



Building Design Guidelines

Campus Technology Infrastructure

Version: Summer 2006

Building Design Guidelines: Technology Infrastructure

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Prepared in coordination with IT Network Engineering for the College of Charleston by
Telecom Design Management, Inc.

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INTRODUCTION

The College of Charleston, IT Network Engineering design guidelines describes the installation of a non-vendor specific telecommunication infrastructure that will support the following cabling systems:

- Data
- Voice
- Video
- CATV
- ARAMARK/Campus Food Service provider
 - Student swipe card system
- Bookstore/Follett network
- Public Safety Security Devices
 - Card entry points
- Physical Plant CMI climate control

This document is intended to provide general guidelines and reference information for the design of new and renovated College of Charleston buildings and structures.

This document shall not take precedence over the local authority having jurisdiction for the area or locale(s) within which the work is performed.

Any omission of or lack of reference to local or appropriate laws made by this document shall not relieve the architect or engineer of his obligation to meet such laws.

Documentation Requirements

During the conceptual phase of renovations and construction, the following will be provided to IT Network Engineering as soon as they are available:

- Three paper copies and one electronic copy of the electrical site drawings shall be furnished to the IT Network Engineering Department, with the initial conceptual electrical site drawings

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- A brief description of the usage and the technical needs of the building along with the rooms within identified.

The architect will be responsible for arranging meetings between the electrical engineer and IT Network Engineering (starting the conceptual phase through the design development phases of the project) to assure that telecommunications requirements are understood and have been incorporated in to the construction drawings.

The architect shall provide copies of minutes from all meetings for approval.

IT Network Engineering must review the final drawings prior to the DD submission and be accorded time to identify, address and make final changes, corrections, to the plan drawings.

An Electronic Copy of the E-drawings that illustrate the telecommunications outlet placement shall be provided to IT Network Engineering for new and renovation construction for the purpose of documentation. This documentation will become a permanent record of the installation of the infrastructure.

Estimating

IT Network Engineering will provide a preliminary, ballpark estimate for the telecommunications portion of the project to be completed based on the conceptual information and the drawings provided.

An initial estimate will be provided within two weeks of receipt of the conceptual drawings.

When final drawings are complete, a second set of drawings shall be provided to IT Network Engineering for review. This set of drawings shall include room numbers, with the use of each room identified. IT Network Engineering will then, in conjunction with CIO, provide a final and detailed estimate outlining the telecommunications needs for the building. This estimate will be based on the previous meetings held by the architect and the information gleaned from these meetings as to the use and requirements necessary to serve the telecom needs of the building and its occupants. This estimate will require three weeks to complete from the time of receipt of the final drawings.

References and Documents for Telecommunications Standards and Guidelines

- 1) ANSI/NECA/BICSI-568 -- Standard for Installing Commercial Building Telecommunications Cabling
- 2) ANSI/TIA/EIA-568-B.1 -- Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements
- 3) ANSI/TIA/EIA-568-B.2 -- Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
- 4) ANSI/TIA/EIA-568-B.2-1 -- Commercial Building Telecommunications Cabling Standard, Part 2: Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cabling
- 5) ANSI/TIA/EIA-568-B.3 -- Optical Fiber Cabling Components Standard
- 6) ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces
- 7) ANSI/TIA/EIA-606 (A) -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- 8) ANSI/TIA/EIA-607 (A) -- Commercial Building Grounding and Bonding Requirements for Telecommunications
- 9) ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
- 10) ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant
- 11) ANSI/EIA-310-D -- Racks, Panels, and Associated Equipment
- 12) ANSI/NFPA-101 -- Life Safety Code
- 13) ANSI/TIA/EIA-758 -- Customer Owned Outside Plant Telecommunications
- 14) ASTM E814 and UL1479 -- Fire-Stop Standards
- 15) ISO/IEC-11801 -- Generic Cabling for Customer Premise
- 16) FCC PART 68 -- Code of Federal Regulations, Title 47, Telecommunications
- (17) National Fire Protection Agency (NFPA-70), National Electrical Code (NEC)
- (18) OSHA CFR 29, Applicable portions of Parts 1910 & 1926

Install cabling in accordance with the most recent edition of BICSI® publications:

BICSI—Telecommunications Distribution Methods Manual

BICSI—Cabling Installation Manual

BICSI—LAN Design Manual

Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of the specifications as if herein repeated or hereto attached. If the contractor should note items in the drawings or the specifications, construction of which would be code violations, promptly call them to the attention of the owner's representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.

MAIN TELECOMMUNICATIONS ROOM (MTR)

Each facility will require one (1) main telecommunications room (MTR) or Main Distribution Frame (MDF) located on a 2nd floor or higher

The MTR will be the source of delivery and distribution for communications to all areas within the building. The room will serve as the distribution or cross connect point between outside services (such as internet and phone service) and distribute these services throughout the facility.

The room should be located on the second floor or higher of a building to prevent possible flooding.

Refer to Appendix A: Figure 1 for an illustration of the “Main Telecommunications Room.”

Location

The MTR (one per facility) should be located near the center of the building or as close as practical. The MTR should be accessible from a main hallway or common area for convenient access for performing system administration and maintenance. The MTR should not be shared with electrical installations, other than those if required for telecommunications. The MTR must not be near water pipes or below rest room facilities and should not serve as janitorial or a storage room.

- The room shall be dedicated to Telecommunications Functions.
- The MTR may contain some or all of the following:
 - Phone Switch.
 - Campus Video
 - Telecommunication racks (cabling, fiber optics, network electronics), computer server cabinets, computer server racks, telecommunications backboard and building entrance cables for all telecommunications services to the building.
 - Security interface and cabinets.

MAIN TELECOMMUNICATIONS ROOM (MTR) (continued)

Size

For 5,000 sq. feet or less of usable floor space the interior dimension of the MTR must be at least 10 ft. x 7 ft. Larger than 5,000 sq. ft. and less than or equal to 8,000 sq. ft up to 10, 000 sq. ft. the interior dimensions of the room must be at least 12 ft. x 12. ft.

Distribution from the MTR

Cable placed from this room to other locations within the building, will be used to feed telecommunications from this room to other rooms throughout the building known as Equipment Rooms ER. Satellite rooms, known as Equipment Rooms (ERs) will house the distributed services from the MTR. In some cases, based on location and need, this room may also be used to feed workstations and a section of the room will be used as a TR. In this instance, a section of the MTR will be used to terminate workstation cables. ERs are discussed in a subsequent section of this document.

Refer to the “Cable Pathways” section of this document for required pathways.

Design of the MTR

A cable tray or ladder racking should be installed around the perimeter of the room to route cables from the point where they enter the room to the termination point of each.

SIZE – The College standard Main Telecom Room size for a multi-story campus building is 12' x 12' – literal dimensions. These dimensions may be adjusted only with the documented approval of the IT Network Engineering Department. Exact sizing may differ based on the equipment required for the requested services for the particular building being designed.

Note: In renovations or retrofits, effort needs to be made to achieve these dimensions as close as possible.

MAIN TELECOMMUNICATIONS ROOM (MTR) (continued)

Environment (Minimum)

- The door should be at least 36” wide, 80” high and hinged to open outward (if code permits) and there should be no doorsill. Access to telecom rooms should be from hallways only with no through access to other areas. Doors should be placed in the corner of the room if possible.
- All IT Network Engineering MTR/ERs should be keyed the same with the College standard MEDECO “CR” key.
- The door shall swing out and not in to the room.
- Continuous climate control – Dedicated HVAC - (24/7) Temperatures should be maintained between 64 and 75 degrees Fahrenheit with relative humidity between 30% to 55%. There should be a minimum of one (1) air exchange per hour.
- The average equipment load in a main MTR is approximately 10,000 – 15,000 watts.
- Flooring - Carpet should not be installed in communication closets. VCT or sealed concrete floors will protect equipment from static electricity and dust.
- Lighting requirements – Provide a minimum of 50 foot-candles, measured 3 feet above the finished floor and mounted 8.5 feet above finished floor.
- The room shall not be used as a passage way for water pipes, roof drains and other facilities not a part of telecommunications.
- The room shall be as square as possible and not installed with angled walls.
- If columns are placed within the room, the room size and layout shall be adjusted to accommodate the loss of space caused by the column.

MAIN TELECOMMUNICATIONS ROOM (MTR) (continued)

Power

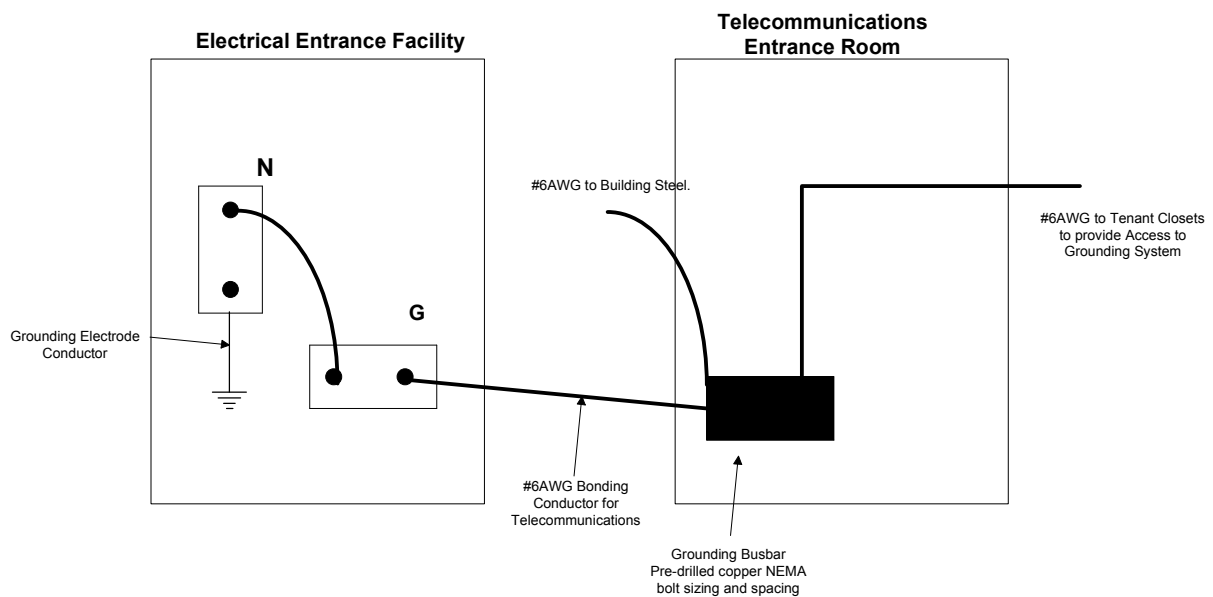
If a building based UPS system has been installed, the MTR shall be supported if possible. A separate panel may be installed in the communications rooms to feed that room only.

- Surge Protection should be provided and installed at each power panel that feeds telecom circuits.
- Each MTR communications room will require two single gang receptacles to power rack mounted data equipment:
 - L5-30P receptacles for large buildings, mounted 90” above the finished floor on the backboard behind the communications racks one (1) 30Amp/120V circuit will feed each of the receptacles.
 - L5-15P receptacles for smaller buildings.
- Each rack and server location will also require a 4-plex receptacle on a dedicated 20-Amp circuit. Mount the receptacle 90” above the finished floor on the backboard behind or beside the rack locations as illustrated.
- Place at least two locations within the room two receptacles, each on a 20 Amp circuit.
- Each wall in the communications room requires one (1) duplex receptacle for convenience.

MAIN TELECOMMUNICATIONS ROOM (MTR) (continued)

Grounding

- Grounding shall be provided in accordance with NFPA 70, Article 250, Article 800 and TIA/EIA 607.
- There must be a grounding bus bar available for each MTR and ER that is electrically connected via a proper sized copper conductor to the Building Grounding Electrode.
- Each telecom room will have a Telecommunication Grounding Busbar (TGB) requiring a grounding plate that is bonded to building ground and the building electrical ground.
- All Telecommunications rooms shall be connected and bonded to a common ground via a Telecommunications Bonding Backbone (TBB). A minimum #6AWG shall be used for the grounding back bone.



Following EIA/TIA-607 - A #6AWG ground and ground bus bar shall be provided to the room and installed on the plywood backboard. This ground busbar shall be a pre-drilled copper busbar provided with standard NEMA bolt hole sizing and spacing.

- Each shall be bonded to building ground at the electrical service entrance equipment for the building. (See the previous illustration.)

Cable tray shall be bonded and grounding to the TBB.

MAIN TELECOMMUNICATIONS ROOM (MTR) (continued)

Conduit and Sleeves

- The MTR will contain a minimum of 2 - 4" conduits placed from the MTR to the College telecommunications infrastructure. This infrastructure will consist of connections to other buildings or to a handhole or manhole serving the site or building. In rare cases, both connections may be necessary.
- The MTR shall be connected via conduit or sleeves to each TR.
(See "Cable Pathways: Inside Building Distribution" section.)
- Each MTR shall have a minimum of four (4), 4" sleeves from the room to the cable tray or "J" hook pathway to the telecommunications outlets.
- ERs on different floors should be stacked vertically or as close to vertical as possible with the MTR, and contain a minimum of two (2), 4" sleeves or two (2), 4" conduit pathways between the MTR and each TR.

Plywood

Cover all four walls of the MTR with $\frac{3}{4}$ " plywood as illustrated. Securely fasten the plywood to the walls, mounting each 4' x 8' sheet of plywood vertically to maximize the 8 feet height of each sheet.

Paint the plywood on all six sides with two (2) coats of fire retardant paint, black in color, with intumescent, elastomeric, and ablative properties.

EQUIPMENT ROOM (ER)

Definition and Use of the Room

The Equipment Room (ER) is the location where information is received and distributed to the desk top from the Main Telecommunications Room (MTR). This is accomplished using cabling from the ER to the data communication outlets in individual user areas. The ER will contain the Data Racks for the termination of the user outlet cables and the backbone cabling back to the MTR which feeds the area. The connection from horizontal to backbone facilities will be accomplished here.

Refer to Appendix A: Figures 2.1 and 2.2 for illustrations of two telecommunication room options.

Number and Location

There must be a minimum of one (1) Equipment Room (ER) for voice & data communications on each floor.

In most cases, the Main Telecom Room can serve as the ER for the floor where it is located.

Additional ERs will be required when horizontal cabling lengths will exceed 100 meters to meet EIA/TIA certification requirements for cable lengths.

The total horizontal and vertical measurement from each ER to the communication outlet should not exceed 225 feet linear measurement in order to stay within the 100 meter limit for total cable length.

- The ER should be centrally located to each space it serves and act as a junction point for communications cabling.
- Each ER will serve an area within 225 feet of the user area (the number of ERs is determined by the number of outlets to be served and the distance of the user areas from the TR).
- ERs should be located in a stacked position with the MTR.

EQUIPMENT ROOM (ER) (continued)

Design of the ER

A cable tray should be installed along two walls of the room as illustrated, to route cables from the point where they enter the room to the termination point of each.

SIZE – The College standard ER size is 8' x 10' – literal dimensions. These dimensions may be adjusted only with the documented approval of the IT Network Engineering Department. Angular walls are not acceptable unless the 8' x 10' dimension can be met within the angular room space.

Note: In renovations or retrofits, effort needs to be made to achieve these dimensions as closely as possible.

Environment (Minimum)

- The door should be at least 36" wide, 80" high and hinged to open outward (if code permits) and there should be no doorsill. Access to telecom rooms should be from hallways only with no through access to other areas. Doors should be placed in the corner of the room if possible.
- All IT Network Engineering MTR/ERs should be keyed the same with the College standard MEDECO "CR" key.
- The door shall swing out and not in to the room.
- Continuous climate control – Dedicated HVAC - (24/7) Temperatures should be maintained between 64 and 75 degrees Fahrenheit with relative humidity between 30% to 55%. There should be a minimum of one (1) air exchange per hour.
- The average equipment load in an ER is approximately 2,000 – 5,000 watts.
- Carpet should not be installed in communication closets. VCT or sealed concrete floors will protect equipment from static electricity and dust.
- Lighting requirements – Provide a minimum of 50 foot-candles, measured 3 feet above the finished floor and mounted 8.5 feet above finished floor.
- If the room contains a sprinkler head, the head shall contain a wire cage to prevent accidental operation.
- Ceilings are not needed in the TR, but if one must be installed, a minimum of 8'-6" must be maintained above the finished floor.

EQUIPMENT ROOM (ER) (continued)

Power (Minimum)

- Surge Protection should be provided and installed at each power panel in construction projects that do not allow for a building based UPS system.
- Each communications room requires two single L5-30P receptacles, mounted 90” above the finished floor on the plywood backboard behind the communications racks, with one (1), 30Amp/120V circuit feeding each receptacle.
- Each rack and server location will require a 4-plex receptacle on a dedicated 20-Amp circuit. Mount the receptacle 90” above the finished floor on the plywood backboard behind or beside the rack locations – as illustrated.
 - Each wall in the communications room requires a 4-plex receptacle for convenience.
 - Each rack and server location will require a 4-plex receptacle on a dedicated 20-Amp circuit.
 - Each communication requires a grounding plate that is bonded to building ground.

Grounding

- Grounding shall be provided in accordance with NFPA 70, Article 250, Article 800 and TIA/EIA 607.
- There must be a grounding bus bar available for each MTR and ER that is electrically connected via a proper sized copper conductor to the Building Grounding Electrode.

Conduit and Sleeves

- Multiple ERs located on the same floor shall be connected by a minimum of two (2 each), 4” conduits, or equivalent pathway such as “J” hooks or cable tray.
- ERs on different floors should be stacked vertically or as close to vertical as possible, and contain a minimum of two (2), 4” sleeves or two (2), 4” conduit pathways between the floors.
- Each ER shall have a minimum of three (3), 4” sleeves from the room to the cable tray or “J” hook pathways.

EQUIPMENT ROOM (ER) (continued)

Plywood

For the TR, cover two walls with $\frac{3}{4}$ " plywood as illustrated. Securely fasten the plywood to the walls, mounting each 4' x 8' sheet of plywood vertically to maximize the 8 feet height of each sheet.

Paint the plywood on all six sides with two (2) coats of fire retardant paint, black in color, with intumescent, elastomeric, and ablative properties.

NETWORK CABLING—INFRASTRUCTURE BY AREA

Offices, Work Rooms, Storage Rooms, Etc.

Minimum Technology Requirements

Place two (2 each) outlet box locations per desk or work station for any office area, work room, storage area, or any area that could be used as office space.

Place the outlets appropriately within the room on opposing walls and in areas that are practical for use with office furniture.

- Place one 1" conduit from a single gang outlet box to 6" above the finished wall or to the closest cable tray or "J" hook pathway.
- Power Requirements
 - Place one duplex receptacle adjacent to each telecom outlet.

Outlet Boxes

- The architect must specify the color of outlet plate. Either white, off white, electrical ivory, or stainless steel. IT Network Engineering will match the color of plate specified for the electrical.
- Single gang outlet boxes shall be no smaller than 50 mm (2 in) wide, 75 mm (3 in) high, and 64 mm (2 1/2 in) deep.
- Non-standard decorative or specialty boxes and plates, required for either floor or wall; i.e., brass, wood, etc. shall contain all of the necessary fittings to bring the telecom outlet box to standard size and fittings and be included in the electrical contract. Items such as round floor boxes, furniture boxes and other non-standard items, that can not house a standard single gang faceplate, must be retrofitted as a part of the electrical contract and brought in to standard size and conformity.
- Double gang telecom outlet boxes shall contain plaster rings to bring the outlet box to single gang outlet box size.

NETWORK CABLING—INFRASTRUCTURE BY AREA (continued)

All Other Miscellaneous Common Areas Including Hallways

Minimum Technology Requirements

Other miscellaneous areas must be evaluated on a case per case basis. Size, location and possible future use of each area must be evaluated by IT Network Engineering and the Academic or Administrative Department that will use the area.

Wireless Access Point

- Wireless access is an integral part of the College of Charleston Strategic Technology Plan and must be incorporated into every facility and area on campus.
- Place one (1) single gang box, located above the drop ceiling, for a wireless access point. Exact placement and locations of each access point will be determined by IT Network Engineering or an IT Network Engineering representative.
- Wireless access points are located in serving zones throughout a building and will be required in all common areas.
- Area serving wireless access points may be installed and located on the outside of the building structure to service adjacent courtyard areas or buildings. This type of installation usually requires a telecom outlet mounted inside the parapet, with the antenna mounted outside on the parapet.

Classrooms

Laptop Ready Classrooms

Teacher Workstation and Peripherals

Laptop ready classrooms refer to classrooms on campus that include integrated data video systems that aid in instruction. Images are projected on to screens by the instructor as a part of the course of instruction.

Exact locations and layouts of instructor podiums, projectors and screens must be verified and approved by a representative of IT Network Engineering. Below are the basic guidelines for the set up of a Laptop Ready Classroom.

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Building Design Guidelines: Technology Infrastructure

Refer to Appendix A: Figure 3 for an illustration of the “Laptop Ready Classroom.”

NETWORK CABLING—INFRASTRUCTURE BY AREA (continued)

Classrooms

Laptop Ready Classrooms

Video Projection

Adjacent to the instructor podium or position:

- Place one (1), 4.5" x 5" outlet box with a 2" EMT conduit from the outlet box to above the ceiling. This conduit will provide path for video feed cables from the instructor work station to a ceiling mounted video projector.
- Place a single gang, outlet box with 1" conduit stubbed above the ceiling for telecommunications.

In the Ceiling

- In the ceiling, place a duplex power outlet for the projector.
- Locate the projector 12' – 15 feet from the serving wall.
- Based on the size and layout of the room, up to four ceiling speakers may be installed.

Screen at the Front of the Room

- Screens used by the College are generally 8' x 10' and are installed either motorized or manual. If the screen is to be motorized, a wall mounted switch must be installed to control the operation of the screen. Remote control screens can be an option, but must not be the only means to operate the screen.

If the ceiling in the room is to be inaccessible, provide conduit path for all connections illustrated in the diagram that follows.

Power Requirements

- One (1) duplex receptacle in the ceiling for video projector equipment.
- One (1) duplex receptacle each at the projector location in the ceiling and the workstation location. Both receptacles must be on the same AC circuit.

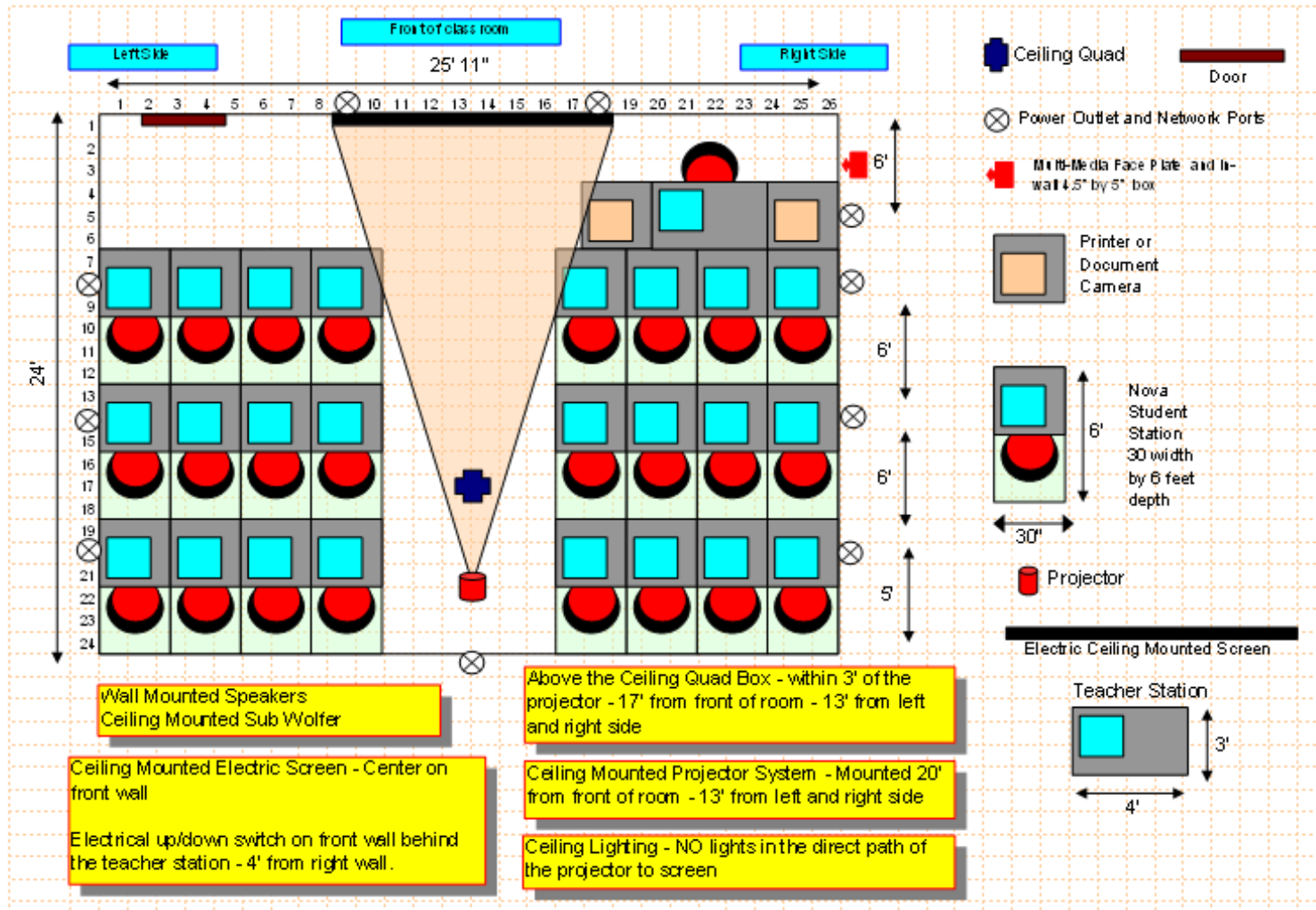
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NETWORK CABLING—INFRASTRUCTURE BY AREA (continued)

Classrooms

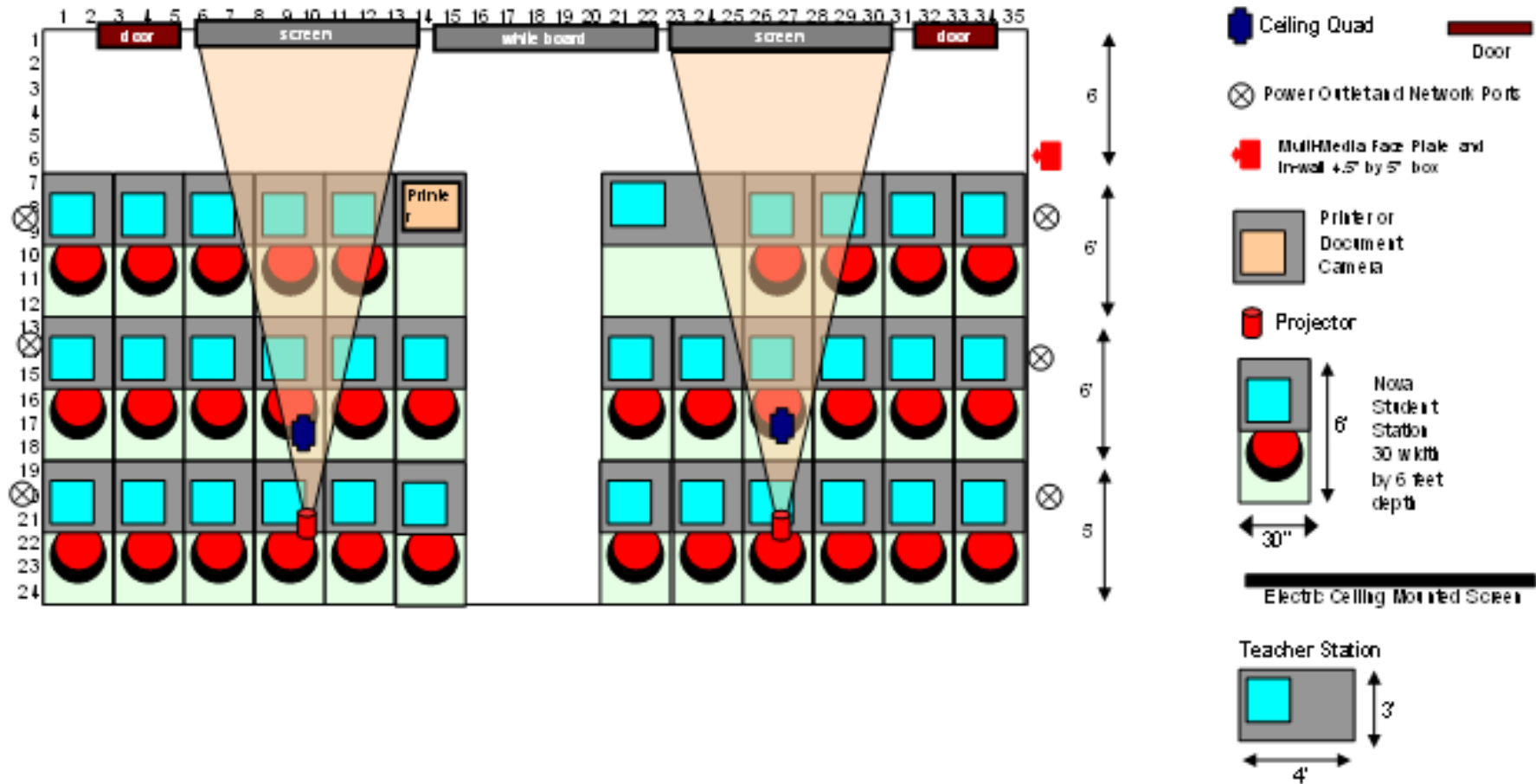
Nova Desk Classroom



NETWORK CABLING—INFRASTRUCTURE BY AREA (continued)

Classrooms

Dual Projector Classroom



NETWORK CABLING—INFRASTRUCTURE BY AREA (continued)

Classrooms

Computer Labs

Size and scope of computer labs can vary from building to building. The term lab will define any area where multiple computers are placed within a room for general purpose use.

In a lab environment, the cabling path and the provisioning of power to the workstations can be provided by several means – a grouped path or individual paths. A grouped path example would be the placement of surface, split channel raceway to provide path for power and data.

With either, the design of the room must provide adequate path for the placement of cable to the workstations.

The current cabling standard for the College is a Category 6 compliant solution which will require 1” path to each computer or device in a lab environment.

Planning must also include a wireless access point in the lab and provide telecom outlet points for scanners, printers and other peripherals that might be utilized in the lab environment.

A lab that is used for instructional purposes will require that it be configured as a Laptop Ready classroom, described earlier in this document. The purpose of the room will be defined by the College staff.

Power Requirements for the Computer Lab

Power Requirements

- Three (3) duplex receptacles for each two (2) PCs (include printers and scanners in this configuration which count as a PC).
- One (1) duplex receptacle in the ceiling for video project equipment.

WIRELESS DATA OVERLAY STANDARDS, SPECIFICATIONS, AND INFRASTRUCTURE

Overlay Infrastructure

- Wireless Access Points and antennas will be placed around campus, with the choice of locations for each dependant on the size of the area to be served, the range of the antenna and the number of computers to be served.
- Wireless infrastructure to be planned based on current industry specs for approved standards at the time of installation.
- The exact location of wireless access points will be determined by an IT Network Engineering representative at the time the building is in the planning stages.
- The Architect shall provide one (1), 1" conduit from the wireless access point locations to the cable tray or "J" hook pathway. Terminate the $\frac{3}{4}$ " conduit in a single gang box within 12" of the ceiling grid.
- Wireless electronics will be installed by others. The wireless Cisco Catalyst product provides power through the data cable and additional power is not needed.

CABLE PATHWAYS

Inside Building Distribution

Cable Tray and/or “J” hook pathways are suitable for telecommunications cabling support and pathway. Based on the size of the building, and the number of outlets being served, some buildings may require one or both of means of support. IT Network Engineering will assist the architect with the planning, sizing and placement of cable pathways.

Firewall Penetrations

It is the responsibility of the Architect to provide adequate passage ways through fire rated barriers. Where cable trays or “J” hook pathways need to transverse through a fire rated wall, sleeves shall be specified by the Architect and installed by the building contractor at the time of the installation of the tray.

- For each 12” tray, a minimum of three (3), 4” metallic sleeves shall be installed and specified to meet or exceed the requirements of ASTM E 814, UL1479 and local/state building codes.

Cable Tray

When cable tray is to be installed, the Architect shall be responsible for coordinating the placement of cable tray with other trades. Coordinate tray locations with lighting, air-handling systems, fire sprinkling systems and all other trades.

- When tray is specified, the tray must be installed with a minimum of 12” clearance above the tray and a 24” minimum clearance around the tray for the installation of cable.
- Cabling shall be installed in “J” hooks and/or cable trays. Any methods, other than those listed above, must be approved by IT Network Engineering.
- If the cable tray is broken, all sections must be bonded and grounded.
- All edges of the tray shall be smooth and not contain barbs or rough edges that can injury to workmen or damage to cable.
- Wall mounted cable trays are more accessible and preferred over center or side mounted trays.

CABLE PATHWAYS (continued)

Inside Building Distribution

Conduits

Outlet Conduits

Outlet conduits for new construction shall not be smaller than 1" in diameter unless otherwise specified. "LB's or other tight 90 degree fittings shall not be used.

- Conduits shall be installed at each outlet and either stubbed to above a lift out accessible ceiling or ran to a corridor or hallway.
- If continuous conduit is run from the outlet box, the conduit shall have no continuous sections longer than 100 feet without the placement of an appropriately sized, and easily accessible, junction box.
- Outlet conduits shall not be looped from one outlet to another.
- Outlet conduits shall not contain more than three (3) 90 degree sweeping bends.
- Flex-conduit shall not be used for telecommunications pathways without the written approval of the College.
- No more than two 90 degree bends are allowed between pull boxes.
- LBs are not permitted in any instance.
- A Nylon pull line shall be installed in each conduit placed.
- All conduits shall contain bushings to prevent cutting or scraping of cables during installation.

*In Slab Conduits**

The College wishes to avoid conduits and cabling run in the 1st floor slab where possible due to moisture problems in the Charleston area.

The preferred pathway for low voltage conduits and cabling is overhead in the ceiling areas of the building and not run under or in the slab. If conduits for communications are to be placed in the slab, the Architect must assure that the pathway will be as dry as possible.

***Note:** Article 300.D.5. NEC now considers conduits located within the concrete slab as "wet locations."

Telecommunications cabling designed for wet locations is substantially more expensive than regular dry location cables.

CABLE PATHWAYS (continued)
Inside Building Distribution

Floor Box Requirements

If floor outlets are to be used in the infrastructure, the outlet floor boxes to be used must be approved by IT Network Engineering. The locations, the routing and size of conduits to each, must be approved by IT Network Engineering.

Sleeves

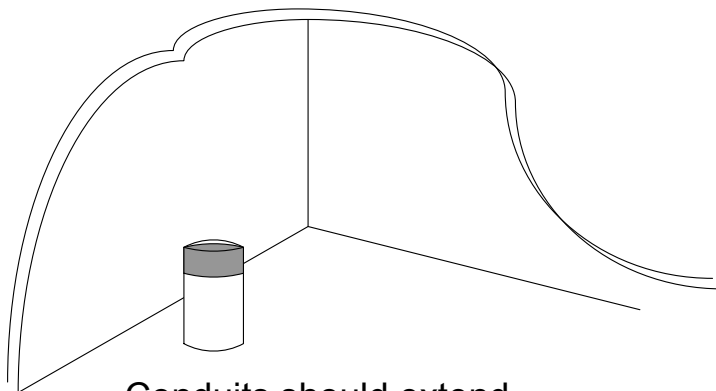
Conduit /Sleeves Between Floors—Linking Stacked ERs

A pathway must be provided from the MTR to reach each of the ERs. This can be accomplished by providing access between the ERs on the various floors. When this pathway is in place, cable can be placed from the MTR to ERs located on the same floor as the MTR and passed to the other closets.

- Provide two (2), 4" conduit sleeves between floors when rooms are stacked on top of each other.
- When rooms are not stacked, provide two (2), 4" conduits between ERs, unless otherwise specified by the customer.

Sleeves must be placed between floors. There should be a minimum of two (2), 4" conduit/sleeves between stacked ERs

- Each should extend above the finished floor a minimum of 3" and contain bushings.



**Conduits should extend
above the finished floor 3",
contain bushings**

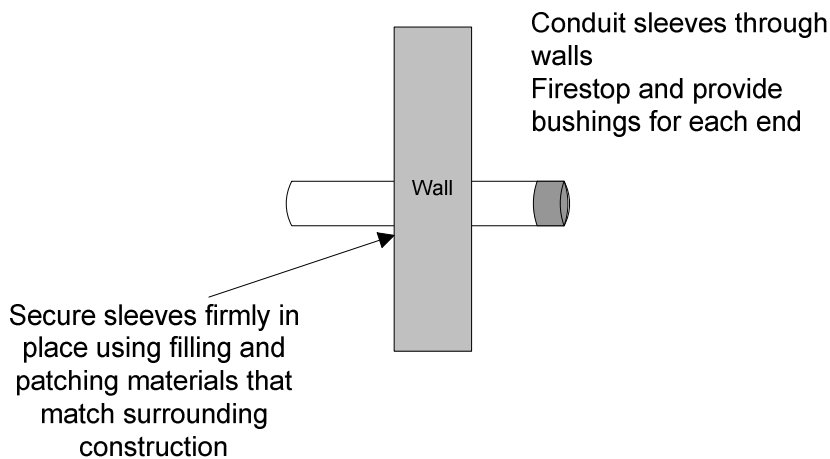
CABLE PATHWAYS (continued)
Inside Building Distribution

Sleeves

Wall Sleeves

Wall Sleeves shall be adequately sized to accommodate immediate needs as well as future needs.

A minimum of four (4), 4" conduits shall be installed at each ER location in to the corridor cable tray. A minimum of 2" shall protrude into each ceiling space. There shall be a minimum of 1/2" between sleeves. Sleeves must have a protective bushing at each end to prevent chaffing.



Any penetration through fire-rated walls will be sealed with an Underwriters Laboratories-approved (UL) sealant, restoring the fire rated wall to its originally rated level following ASTM E 814, UL1479 and local/state building codes.

- All sleeves shall contain bushings to prevent cutting or scraping of cables during installation.

CABLE PATHWAYS (continued)

Outside Service Entrance Conduit

- Each building will require a minimum of three (3), 4" conduits from the MTR to the campus telecom infrastructure for connection with the campus networks. This infrastructure will consist of linking to an adjacent building or to an adjacent handhole or manhole on the College telecom duct bank system.
Refer to Appendix A: Figure 4 for an illustration of the "Typical Handhole & Conduit Installation."
- If no existing manhole or handhole exists, the design shall include the installation of conduit from the building MTR to a handhole with the minimum dimensions of 36" x 48" x 36".
- Each handhole shall have a heavy duty lid with the "Communications" logo.
- Each outside entrance conduit for telecom entrance facility should extend from the outside in to the MTR room and terminate approximately 3" above the finished slab. Each conduit should contain bushings to prevent cable damage during placement.
- Each conduit shall slope away from the building.
- Cap all conduits to prevent debris, water and gases from entering the conduit before cable installation
- All PVC conduits will be Schedule 40 UL approved with minimum wall thickness of .237.
- At the building entrance, all conduits will transition to 4" GIP conduit, extended a minimum of 4 feet beyond the foundation of each building.
- All conduits should be installed with a minimum of 30 to 36" of cover. The general rule will be, if foreign obstacles are encountered at the proposed depth, the depth will be increased.
- If outside wall conduit entrances are necessary, they should be GIP (rigid galvanized) and shall be permanently attached using Unistrut. The conduit entrance in to the building will be made using a Galvanized pull box, attached to the side of the building with sleeves through the back of the pull box in to the Telecom Entrance Room.
- All inside penetrations shall be sleeved with metallic conduit that contains bushings on each end.
- Fire wall penetrations must be sleeved and properly fire stopped in accordance with ASTM E 814-84.

Administrative Computing and Telecommunications Services

Building Design Guidelines: Technology Infrastructure

CABLE PATHWAYS (continued)

Outside Service Entrance Conduit

- All conduits shall be sealed at the building entrances.
- All conduits shall contain a 1/4" pull rope or pull line with a minimum of 200 pounds rating.

SOIL RESTORATION

- Backfill shall be made in layers of 6" and tamped or flooded after a 6" cover is in place. It shall be dense and compacted sufficiently to prevent any further settling. It should be compacted to 95% proctor as measured by industry standard measurements of soil density.
- Disposing of surplus soil and spoil shall be the Contractor's responsibility.
- Where trenching or conduit burial is in close proximity to a building, grading of the soil must be away from the building to provide proper drainage of surface water.
- Every effort must be made to restore the premises to their original condition, or to the satisfaction of the owner.

WARNING TAPE

- Install one (1 each), 3" wide Warning Tape over all underground conduit runs. This tape will be installed at a depth of 12" below grade along the entire conduit route.

PULL TAPE

- Provide one (1), 1/4" diameter poly rope or nylon pull line rated for 200 pounds in each conduit.

FURNITURE PATHWAYS AND SPACES

The furniture design and placement shall not cover, impede or obstruct access to telecommunications outlets, pathways or spaces whenever possible.

If furniture is to be placed flush against a wall, modular furniture should not include a modesty panel that will totally cover the power and communications outlets.

The College does not use power poles to route cabling to cubicles. Other access options are described below.

Connections to Wall Plates, Floor Boxes or Columns

(Source: EIA/TIA/6.3.2 Building Interfaces)

Coordination between the furniture contractor and the architect is imperative.

A raceway must be provided between the telecommunications pathway system and the modular furniture system.

- Floor poke through feeds must be planned so that furniture connection whips are no longer than 12" and the connections do not impede or occur within the floor workspace or violate applicable local and federal building safety codes.
- Wall or column feeds, unless totally concealed from aisles and walkways, must be 12" or less in length and not installed across pathways and exposed spaces which impede the work space function or foot traffic and the aesthetics of the area.

If the service must feed in to the kick plate of the cubicle, a minimum 1" diameter flexible "seal tight" type conduit with right angle connectors should be provided as pathway for every two communications workspaces within the cubicle grid.

- This conduit should be permanently affixed to the wall, column or floor fed outlet using right angle connectors and should be permanently affixed to the cubicle base.
- For example, a grid of four (4) workspaces would require 2 – 1" feeds for communications.

A workspace is defined as any space that requires connectivity for a printer/fax or voice/data. Some work spaces do not house an employee but house joint or shared equipment for general office use. These spaces are cabled the same as any general work space with a minimum of three (3) communications cables.

Administrative Computing and Telecommunications Services

Building Design Guidelines: Technology Infrastructure

FURNITURE PATHWAYS AND SPACES (continued)
Connections to Wall Plates, Floor Boxes or Columns

(Source: EIA/TIA/6.3.4.1 Building Interfaces)

SEPARATIONS BETWEEN TELECOMMUNICATIONS AND POWER CABLES

- Furniture should include dual separated channels – one for communications and one for power.
- All furniture pathways must include separation barriers within the furniture raceway and the outlet boxes and compartments.

REQUIRED PATHWAY CAPACITY

- Furniture pathways for communications cabling should provide a minimum pathway cross-sectional area of 1.5in².

FURNITURE KNOCKOUTS

- The College uses Panduit and Systimax communications solutions. The furniture supplier should provide cubicle base knockouts that are of the following dimensions:
 - 1.374" H x 2.649" L
- EIA/TIA provided a minimum trade size opening of NEMA OS 1 (Ref D.14) with a minimum depth of 1.2 inches.

FURNITURE PATHWAYS AND SPACES (continued)

Coordination of Job Services

Cubicle installation must be coordinated with the communications contractor. Kick plates and bases should be left off until the communications cables have been installed.

During the installation of the furniture, adequate space shall be provided between the wall and the furniture so that outlet plugs and cords are not smashed, crimped or damaged.

Furniture shall be stalled with a minimum 4” clearance to prevent damage to power and communications cables.

Care should be taken during the installation of the furniture to avoid cutting, kinking or crimping communications outlet cords.

The furniture manufacturer shall coordinate with the electrical engineer to assure that the necessary interfaces are provided between the furniture systems and the building pathways and spaces. Any necessary adapter rings, plates or other devices must be planned and coordinated for both power and telecommunications.

RENOVATIONS

The Architect will be required to include adequate access to the building structure and include a cable pathway route designated in the design plan.

This effort is to prevent ceiling spaces from being taken on a “first come” basis, blocking the installation of telecommunications.

Efforts shall be made to bring the renovated portions of the property to College standards.

However, in existing buildings where cable tray is cost prohibitive, “J” hooks can be installed to provide the necessary cable pathways

Cables shall:

- Not be laid on top of acoustical ceiling panels.
- Not be supported by acoustical ceiling hanger wires that support ceiling grid systems.
- Not be supported by other trade material, equipment or devices.

Removal of Abandoned and Old Communications Cables

Renovations shall include the removal and disposal of all old and unusable cables from the infrastructure, per NEC 800.2 - 2002. Contact IT for the identification of cables that will need to be removed.

CABLING INSTALLATIONS: PREFERRED LIST OF MATERIALS

The following pages provide a list of the College's preferences for each of its installations.

Item #	Item Description	Manufacturer #1	Part Number	Manufacturer #2	Part Number
<u>Wireless</u>					
1	Single gang, surface mount boxes		vendor choice		vendor choice
2	2 port faceplates with ID windows	Systemax	M12LE-246 Ivory 108333055	Panduit	Panduit CFPE2IW
3	24 port Patch panel for wireless	Systemax	1100GS3-24 700173750	Panduit	Panduit DP24688TP
4	2 cables to each wireless box Plenum rated, Category 6, UTP cable Yellow	Systemax	2071004EYL 700210123	CommScope	CommScope Ultra Pipe 6ECMP Yellow
5	Category 6 RJ-45 Jack modules - yellow (for wireless)	Systemax	MGS400-123- Yellow 700206691	Panduit	Panduit Mini-Com TX6 Plus CJ688TPYL
<u>Data Riser</u>					
6	12 cat 6 risers required per closet				
7	Category 6 patch panels - 24 port MDF	Systemax	1100GS3-24 700173750	Panduit	Panduit DP24688TP
8	Category 6 patch panels - 48 port	Systemax	110GS3-48 700173768	Panduit	Panduit DP48688TP
9	Category 6, plenum rated cable for MDF to TR risers - Red for risers	Systemax	2071004ERD 700210263	CommScope	CommScope Ultra Pipe 6ECMP Red

CABLING INSTALLATIONS: PREFERRED LIST OF MATERIALS (continued)

Item #	Item Description	Manufacturer #1	Part Number	Manufacturer #2	Part Number
<u>Station</u>					
<u>Faceplates</u>					
10	Snap in blank modules for faceplates - pack of 100	Systimax	M20AP-246 107067860		Panduit Mini-com blanks CMBIW-50
11	4 port faceplates with ID windows	Systimax	M14LE-246 Ivory 108333154		Panduit Executive Series CFPE4IW
12	Dual Gang 40A1 Outlet Multi-media Faceplate Nova Desks classroom use	Systimax	M40A1-B262 107992927	Systimax	M40A1-B262 107992927
13	RJ-45 insert panels for 40A1 multi port outlet box	Systimax	M40RJ4A-B-262 108004268	Systimax	M40RJ4A-B-262 108004268
14	Computer icons for jacks - primary data (100 per pkg)	Systimax	M61A-318 blue 108065822	Panduit	Panduit blue CIDBU-C
15	Computer icons for jacks - voice (100 per pkg)	Systimax	M61F-246 Ivory 108066275	Panduit	Panduit ivory phone CIPIW-C
16	Computer icons for jacks - data spare (100 per pkg)	Systimax	M61A-226 Green 108065822	Panduit	Panduit green CIDGR-C
17	Whips, cubicles adapters for transition from floor/wall boxes to furniture		include metallic connector 1" seal tight conduit with angle connector		include metallic connector 1" seal tight conduit with angle connector
18	Single gang surface mount box for Student modular furniture		vendor choice		vendor choice
19	Single gang two port faceplates for Student modular furniture	Systimax	M12LE-246 Ivory 108333055	Systimax	M12LE-246 Ivory 108333055
20	Faceplates for 3rd and 4th floor cubicles	Systimax	M14C-003 black 106650849	Systimax	M14C-003 black 106650849
21	Rj-45 to modular jack adapter cords 10ft	Systimax	GS8MGS-SN-BK-10 CPC3282-18F010	Systimax	GS8MGS-SN-BK-10 CPC3282-18F010
22	Rj-45 to modular jack adapter cords 15ft	Systimax	GS8MGS-SN-BK-15 CPC3282-18F015	Systimax	GS8MGS-SN-BK-15 CPC3282-18F015
23	Rj-45 to modular jack adapter cords 25ft	Systimax	GS8MGS-SN-BK-25 CPC3282-18F025	Systimax	GS8MGS-SN-BK-25 CPC3282-18F025
24	Rj-45 to modular jack adapter cords 33ft	Systimax	GS8MGS-SN-BK-33 CPC3282-18F033	Systimax	GS8MGS-SN-BK-33 CPC3282-18F033

CABLING INSTALLATIONS: PREFERRED LIST OF MATERIALS (continued)

Item #	Item Description	Manufacturer #1	Part Number	Manufacturer #2	Part Number
Station (continued)					
Jacks					
25	Category 6 RJ-45 Jack modules -ivory	Systemax	MGS400-246-Ivory	Panduit	Panduit Mini-Com TX6 Plus CJ688TPIW
Cat 6 Testing					
26	Provide Category 6 testing for data with results on CD		to EIA/TIA standards for Category 6 cable		to EIA/TIA standards for Category 6 cable
Station Cable					
27	Provide Category 6, UTP, 4pr plenum rated station cable Gig speed primary data	Systemax	Blue2071004EBL 700208093	CommScope	7540 Blue
28	Provide Category 6, UTP, 4pr plenum rated station cable Gig speed - voice	Systemax	White2071004EWH 700208101	CommScope	7504 white
29	Provide Category 6, UTP, 4pr plenum rated station cable Gig speed data spare	Systemax	Slate2071004ESL 700214372	CommScope	7504 gray
30	Provide Category 6, UTP, 4pr plenum rated station wire - flooded for in slab conduit and wet locations	Systemax	Avaya Systemax 1571 Category 6 1571 004ABK 760008888	CommScope	Media 6NF4+
Elevator					
31	Plenum rated, Category 3, UTP for voice (elevator, pay phones, fire alarm, student call) 24AWG, plenum	Systemax	2010004BGY 107256737 or vendor choice	CommScope	3504 or vendor choice
32	Category 3 jacks	Systemax	M1BH-246 107321721	Panduit	CJ88IW
33	single gang surface mount box		vendor choice		vendor choice
34	2 port faceplate	Systemax	M12L-246 108168477	Panduit	CFP2IW
35	1 port wall phone outlet	Panduit	KWP5e or vendor choice	Panduit	KWP5e or vendor choice

CABLING INSTALLATIONS: PREFERRED LIST OF MATERIALS (continued)

Item #	Item Description	Manufacturer #1	Part Number	Manufacturer #2	Part Number
<u>MISC.</u>					
36	"j" Hooks	Erico	Erico Cablecat 32	Erico	Erico Cablecat 32
37	"D" rings		vendor choice		
38	Update CAD drawings and provide As-built files for College		CAD files in on CD to IT		CAD files in on CD to IT
<u>Voice Riser</u>					
39	110 19 inch mounting bracket in 19-inch rack	Systimax	110RD2-200-19 107535585		Panduit P110B100R4WJ
40	100 pair 110 wiring blocks for Cat 3 riser termination (with legs)	Systimax	110AW2-100 107059891		included in above part
41	Vertical plastic 110 Jumper Trough	Systimax	110A3 107831133		included in above part
42	Category 3, 24AWG, plenum or riser rated cable - pair count to be sized according to need		vendor choice		Vendor Choice
<u>Closet</u>					
43	Rack mounted 110 Visipatch 112 - field termination Kit (use in multiples of 2)	Systimax	108836792	Systimax	108836792
44	110 Visipatch rack mount bracket	Systimax	110U19M 108634429	Systimax	110U19M 108634429
45	Category 6 - 48 port patch panel 568B	Systimax	110GS3-48 700173768	Panduit	DP48688TP
46	Category 6 - 24 port patch panel 568B	Systimax	1100GS3-24 700173750	Panduit	DP24688TP
47	Floor mount communications rack, 19" x 84" RackTech RR1984BLT or equivalent	RackTech	Vendor can choose equivalent	RackTech	Floor mount communications rack, 19" x 84" RackTech RR1984BLT or equivalent
48	4 post rack for servers and server rooms	Panduit	NF4PR84(or equiv.)	Panduit	NF4PR84(or equiv.)
49	Wall mounted, 19" swing racks	B-Line	B-Line SB706193818 (or equivalent)	Chatsworth	11790-X18(or equiv)

CABLING INSTALLATIONS: PREFERRED LIST OF MATERIALS (continued)

Item #	Item Description	Manufacturer #1	Part Number	Manufacturer #2	Part Number
<u>Closet</u> (continued)					
50	Rack 19" x 47" blk	Panduit	Panduit CMR19x47blk (or equivalent)	Panduit	Panduit CMR19x47blk (or equivalent)
51	Wall mounted 19" x 38.5" blk	Chatsworth	1163-2-7-18		
52	Rack and ladder rack Grounding Accessories	Panduit	Panduit TRGK672 (or equivalent)	Panduit	Panduit TRGK672 (or equivalent)
53	horizontal wire minders with front <u>and</u> back mgmt, 19" x 3"	Panduit	NCMH2 Panduit	Panduit	NCMH2 Panduit
54	Horizontal wire minders with front mgmt only, 19" x 3" (used w/48 port pp)	Panduit	NCMHF2 Panduit	Panduit	NCMHF2 Panduit
55	Vertical wire minders, side mount - 83"	Panduit	PRV6 Panduit	Panduit	PRV6 Panduit
56	Vertical wire minders, side mount doors - 83"	Panduit	PRD6 Panduit	Panduit	PRD6 Panduit
57	"J" bolt kits for rack to runway mounting	B-Line	B-Line SB-2133-12	Chatsworth	11304-000
58	12" ladder rack/cable runway, tubular 1 1/2", black	B-Line	B-Line SB-17-12FB	Chatsworth	10250-712
59	1 1/2" but splice kit	B-Line	SB-2107	Chatsworth	11301-001
60	1 1/2" junction splice kit	B-Line	SB2101-A	Chatsworth	11302-001
61	Triangular 12" wall support	B-Line	B-Line SB213S-12 FB	Chatsworth	11312-712
62	Triangular 15" wall support	B-Line	B-Line SB213S-15 FB	Chatsworth	11312-718
63	12" End wall support Kits	B-Line	SB-2113-12-FB	Chatsworth	11421-712
64	Adjustable Horizontal Splice Kit	B-Line	SB-2103-A	Chatsworth	10616-001
65	12" Cable Runway Radius Bend	B-Line	SB-13-12-VO- 12GR	Chatsworth	10723-7-12
66	Velcro cable ties for closets		vendor choice		vendor choice
67	Plenum rated cable ties where applicable		vendor choice		vendor choice
68	Cable ties		vendor choice		vendor choice

CABLING INSTALLATIONS: PREFERRED LIST OF MATERIALS (continued)

Item #	Item Description	Manufacturer #1	Part Number	Manufacturer #2	Part Number
<u>Closet</u> (continued)					
69	Firestop through penetrations, conduits and sleeves		vendor choice		vendor choice
<u>CATV</u>					
70	RG-6 plenum rated, coaxial cable - Commscope P/N 2227, quad shield, 18awg	Commscope	Commscope 2227V		
71	RG-6 riser rated, coaxial cable - indoor/outdoor	Commscope	Commscope 5728	Commscope	Commscope 5728
72	RG-11 14Awg, riser rated, coaxial cable - indoor/outdoor	Commscope	Commscope 5914	Commscope	Commscope 5914
73	Coaxial connectors for RG-6	Commscope	SNAP & SEAL	Commscope	SNAP & SEAL
74	Coaxial connectors for RG-11	Commscope	SNAP & SEAL	Commscope	SNAP & SEAL
75	Coax bulkhead module F type module for RG-6 station faceplates and closet	Commscope	CommScope M81C coupler 108009432	Commscope	CommScope M81C coupler 108009432
76	Rack mounted patch panel for termination of Coax at closet end - 24 port capacity (use with modular F connector inserts)	Systemax	Avaya Multimedia Max M1000P5 108006198	Panduit	Mini-Com CPPL24WBL
77	Continuity testing for all Coaxial cables				
78	Wall mounted, 19" swing rack	B-Line	B-Line SB706193818	B-Line	B-Line SB706193818
79	Rack and ladder rack Grounding Accessories	Panduit	Panduit TRGK672 or equivalent	Panduit	Panduit TRGK672 or equivalent
80	Horizontal wire minders with front and back mgmt, 19" x 3"	Panduit	NCMH2 Panduit	Panduit	NCMH2 Panduit

CABLING INSTALLATIONS: PREFERRED LIST OF MATERIALS (continued)

Item #	Item Description	Manufacturer #1	Part Number	Manufacturer #2	Part Number
Fiber Optic					
81	24 multi-mode 62.5/125 and 12 single mode, indoor/outdoor riser rated fiber optic cable	Commscope	Commscope FSU8W12/6F24 24/mm & 12 sm (or College Approved equiv.)	Commscope	Commscope FSU8W12/6F24 24/mm & 12 sm (or College Approved equiv.)
82	12 multi-mode 62.5/125 fiber optic cable for cable tray installation	Commscope	Fiberguard P-012-DZ-6F-FSDOR (or College Approved equiv.)	Commscope	Fiberguard P-012-DZ-6F-FSDOR (or College Approved equiv.)
83	6 single-mode fiber optic cable for cable tray installation	Commscope	Fiberguard P-006-DZ-8w-FSDOR (or College approved equiv.)	Commscope	Fiberguard P-006-DZ-8w-FSDOR (or College approved equiv.)
84	STconnectors for M/M - epoxy type	FONS	FONS Epoxy CON/ST/MM/BK	FONS	FONS Epoxy CON/ST/MM/BK
85	SC connectors for S/M - epoxy type	Alcoa	Alcoa Epoxy CS00318-100	Alcoa	Alcoa Epoxy CS00318-100
86	Rack mounted fiber enclosure, 36 port capacity	Superior Mod.	SMP RTC36B	Superior Mod.	SMP RTC36B
87	6 port SC coupler panels for Single Mode	Superior Mod.	Superior Modular SMP 616SMSC	Superior Mod.	Superior Modular SMP 616SMSC
88	6 port ST coupler panels for Multi- Mode	Superior Mod.	Superior Modular SMP 616MMSC	Superior Mod.	Superior Modular SMP 616MMSC
89	Light Meter testing for fiber, both wavelengths, one direction M/M				
90	Light Meter testing for fiber, both wavelengths, one direction S/M				
Security Cable					
91	Condumex, 2 conductor camera wire, 18AWG	Condumex	condumex E117934000029844	Condumex	condumex E117934000029844
92	Category 5e, Plenum rated, UTP for security camera feeds		Vendor Choice		Vendor Choice