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Enterprise Computer Services, Support Services

Network Cabling Infrastructure

Design and Installation Standards

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Network Cabling Infrastructure: Design and Installation Standards

This standards document is a living document. The references within this document are subject to revision and modifications as necessary. Changes will be required over time to maintain support and compatibility with changing construction techniques and technological developments. You should always verify that you have the most recent revision of this document and the incorporated standards before beginning design on telecommunications systems.

General

Scope

This document is intended to provide a framework for the design specifications of new construction. These standards will apply to new building construction, and major renovations, and will also apply to major infrastructure upgrades and expansions.

When adding to existing installations, the following guidelines should be used. When the requirements call for adding less than twelve (12) cables in an existing closet, and patch panel space is available, the installation may maintain compliance with the standards in use at the time of the original installation. If twelve (12) or more cables are required, or if the existing patch panels do not have sufficient open space for the addition, this current standard should be followed.

Drop Definition

All telecommunications outlets in new facilities are to be non-specific multipurpose outlets capable of supporting data, voice, video, or any combination of the three. As such, a standard outlet in a typical user location shall consist of three color-coded ports and three wires. In the design and installation of these facilities, no distinction should be made to identify the intended use of the specific outlet; rather the outlet should simply be designated as a standard telecommunications outlet with the specifications which are detailed in this document.

Brand Specific Statement

Many items in this document specify brand name products such as Belden and Panduit. It is highly recommended that these specific brands and models be used to maintain continuity with existing installed systems.

In addition, the design as the staff at LSUHSC has been trained to support these products. Any deviation from these brand specifications would require additional training for technicians and analysts, as well as additional tools and separate spares inventory to support the new products.

Finally, LSUHSC has been approved to participate in an industry cooperative agreement between Belden and Panduit called Integrity. The Integrity program represents a significant increase in the long-term warranty of the cable plant installation provided when approved and trained installers provide the installation service with the products specified in this document.

Industry Standards

These are to be used as *minimum* standards. An authorized representative of LSUHSC Computer Services must approve deviation from these standards in writing *prior to implementation of the deviation*. Please refer to the most current copy of the standard for complete details.

Following is a partial list of industry standards that must be adhered to. Compliance with the most current revision of these standards is required.

- STATE OF LOUISIANA, DIVISION OF ADMINISTRATION: FACILITY, PLANNING, & CONTROL, Guideline Requirements, Specifications, and Wiring Diagrams for Communications Cable/Wire and Related Building Facilities
- TIA/EIA Building Telecommunications Wiring Standards
  - TIA/EIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant - OFSTP-7 (August 1998)
  - TIA/EIA-526-14 Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant - OFSTP-14 (August 1998)
  - TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements (May 2001)
  - TIA/EIA-568-B.2 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components (May 2001)
  - TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard (April 2000)
  - TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces (June 2001)
  - TIA/EIA-598 Optical Fiber Cable Color Coding (May 1995)
  - TIA/EIA-606 The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings (February 1993)
  - TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications (August 1994)
  - TIA/EIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard (April 1999)
- ISO Category 6 (proposed)
- Anixter Levels Channels Program, Levels 5, 6, & 7

Unshielded Twisted Pair Cable

Cable and connectivity

- New cable installations should consist of Belden Media Twist Level 7 (Category 6) cable. Part numbers are Belden 1872A and 1874A (Plenum). Cables shall be color coded to match the connectors. Blue for data, red for voice, and electric ivory for spare/other.
- All new installations will use Panduit connectorization components rated for Category 6.
- All cable runs should be terminated on connectors and labeled on both ends. In the Horizontal Cross-connect (HC), all terminations must be on patch panels. In the work area, all terminations must be in securely mounted junction boxes.
- All cable runs should terminate in an HC located on the same floor as the work area being served.
- Drop definition: a drop is a single faceplate with one or more cables using a common path and originating from the same location (Horizontal Cross-Connect). A standard drop, as per this specification, will consist of three cables.
- LSUHSC Drop Standards
    - There will be a minimum of three cables per drop. All cables will meet the specifications above.
    - Each drop will consist of one voice cable, one data cable, and a spare. Cable jacket color scheme will be as follows: data–blue; voice–red; spare-gray, white or other neutral color. When the appropriate cable is not available, substitutions may be considered.
    - Data, voice, and spare cables will terminate on separate patch panels, located in the same closet. All data (blue) patch panels shall be grouped together in the racks, as will the voice and spare patch panels to create three groups of patch panels each housing one of the three unique colors of the connectors.
    - Eight position jack pin/pair assignments will comply with T568A designation identified in TIA/EIA-568-B.2 *Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components* (May 2001).
    - Voice patch panels will be located in a separate 19” rack, or cabinet. They will occupy, at a maximum, 50% of the voice rack. The remaining space in the voice rack will be reserved for housing patch panels terminating voice trunk lines.

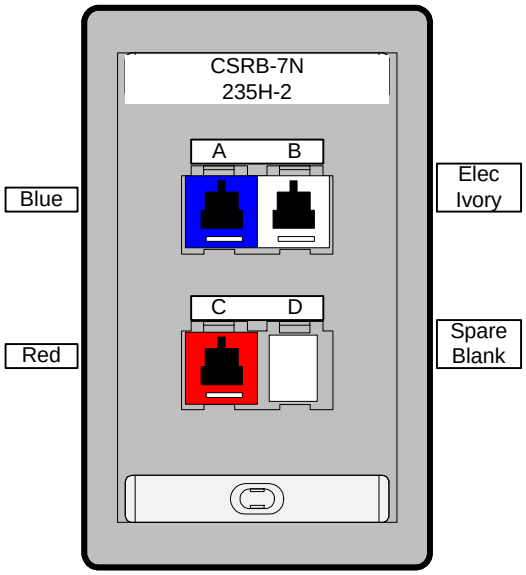

Figure 1: Panduit style faceplate

- The work area outlets shall consist of electric-ivory four-port faceplates, Panduit part number CBEEI using CHSR2 recessed module inserts. All connectors on faceplates and in telecomm room patch panels should be RJ45 jacks. All connectorization shall be Anixter Level 7 rated. Each faceplate will have three jacks. These are to be designated and color coded as follows: Data jacks are to be blue and positioned top left. Voice jacks are to be red and positioned at the bottom left. Spare jacks are to be electric ivory and positioned top right. Blanks shall be the same color as the faceplate (electric ivory) and positioned bottom right. All directional references above assume the installer is facing the front of the faceplate. The faceplate is illustrated in Figure 1.
- When the work area outlets are installed in a horizontal orientation (such as on a table surface) and the ports face up, shuttered modular jacks, Panduit part number CJD688TBU (blue, other colors available) are required. The shuttered jacks are required to prevent the accumulation of dust and debris within the jack and on the pin contacts.
- Patch cables should be supplied by the installer for each blue and red jack in the closet. Colors for patch cables will match the connectors, so blue and red patch cables are required. One patch cable is required for each blue and red connector in the closet. Length of the cables shall be determined based upon the design of the closet, racks, patch panels, and electronics. The shorter length cables are desired. Patch cable lengths should be long enough to reach between the electronics ports and the patch panel ports and allow for proper routing of the patch cable through the cable management equipment installed. Typically patch cables will be 4, 7, or 10 feet in length and a combination of the various lengths may be required to provide adequate length for proper cable management without excessive extra lengths.
- It is the responsibility of the local desktop supporter(s) to supply and cross-connect the desktop node (printer, workstation, or other) to the work area outlet using a patch cable. Commercially available certified patch cables are inexpensive and highly recommended. Work area patch cables shall be tested to meet a minimum rating of Category 5E or better. Work area patch cables shall not exceed 5 meters (16 feet) as specified in TIA/EIA-568-B.1.
- Telephony Cross-Connect
    - When the local service provider maintains a backboard-mounted demarcation, then the horizontal cable plant design shall include a transition system between the horizontal voice cable equipment rack and the backboard service provider blocks.

- The legacy telephony transition system shall consist of three components: (a) 19” rack mounted patch panels with RJ-45 connectors on the front and Telco 50 pin connectors on the rear of the panel, pins 4 and 5 are active, (Ortronics part number OR-808004041) (b) backboard mounted 66-style punch down blocks, (Amphenal part number S66M2-5W) (c) and 25 pair trunk cables with Telco connectors between the patch panels and the punch down blocks, with each 24 –port patch panel requiring one 25-pair trunk cable (Amphenal part number TP-1000L3-100).
- The length of the trunk cable is a function of the distance between the telecommunications room and the telephony service provider demarcation. It is recommended that all telephony transition system cabling span the entire distance to the service provider demarcation, (i.e. no intermediate cross-connect points).

Fiber Optic Cabling

Topology.

The interbuilding fiber optic backbone shall be a star topology in compliance with TIA/EIA-568-B.1 *Commercial Building Telecommunications Cabling Standard Part 1: General Requirements* (May 2001). Fiber installation shall also comply with TIA/EIA-568-B.3 *Optical Fiber Cabling Components Standard* (April 2000).

Interbuilding Cabling.

All new interbuilding backbone cabling will consist of at least 12 strands of single-mode (8.3 micron) fiber optic cabling. The actual cable type shall be determined on a case-by-case basis and will take into consideration the type of installation required, distance, size of area being served, etc.

Depending upon the geographic location of the building being served, as well as its logical relationship to the campus environment, the number and type of strands may be increased. For example, a hybrid cable consisting of 12 strands of single-mode and 12 strands of multimode fiber may be recommended.

Intrabuilding Cabling.

New fiber optic riser systems within buildings will normally be a designed in a star topology with a minimum of 12 strands of multimode (62.5/125 micron) fiber to each intermediate and horizontal cross-connect from the main cross-connect.

Installation Techniques.

Fiber optic cabling shall be completely encapsulated for the entire length of the cable run. This encapsulation can be in innerduct, rigid metallic conduit, electrical metallic tubing, flexible metallic tubing, or other suitable enclosure that meets the requirements of the installation. Different types of encapsulation materials may be required in different areas such as intrabuilding or interbuilding paths. Conduit shall be installed in compliance with TIA/EIA-569 *Commercial Building Standard for Telecommunications Pathways and Spaces* (June 2001).

Cable Pathways

All cable pathways and spaces must be in compliance with TIA/EIA-568-B.1 *Commercial Building Telecommunications Cabling Standard Part 1: General Requirements* (May 2001), and TIA/EIA-569 *Commercial Building Standard for Telecommunications Pathways and Spaces* (June 2001).

Cable paths should consist of a primary path above the main hallways of the building with individual drops exiting the main pathways at right angles towards the top of the wall above the intended telecommunications outlet location. A continuous support structure, such as cable tray, appropriately sized for the estimated number of cables should be used in the primary paths. The continuous support structure as well as individual wires for telecommunications outlet locations should be suspended above the ceiling by means of anchoring to the ceiling above the crawl area. No component of the cable system or support structure should be mounted to the suspended ceiling support wires. In areas with suspended ceiling tiles, all cabling and support structures should be installed above the ceiling tiles in such a way that will not interfere with the moving or removal of ceiling tiles. Care should be taken with cable paths so as not to obstruct areas, which require access for service, such as HVAC equipment.

Specific attention should be paid to issues such as:

- Distance requirements for separation from EMI emitting devices and electrical equipment such as fluorescent lighting and power supplies.
- Proper supporting of cables within cable paths to prevent the weight of cables from damaging cable or other equipment.
- Proper conditioning of floor and wall penetrations to prevent damage to cable jackets while installing the cable and throughout the cable life.
- Segregation and separation of different types of cables within a common pathway. For example, fiber optic cables should not be strapped to UTP cables with cable ties. Separate bundles should be maintained for each type pf cable within a common pathway.
- Generally, fill rates for conduit, raceway, and other pathways should not exceed 50 to 60%.

Testing and Certification

All testing shall be in compliance with TIA/EIA-568-B.2 *Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components* (May 2001) and TIA/EIA-568-B.3 *Optical Fiber Cabling Components Standard* (April 2000).

All UTP cables shall be tested to 250 MHz on each cable pair. Test results shall be saved and submitted electronically to the building owner and LSUHSC Office of Computer Services upon completion of the installation. Format for electronic submission of test results shall be in a file format mutually agreed to by the contractor and LSUHSC Office of Computer Services.

Conduit

For conduit and innerduct installations, the following practices should be adhered to:

- When using conduit greater than 2” inner diameter, innerduct shall be used within the entire length of the conduit unless a shielded cable is used.
- Innerduct should be cut and securely fastened at all conduit junction boxes.
- When 4” conduit is installed, it should be completely filled with innerduct.
- All empty innerduct and unfilled conduit shall contain pull strings to assist with future cable installations.
- All conduit, tubing, and innerduct shall be securely terminated on both ends with appropriate termination hardware and junction boxes.
- Conduit and tubing shall terminate in junction boxes appropriately sized for the type and quantity of cable being installed.
- Transitions between different types of tubing, conduit, and innerduct shall be made with a junction box unless a special adapter designed for such purpose is available.
- No section of cable shall be exposed except in the telecommunications rooms where service loops may be mounted on walls.
- Service loops shall be prepared on both ends of all fiber optic cables. Service loops of at least three times the longest telecommunications rooms’ wall length are required. Average service loops should be 30-45 feet as space permits.
- Conduit shall have a maximum fill capacity of 50%. Innerduct may be filled to any capacity that can be achieved with a single pull without damaging the integrity of the cables being installed.
- All conduits shall use sweeping bends for directional changes.
- Conduit shall be clearly labeled on the exterior surface, at least every 50 feet, with the words “Fiber Optic Cabling / LSUHSC CSVCS”. Labeling shall consist of black letters, at least 1.5” – 2” high, on a white or yellow background. Labels should be self-adhesive labels suitable for outdoor installation. Innerduct not contained within conduit shall also be labeled in the same manner.

Telecommunications Rooms

All telecommunications rooms must be designed and sized in compliance with TIA/EIA-568-B.1 *Commercial Building Telecommunications Cabling Standard Part 1: General Requirements* (May 2001), and TIA/EIA-569 *Commercial Building Standard for Telecommunications Pathways and Spaces* (June 2001).

Telecommunications rooms should be a minimum of 10ft by 7ft, (see *Size and Spacing* section below) and requirements may dictate multiple or larger rooms based upon issues such as size of the area being served, density of telecommunications outlets in service area, and additional equipment that must be located in the telecommunications rooms. For floor areas smaller than 5000 ft^2, Annex B, Section B.3 of TIA/EIA-569-A provides suggestions for smaller telecommunications rooms which may be considered. These deviations require approval from LSUHSC Office of Computer Services on a case-by-case basis.

A minimum of three seven foot, 19" equipment racks should be installed in a single line, side-to-side, and securely fastened. Four-inch, double-sided, full-length wire management rails are required between each rack as well as at both ends of the line of racks. Racks should be securely mounted to the floor and braced with ladder tray to the walls, which also serves as the cable path and support structure for all copper and fiber cabling terminated in the racks. The racks shall be positioned within the telecommunications room to allow access to both the front and rear of all racks. When planning access to the rear of the racks, consideration should be made for the fact that equipment mounted in the rack will often extend at least 24 –30 inches behind the rack. As such, adequate allowance shall be made to the rear of the rack to allow for access behind the racks even after equipment is permanently installed.

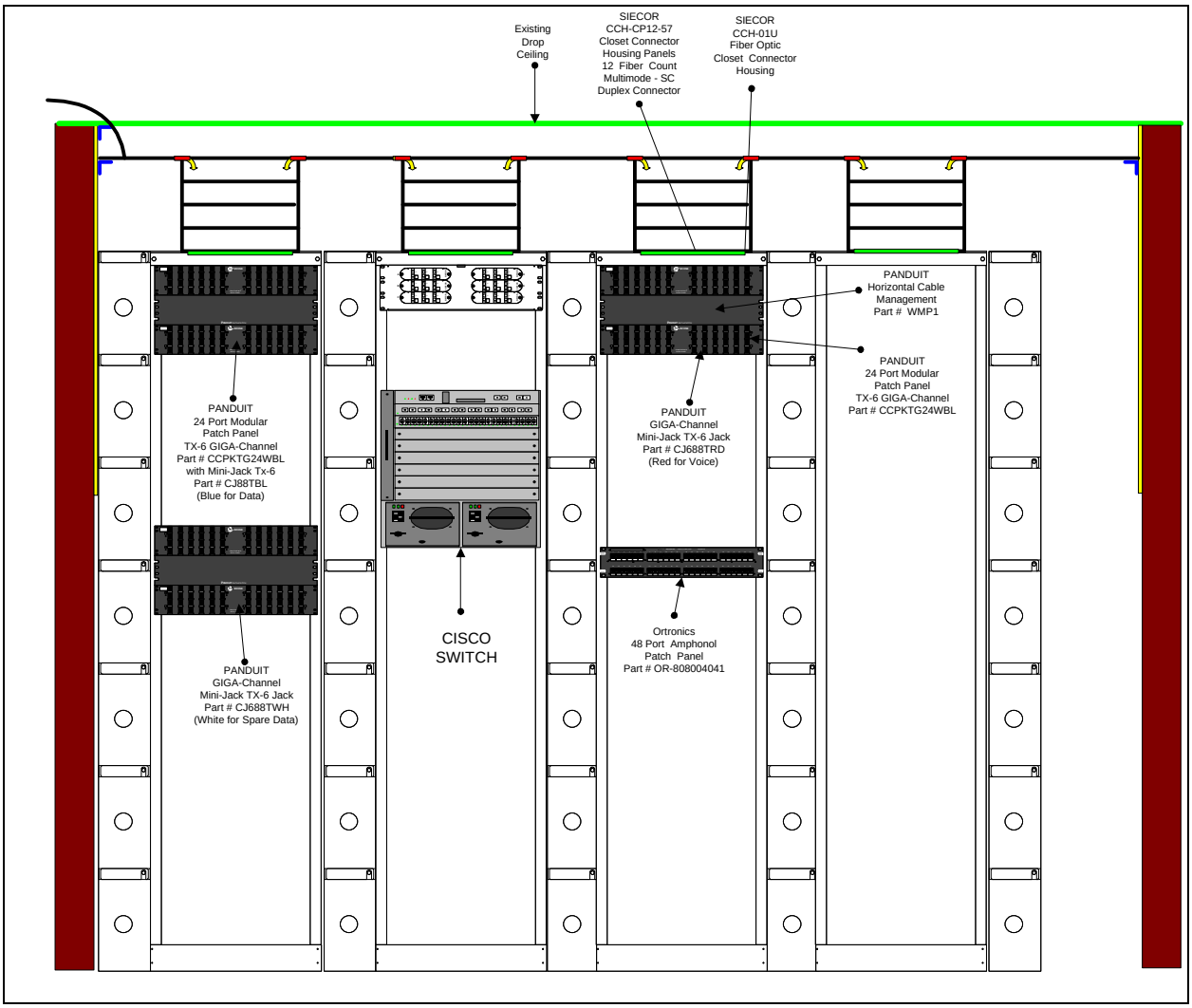

Figure 2: Typical Telecommunications Room Rack Layout

Room Location

The telecommunications closet shall be located as close as practicable to the center of the area served and preferably in the core area. The room shall not be located adjacent to electrical and mechanical areas or other areas that are likely to exhibit EMI.

Codes

All applicable local, state, and federal codes shall be observed for the design of the telecommunications closet.

Relative Termination Locations

Horizontal pathways shall terminate in the telecommunications closet located on the same floor as the area being served.

Purpose and Usage

Telecommunications closet space shall be dedicated to the telecommunications function and related support facilities. Telecommunications closet space should not be shared with electrical installations other than those for telecommunications.

This document assumes the shared use of the telecommunications closet space for the telecommunications needs of all occupants of the area served.

Equipment not related to the support of the telecommunications closet (e.g., piping, ductwork, pneumatic tubing, etc.) shall not be installed in, pass through, or enter the telecommunications closet.

Size and Spacing

There shall be a minimum of one telecommunications closet per floor. Additional closets (one for each area up to 1000 m^2 (10,000 ft^2), should be provided when:

a) the floor area to be served exceeds 1000 m^2 (10,000 ft^2); or

b) the horizontal distribution distance to the work area exceeds 90 m (295 ft).

Based on one work area per 10 m^2 (100 ft^2), the telecommunications closet should be sized as detailed in the following table, which provides minimum acceptable closet dimensions based on areas served up to and not exceeding 1000 m^2 (10,000 ft^2).

Serving Area	**Closet Size**
Ft^2	**Feet**
10000	10 x 11
8000	10 x 9
5000	10 x 7

Table 1: Telecommunications closet size

Floor Loading

Telecommunications closets shall be located on floor areas designed with a minimum floor loading of 2.4 kPa (50 lbf/ft^2). It shall be verified that concentrations of proposed equipment do not exceed the floor loading limit. If unusually heavy equipment is anticipated, these specifications may have to be increased.

Lighting

Lighting shall be a minimum of 500 lx (50 foot candles) measured 1 m (3 ft) above the finished floor, mounted 2600 mm (8.5 ft) minimum above finished floor.

NOTE - Lighting fixtures should not be powered from the same electrical distribution panel as the telecommunications equipment in the telecommunications closet. Dimmer switches should not be used and emergency lighting and signs should be properly placed such that an absence of light will not hamper emergency exit.

Ceiling

For maximum flexibility, a false ceiling shall not be provided.

Entry Door

The door shall be a minimum of 910 mm (36 in) wide and 2000 mm (80 in) high, without doorsill, hinged to open outward (codes permitting) or slide side-to-side, or be removable, and fitted with a lock.

Surface Treatment

Floors, walls, and ceiling shall be treated to eliminate dust. Finishes shall be light in color to enhance room lighting.

A minimum of two walls should be covered with rigidly fixed 20 mm (¾ in) A-C plywood, preferably void free, 2440 mm (8 ft) high, capable of supporting attached equipment. Plywood should be either fire-rated or covered with two coats of fire retardant paint. At least one covered wall shall be the wall behind the rear of the equipment racks.

Electrical

A minimum of two dedicated 120 V nominal, non-switched, AC duplex electrical outlet receptacles, each on a separate branch circuit, shall be provided for equipment power. These receptacles should be rated at 20 A and be connected to a 20 A branch circuit. In addition, identified and marked convenience duplex outlets shall be placed at 1.8 m (6 ft) intervals around the perimeter walls, at a height of 150 mm (6 in) above the floor. If standby power is available, automatic switchover of power should be provided.

Specific outlets for equipment and convenience along with their locations shall be coordinated with the telecommunications system designers. LSUHSC normally requires that outlets for network equipment be placed on the wall behind the racks. These outlets shall be installed at a height of 6 ft. to allow for proper routing of electrical supply cables without restricting access to the rear of the equipment racks.

NOTE - In many cases, it is desirable that a dedicated power panel be installed to serve the telecommunications closet. It is also desirable to have an electrical quick disconnect box instead in the room which would serve all telecommunications equipment in the room.

Grounding

Access shall be made available to the telecommunications grounding system specified by TIA/EIA-607 *Commercial Building Grounding and Bonding Requirements for Telecommunications* (August 1994). References from the standard follow.

Each telecommunications closet and equipment room shall contain a telecommunications grounding bussbar (TGB). The TGB shall be located inside the closet/room and be insulated from its support; a 50 mm (2 inch) separation is recommended. The TGB shall be located so as to provide the greatest flexibility and accessibility for telecommunications system grounding, (minimizing lengths and number of bends of the bonding conductor to the TGB, but within constraints of Clause 5).

Multiple TGBs may be installed within the same closet to aid in minimizing bonding conductor lengths and terminating space. In all cases multiple TGBs within a closet shall be bonded together with a conductor sized per 5.3.4.1.

Where a panel board for telecommunications is not installed in the telecommunications closet, the TGB should be located near the backbone cabling and associated terminations. In addition, the TGB should be located so that the grounding conductors are as short and straight as possible.

Telecommunications Closet Penetrations

To facilitate cable pulling, sleeves and slots should be located adjacent to the door. Sleeves or slots shall not be left open, except during cable installation, and shall be properly fire stopped per applicable codes immediately after the wiring is completed.

The quantity of backbone pathways using 103 (4) trade size conduits or sleeves shall be: one sleeve or conduit per 5000 m^2 (50,000 ft^2) of usable floor space served by that backbone system, plus two spares for a minimum of three sleeves. Where a slot is used it shall have a minimum 25 mm (1 in) curb around the top of the slot. Where a sleeve is used, it shall extend 25-75 mm (1-3 in) above the floor.

Horizontal penetrations shall be sufficient to allow access to the main horizontal distribution pathway and allow the placement of a 12" x 4" ladder tray through the penetration.

Security and Fire Protection

The telecommunications closet is preferably located in an accessible area on each floor, e.g., a common hallway. Access to shared-use space shall be controlled by the building owner or agent.

Fire protection of the telecommunications closet, if required, shall be provided as per applicable code.

Sprinkler heads, if required, shall be provided with wire cages to prevent accidental operation.

Proposed design of the fire protection within the room shall be reviewed and certified by a licensed sprinkler and fire safety specialist. Coordination with the State Fire Marshall may be required, especially if the sprinkler system is disabled in these areas.

Safety

A review of the current location, extent, and condition of asbestos will be required. The construction of the room must be such that the safety of the occupants of the building is not jeopardized before, during, or after construction. If asbestos is determined to exist within the open areas of the telecommunications room, sufficient notification shall be prominently displayed so that those entering the room are informed of the risks of doing so.

Environmental Considerations

HVAC shall be included in the design of the telecommunications closet to maintain a temperature the same as the adjacent office area. Planning for eventual provisioning, as required, of continuous HVAC (24 hours per day and 365 days per year) shall be included in the initial design. A positive pressure shall be maintained with a minimum of one air change per hour, or as required by applicable code. When active devices (heat producing equipment) are present, a sufficient number of air changes should be provided to dissipate the heat. If a standby power source is available in the building, the HVAC system serving the telecommunications closet should be connected to the standby supply.

Labeling and Numbering Schemes

Labeling is a critical part of any network infrastructure installation and administration. Proper labeling should be semi-permanent, logical, and machine printed. In addition, labeling should have common characteristics on both ends of a given installation so that an administrator can easily correlate two end points.

Labeling shall be in compliance with TIA/EIA-606 *The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings* (February 1993), Section 8, Labeling and Color Coding.

Labeling should address the following objectives:

1- Identify the location of the opposite end of the cable by a sequence number
2- Identify the intended use or type of cable at the faceplate and in the telecomm closet
3- Provide a reference as a unique identifying number

Specific labeling requirements are:

- Label both ends of all cables with a common naming scheme so that both ends of the cable have the same identifying code on the terminating hardware. For example, the faceplate and patch panel or other termination device should be labeled. It is not necessary to label the cable itself, if the cable is permanently terminated on a patch panel with appropriate labeling.
- Patch panels should be labeled to uniquely identify each and every cable within the building. Typically, a room number and faceplate sequence number will provide a unique labeling scheme within a building. The patch panel port label should contain the same room number and sequence number as the faceplate that terminates the other end of the cable. When possible, cables should be installed in the patch panels in sequence number order to simplify locating specific ports.
- Each faceplate should be labeled to allow identification of the serving telecommunications closet as well as the room number and faceplate sequence number. For instance in the LSUHSC Clinical Sciences research Bldg. each floor is served by two telecommunications closets. The numbering scheme for the closets is "Floor#.TelecomClosetInstance#". First floor telecommunications rooms are numbered 1.1 (North Side), and 1.2 (South Side). The second floor would be 2.1 and 2.2, etc. Every faceplate on the 1st floor should be labeled with a telecommunications closet number followed by "-Room#-FaceplateSequence#". Every faceplate in the building should be numbered similar to the following: "1.2-135A-B". The preceding number indicates, from left to right, a) first floor, b) telecommunications closet 2 (South), c) Room 135A, and d) second faceplate in the room. The patch panel numbering scheme serving the same location will omit the telecommunications room part of the number. It will also label the patch panel port 135A-B.
- When a single telecommunications closet serves one individual floor with all drops on the floor terminating in the respective closet, the faceplate numbering scheme may omit the telecommunications closet portion.
- Multiple jacks within a room should be lettered (sequentially numbered) in a clockwise manner. This should begin with the first faceplate to the left of the main doorway as you enter the room. The main doorway is the one that provides access to a common area, such as a hallway or lobby.

Documentation

Documentation of installed systems is as critical to successful deployment and administration as the planning of the proposed system. Documentation shall be submitted in mutually compatible electronic format, such as Microsoft Excel (.xls).

The documentation required is listed below . It will serve for a successful execution of the Panduit Integrity warranty. The Integrity warranty is a joint offering of a partnership between Panduit and Belden corporations.

Documentation required includes the following:

- As-built drawings are required depicting the path of all backbone and vertical cabling as well as the primary path for horizontal cabling. The primary path is considered to be the common path shared by multiple cable runs. This includes the origination at the telecommunications closet and the main pathway(s). Such paths include those hallways having individual cables before they are separated. These paths are directed towards the termination in the work areas.
- As-built documentation of all floor plans for telecommunications closets including physical location of racks, trays, and penetrations. Proposed floor plans will be provided by the LSUHSC Computer Services Department. As-built drawings will simply require the proposed drawings be updated to reflect any deviations from the original layout .
- A logical representation of each patch panel for both fiber and copper is required.
- For fiber patch panels, the documentation should allow an analyst to quickly and easily determine exactly which cables and strands terminate in the individual connector housings.
- Test results for every cable installed are required. The test results shall be submitted in a mutually agreeable electronic format