be Cooper Industries (Eaton) B-line “Redi-Rail” or as specifically approved by C&C.

Surface mount raceways shall not be used unless specifically approved by C&C.

**Outlet Jacks**

1. Provide ANSI/TIA CAT6A compliant outlet jacks.

2. Colors:

* 1. Yellow in the voice V position on the faceplate (port 1).
	2. Blue in the data D1 position on the faceplate (port 2).
	3. Green in the data D2 position on the faceplate (port 3).
	4. Gray in the data D3 position on the faceplate (port 4).
	5. Violet in the data D4 position on the faceplate (port 5).
	6. Red in the data D5 position on the faceplate (port 6).
	7. Black in the data D6 position on the faceplate (port 7).
	8. Orange in the media M position on the faceplate (port 8).
	9. Blank cover on all unused faceplate ports.
1. Actual number of jacks needed at each locations shall be determined by the building design.
2. If a voice jack is not called for, port 1 shall be empty with a dust cover.
3. “GS” escutcheon shall be installed on all jacks.
4. Provide exact jack layout in faceplate arrangement per detail in drawing package.
5. Approved Manufacturer: SYSTIMAX SOLUTIONS, No substitute.
	1. SYSTIMAX SOLUTIONS, Part No. MGS600-123 (yellow), MGS600-318 (blue), MGS600-226 (green), MGS600-270 (gray), MGS600-361 (violet), MGS600-317 (red), MGS600-003 (black), and MGS600-112 (orange)

**Conduit** –Conduit bends shall conform to accepted radii for the type of conduit used. Communications systems conduits and cable pathways shall have a minimum bend radius of 10:1 (10 times conduit inside diameter). There shall be no more than 180 degrees of conduit bends between pull points. A pull box or conduit shall be installed where there is greater than 180 degrees of combined bends or a U-shaped bend in the conduit. Intermediate pull points shall have their access cover aligned in conjunction with proximal equipment so as to guarantee future access.

Where required, a single conduit pull location shall be an O-Z/Gedney Mogul Conduit Body, Type C for 1.5” conduit, with reduces to 1.25” conduit.

Where required, a single conduit LB pull location shall be an O-Z/Gedney Mogul Conduit Body, Type LB for 1.5” conduit, with reduces to 1.25” conduit.

A conduit body (conduit, J-box, etc.) used for an intermediate pull point shall have its access cover aligned in conjunction with proximal equipment so as to guarantee future access.

Conduits shall terminate slightly above the cable tray and generally perpendicular to the tray without a down-turning end. The contractor shall ensure that conduit ends are easily accessible for cable installation. Conduit cuts shall be cleared of burrs and ends shall be fitted with an appropriate bushing to minimize chafing. All conduits shall be bonded to the cable tray, bolted lugs and green insulated grounding wire, with a minimum 14 AWG. Telecommunications conduit(s) entering the IDF shall have ground bushings installed.

A pull rope/string shall be left in conduits for future cable installs, secured to both end to prevent accidental pull-out.

### **Network Drop Boxes**

Provide voice/data outlet boxes: RANDL 5” square, 2.875” deep box with knockouts for 1”, and 1.25” conduits, and double gang 5/8” mud ring with 1.25” conduit to nearest cable tray. Stub-up conduits are not acceptable.

Provide outlet boxes for wall mount phones: RANDL 5” square, 2.875” deep box with knockouts for 1”, and 1.25” conduits, and single gang 5/8” mud ring, mounted at 43” AFF at center of box and a 1.25” conduit to nearest cable tray.

Provide outlet boxes for above ceiling WAPs: RANDL 5” square, 2.875” deep box with knockouts for 1”, and 1.25” conduits, and single gang no-rise mud ring, mounted in an accessible location no more than 24” above suspended ceiling and a 1.25” conduit to nearest cable tray.

Any surface mount or above ceiling location, provide a RANDL flat, no-rise mud ring appropriate to the application.

There shall be no back-to-back wall outlet boxes in order to reduce sound transmission between spaces.

Substitution for RANDL is approved as long as the box and ring match the RANDL design, dimensions, and knockouts.

**Office Network (Cable) Drops** – Each network (data/voice) location should have an eight (8) port dual duplex face plate installed on the “door wall” (wall that the door knob touches when open) and the opposite wall. The “door wall” shall have 2 data jacks (0,2,0), the opposite wall shall have 1 voice and 1 data jack (1,1,0). Jack location shall be 2”-24” of an electrical outlet. Each office location should have an above ceiling outlet box with 1 data jack for a wireless access point. All unused faceplate ports shall have dustcovers.

**Non-Office Network (Cable) Drops** – Each network (data/voice) location should have an eight (8) port dual duplex face plate. Number and type of jacks shall be determine by the use of the room during the design process. All unused faceplate ports shall have dustcovers.

**Mechanical Room Network (Cable) Drops** – Each network (data/voice) location should have an eight (8) port dual duplex face plate. Number and type of jacks shall be determined by the use of the room during the design process. Each Mechanical Room Network Drop will have a minimum of 4 data jacks.

**Wall-Mount Phone (Cable) Drops** – Each wall phone location be terminated on YELLOW jack, wrapped in plastic to protect from dust/mud. OFOI stainless steel wall-mount jack shall be installed at substantial completion.

**Cable Drop Labeling** – Each cable drop installed shall be labeled per the TESC labeling scheme. Each drop shall be labeled on the front of the jack faceplate, on the patch panel in the IDF and on both ends of the cable. Campus telecommunication personnel will provide specifics to the contractor prior to start of work.

**LABELING**

* + - * 1. Horizontal cable and faceplate outlet jack labeling shall conform to the following TESC standard format devised for any project.
				2. The label at the outlet jack and on cables shall be as follows:

The label will consist of the following fields: AB-C/DE/FG which are defined as follows:

A = TESC Building Wing. (1 digit: A, B, or C. If only 1 wing, use A).

B = Floor of the Communications Room servicing the jack location. (1 digit – numeric).

C = Rack Number. (1digit - numeric).

DE = the patch panel Row from 01 to 99. (2 digits with leading zeros as needed).

FG = the patch panel Column from 01 to 24. (2 digits with leading zeros as needed).

For example A2-1/01/24.

* + - * 1. Database Cable Fields

Submit the database information in the following format:

Building number (will be provided by the project manager or telecommunications personnel) (example: Lab 2 is 012).

Wing designator of the communications room servicing the jack location. (If only 1 wing, use A).

Rack number. (1 digit - numeric).

The patch panel row number from 01 to 99. (2 digits with leading zeros as needed).

The patch panel column number from 01 to 24. (2 digits with leading zeros as needed).

Room number where the outlet jack is located. (4 to 5 digits with leading zeros as needed). Example - 2301 or 2301A.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| BLDG # | WING | FLOOR | RACK | ROW | COLUMN | ROOM # |
| 012 | A | 2 | 1 | 01 | 24 | 2301A |

* + - * 1. Label each outlet with permanent self-adhesive machine printed label to fit the faceplate windows.

Label each horizontal cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in the following locations:

Inside the outlet box at the work area.

Behind the communications room patch panel.

For example: A2-1/01/24.

* + - * 1. Label the communications room patch panels using the TESC scheme devised for this project as follows:

Assign numbers to patch panel jacks in a grid of rows and columns.

Begin row and column identification/numbering at the upper left working left to right, top to bottom across all equipment racks in a lineup.

Numbering shall not cross between racks

Begin numbering with row 1 and column 1.

Number all patch panel jacks whether wired or not.

For example: A2-1/01/24.

TESC telecommunications personnel shall provide patch bay adhesive labels that conform to campus standards.

* + - * 1. Provide the Owner with electronic copy of the outlet-numbering to room number crosswalk database (Outlet Schedule) in comma separated variable (CSV) format on a CD.
				2. Use color-coded labels for each termination field and wiring blocks that conform to ANSI/TIA/EIA-606 standard color codes for termination blocks.
				3. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable unless otherwise noted.

#### **Testing and Reporting of Test Results**

Each Data/Voice drop installed shall be tested using a manufacturer calibrated Fluke brand tester, appropriate to the cable type in accordance with the latest EIA/TIA 568 standards, and the original Fluke format results recorded on a comprehensive project documentation CD/DVD or electronically delivered for each building and provided to the department contacts.

**As-built Documentation** – All required documentation shall be delivered within 2 weeks of project completion. A 90% accurate copy shall be delivered at 90% completion to help TESC facilitate building population. The as-built drawings shall be provided in electronic CADD (dwg) format as indicated by the TESC contact.

As conduit paths, tray connection points, locations of condulets and junction boxes when installed vary from design, conduits and all cable paths shall be annotated to their actual locations. These paths shall be orange in color, pull points noted, and provided on a separate layer in the communications CADD files

These files are to be on a comprehensive documentation CD/DVD for each project. All required documentation (drawings, databases, spreadsheets, cable test results, etc.) shall be included on the DVD, as well as any necessary software for reading test results in native format.

**Invasive Work and Work Schedules** - Invasive work (i.e., core and/or hammer drilling or work that is noisy, dusty, etc.) shall be conducted during off-business hours. Other work shall be coordinated with the College designated representative (e.g., to pull cables during off-hours), and these arrangements shall be determined by mutual agreement.

# **Communication Rooms**

Telecommunications MDF and IDF room space shall be dedicated to the telecommunications function and related support facilities. MDF and IDF locations in multiple-story buildings should be stacked on top of each other. Equipment not related to the support of the telecommunications functions shall not be installed, passed through, or entered in the telecommunications rooms without the review and approval of C&C.

All communications rooms shall be free of water or drainpipes (including sinks or other water sources) not directly required in support of the equipment within the communications rooms. Pipes shall not transit communications rooms. A floor drain shall be provided within the room if risk of water ingress exists. See ANSI 6.5.3.3 for additional information.

Voice and data cabling and equipment will be installed in a 7’, 6" deep, 19" black Chatsworth rack **66353-703**

Vertical cable management shall be 6” wide on the wall-attached rack (**CPI 30165-703**), and 10”wide between racks and on the open, expansion end (**CPI 30166-703**).

Patch bay shall be a **Systimax 360‑PM‑GS6‑2U‑48**, sized to 125% of ports needed at the initial installation (48 port minimum).

The ground bus for all Telecom Rooms shall be **Chatsworth 40153** series.

## **Main Distribution Room (MDF)**

MDF shall be located at a point that minimizes fiber connections to the Library Data Center and fiber connections between the MDF and IDFs within a building.

The MDF houses a building’s distribution network equipment and fiber infrastructure to connect building IDF rooms to the Library Data Center. MDF may also function as IDF rooms.

MDFs shall follow the IDF requirements describe below.

## **Intermediate Distribution Room (IDF)**

IDF(s) shall be located at points that minimize the runs of the network to the end user, typically in the center of the wings of buildings. Network cable runs are to be limited to 90 meters, and this may affect the placement of the IDF or require additional IDFs to be added.

The IDF houses the edge data/voice network switches that are used to distribute the data/voice network to the end user. Edge network switches are housed in vertical racks. Cabling intended primarily for voice use shall be terminated in “rack number 1” on the same type patch bays as the cabling intended primarily for data in subsequent racks.

All exposed backboard surfaces shall be painted with two coats of fire-resistant matte white paint. Fire rating stamps shall not be painted over. At least one stamp per sheet of plywood must be visible after the equipment is installed. The flame-spread rating shall be no greater than 25 when tested according to ASTM W84.

All wall surfaces to be painted.

All concrete floors or other surfaces to be sealed.

Cable television connections shall enter the IDF on dedicated on a single coaxial feeding the appropriate amplifier/splitter network mounted on the backboard with distribution cables run in a star configuration to every designated end-user outlet.

Grounding and bonding shall be provided in the IDF in strict accordance with TIA/EIA JSTD-607-C standard, the most current edition NEC, and as a reference, BICSI DD 120 Grounding Fundamentals for TELCO Facilities, Chapter 4 Telecommunications System Grounding and extended to all IDFs as described therein. All penetrations of the IDF envelope shall be fire-stopped.

IDF(s) shall be environmentally conditioned to accommodate the continuous operation of network equipment (including automatically switched generator AC power) and shall be sized to accommodate an equipment heat load for equipment to be specified by C&C. Temperature in IDF shall not exceed 80°F.

IDFs shall be supplied with dedicated 30 Amp electrical circuits terminating on NEMA L14-30 outlets in the base of each rack with a minimum of 2 outlets in an IDF with only 1 rack. Duplex 20Amp,120vac outlets shall be mounted in the base of the center rack or, if approved by C&C, on the wall within 12” of the racks

IDF shall be supplied with switched lighting which shall not be sourced from the same circuit as the telecommunications equipment.

IDF cooling system shall be capable of continuous operation (including automatically switched generator AC power) and shall be sized to accommodate an equipment heat load for equipment to be specified by C&C. Temperature in IDF shall not exceed 80°F.

IDF shall be sized such that there is ample room to install racks to house the equipment. The IDF shall be sized to accommodate a minimum of two vertical 7'x19" relay racks: one for the fiber, voice equipment, and UPS; and at least one for data jacks and data switch(es). There shall be 48” of space on each side of the rack lineup. Preferably, all IDFs shall be vertically stacked within the building.

IDF shall be sized to accommodate all connections that may potentially be used from that room. In a typical scenario, an IDF would serve an area of approximately 10,000-15,000 Assignable Square Feet (ASF), depending on the density of connections deployed from the IDF.

Doors shall be self-closing and secured with self-locking locksets with electronic access control devices consistent with campus standards.

The communications rooms shall not be located below water level unless preventive measures against water infiltration are employed.

## **IDF Sizes**

**No. of Jacks (Area Serving) Room Size (length x width – ft)**

251-370 (10,000 sq ft) 10’ x 12’

121 – 250 (8,000 sq ft) 10’ x 10’

86 – 120 (5,000 sq ft) 10’ x 8’

41 – 85 (2000 sq ft) 8 x 6 (see example IDF layout below)

1 – 40 (<2000 sq ft) 4’ x 3’ (with single door swinging outward)

2000 sq. ft/25-120 8’ x 6’ (see example IDF layout below)

Less than 2000 sq ft/1-24 4’ x 3’ (with a single door swinging outward)



*Example IDF Layout (41 to 85 jacks):*

# **Campus Room Types**

Several generic types of rooms have been defined for categorization purposes. Except for the minimum number of jacks, the following are suggested configurations. In all cases, the final number of jacks should be determined in consultation with C&C Telecommunication’s personnel.

Desk systems furniture layouts (including AC power and telecommunications interface locations) shall be coordinated prior to determining the exact locations for the associated wall-mounted outlet boxes.

1-1/4” conduit with a Randl “5 square” box with dual duplex faceplate shall be placed to each communications outlet unless otherwise approved by C&C.

Provide (1) AC outlet no less than 2 inches and no more than 24 inches from every outlet box.

Provide (1) dedicated 20-amp circuit/outlet for each production laser printer and copier.

**General Classrooms** – a general classroom shall have a minimum of four outlets: one at the front and rear of the classroom, an additional outlet at the projector location, and an additional above-ceiling outlet for the wireless access point. Each outlet will have 2 data jacks installed.

All Teaching and Learning spaces will include electrical rough-in for a basic AV system including a ceiling-mounted video projector and all devices designated for campus standard 'Teaching Location' even if equipment installation is not planned for the immediate scope of work.

A podium should be anticipated in all large group teaching spaces (greater than 50 students) and appropriate conduit or in-floor ducting should be installed for current or future use.

A wall phone location should be located near the teaching station/podium.

**Computer Laboratory or Networked Classroom** – in addition to the above requirements for General Classrooms, a computer laboratory or a networked classroom may have many computers in it and shall be provided liberally with data and power outlets mounted at locations designated by C&C. Drop-down conduits or cable-management ‘poles’ shall be avoided wherever possible in computer classrooms as they obstruct vision and have insufficient space to meet cable turn radius. The quantity of data and AC power jacks is to be determined by C&C in consultation with the building occupant.

Laboratory rooms, in addition to data locations as prescribed, shall have an easily accessible and highly visible wall-mount phone located near the entrance for safety and general communications

All teaching and learning spaces will meet industry-standard acoustic performance criteria for background noise levels (NC) and sound transmission from adjacent spaces (STC). Performance shall be verified by the certified acoustical engineer involved in the design process with a detailed performance report provided to the college upon completion.

# **Riser/Building Backbone Infrastructure**

The building backbone cabling consists of fiber cable for data and video and copper cable for voice. Fiber cables shall be run between the main data center (“machine room”) on campus (located in the Library Building) and the remote building MDF in a star topology. Copper voice cables shall be run between the MDF (located in the Library PBX room B0447) and the remote building MDF and then to IDFs within the building. A minimum of 12 strands of single mode fiber is required per building MDF back to reach the datacenter (located in Library A0206). A minimum of 12 strands of single-mode fiber is required per building IDF back to the building MDF. A minimum 25-pair copper for voice is required per building IDF back to the MDF (Library PBX room B0447). 200 pairs is preferred depending on the mission of the building.

Standard fiber optic connectors are LC for Single Mode Fiber and LC for Multimode Fiber unless otherwise specified.

The infrastructure for the building backbone cabling shall consist of conduits between the building MDF and each IDF. Separate conduits shall be used for copper cables (voice) and fiber cables (data and video).

EIA/TIA 569 shall be strictly observed for the building backbone pathways. Conduits shall be sized to be no more than 40% full by volume. Long-radius metal sweeps shall be used instead of 90° fittings. No more than 180 degrees of bends shall exist in conduits without the inclusion of a readily accessible pull box, the location of which shall be clearly marked on drawings. In situations where cable trays, conduits, or sleeves extend outside the IDF into occupied portions of the building, they shall be fire-stopped.

Single-mode fiber shall be pre-tested with an Optical Time Domain Reflectometer (OTDR) and optical loss meter at 1310 nm & 1550 nm, upon cable delivery.

Multimode fiber, if used, shall be tested post-installation at 850 nm and 1300 nm.

A bidirectional end-to-end optical loss test shall be conducted at dual wavelengths for each fiber installed.

Cable ladder racks shall be hung in a manner that ensures a minimum of 12" vertical clearance and 18" horizontal clearance on at least one side to allow for sufficient access to the ladder rack for cable installation and maintenance. Mount cable ladder racks no more than 12” above ceiling tiles so as to be accessible by cable handlers using standard ladders. Transitions, where changes in height are unavoidable, shall be gradually sloping. The cable ladder rack shall be routed so as not to interfere with the installation of other systems or access to those systems for maintenance. Pipes and non-communication conduits shall not pass through the cable trays

Coordination with other systems shall be maintained so that, where these systems traverse above or below the ladder rack, access shall not be blocked or interfered with. Cable ladder racks shall not pass-through firewalls. Instead, the ladder rack shall stop on either side of the firewall and be interconnected via multiple 4" diameter conduits passing through the firewall. The bottom of these pass-through conduits shall be no more than 40% filled at substantial completion.

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| Communications cable tray use will be restricted to Telecommunications, AV and low-voltage signaling systems not including fire alarm systems. |
| Cable trays must be fully accessible for future maintenance needs. Where located above ceilings, ceiling systems must be readily removable to facilitate future cable additions. Access to cable trays will not be restricted by 'hard cap' ceilings or other obstructions.All telecommunications and AV system cablings will be installed in conduits and cable trays. J-hooks or other alternate devices may not be used unless specifically approved by C&C prior to installation. |

# **AV/Media Infrastructure and Data Cabling**

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| Specific projects may call for single-mode fiber optic cable for dedicated AV systems. This Media Fiber ('MF') cables should terminate in a dual LC patch panel located in an AV equipment rack. These fiber cables should also include an adequate maintenance loop for future relocation of the fiber patch panel to the adjacent Telecom Closet.  |
| Specific projects may call for CAT6A cable for dedicated AV systems. These Media horizontal CAT6A cabling must terminate in separate telecom patch panel(s) designated for this use in the data closet. In addition, all 'Media' jacks must be cross connected to an "extended' CAT6A patch bay located in a nearby AV Media Equipment rack. While this 'extended' cabling may cause the total end-to-end cable length to exceed applicable limits when cross-connected, these extensions should otherwise conform to all aspects of the applicable CAT6A specifications and installation requirements. |

# **Building Entrance Infrastructure**

EIA/TIA 569 shall be strictly observed for the building entrance. Underground conduits entering a building shall be dedicated for the exclusive use of Telecommunications and no more than 25% full by volume.

Network Telecommunications & Security may request the removal of unauthorized cable(s) within telecommunication entrance conduits. Copper and fiber cables shall be brought into the building in separate, metal conduits. No more than a total of 180 degrees of bends, using long radius metal sweeps, shall exist in conduit runs between pulling points.

The contractor agrees to remedy all defects identified by TESC during the final inspection of the contractor’s work. The scheduling of the remedies shall be approved by TESC. The contractor shall be responsible for obtaining a final work acceptance signature, from the College designated representative, on a mutually agreed upon “punch list” to indicate acceptance of the contractor’s work by TESC.

The contractor shall be responsible for providing an as-built drawing. However, for outside plant infrastructure projects, the contractor in addition shall illustrate route(s), depth and benchmark measurements from existing landmarks and fixtures.

Conduit shall only have virgin (new) 2400 lb. Sequential Mule Tape supplied and installed by the contractor, in each duct without knots and splices. The mule tape shall be exposed at least six feet (6’) for aiding in tying on to the cable. ***\*POLYROPE SHALL NOT BE ACCEPTED WITHIN THE DUCT***

The buried conduit duct shall have a No. 12 UF-type tracer wire installed outside the conduit. Any deviations must be approved by C&C.

# **Grounding and Bonding**

Grounding and bonding shall be provided in the MDF and IDF in strict accordance with TIA/EIA JSTD-607-C standard, the most current edition NEC Article 250, and as a reference BICSI DD 120-Grounding Fundamentals for TELCO Facilities Chapter 4, Telecommunications System Grounding, and extended to all IDFs as described in this document. All penetrations of the IDF envelope shall be fire-stopped.

The telecommunications bonding backbone (TBB) shall be a copper conductor. The minimum TBB conductor size shall be a No. 6 AWG. The TBB should be sized at 2 kcal per linear foot of conductor length up to a maximum size of 3/0 AWG. The TBB may be insulated. If the TBB is insulated, the insulation shall meet the fire ratings of its pathway. The sizing of the TBB is not intended to account

# **Construction Monitoring and Changes**

TESC staff from C&C shall be allowed on-site throughout the construction and commission process in order to monitor construction progress.

# **Telecommunication Submittals**

Certificate submittals for telecommunication contractors will be provided before construction contracts are signed.

All required telecommunication shop drawings, product data, and/or samples will be provided to TESC for review and approval before any related on-site work begins. When providing manufacturer catalog pages or cut sheets for materials, the specific part number shall be clearly marked or called out.

Telecommunication Drawings shall include:

|  |
| --- |
| * A comprehensive Telecom Grounding riser diagram.
 |
| * Telecom Room(s) layout floor plans and equipment elevation drawings
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| * Telecom Room detail drawing showing grounding, ground bar, telecom raceway, AC and emergency AC power, fire-treated backboard, and outlet boxes.
* All voice and data locations using approved icons and nomenclature
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The contractor will provide nearly complete and accurate Telecommunication and AV construction documentation at 90% completion, and 100% prior to final payment. This is to include all as-built documentation and specified testing results.