TSA

Structured Cabling System Guidelines

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1. INTRODUCTION

This document provides direction for a telecommunications wiring system for TSA spaces or buildings to support TSA's mission and operations. Its purpose is to enable the planning and installation of building wiring with minimal advance knowledge of the telecommunications products used.

Building wiring represents a significant investment. A variety of wiring plans and media exist in buildings today, resulting in an increase in labor costs for move, add and change (MAC) activities. Also, selective re-wiring is occurring in some locations where the existing media does not provide sufficient bandwidth transport capabilities.

These guidelines are to apply to future installations and renovations of buildings and work areas.

The content of this document follows EIA/TIA guidelines. It represents a subset of the appropriate EIA/TIA standards refined to meet specific TSA requirements. All cabling standards contained herein are installer independent.

1.1 Scope

This content of this document defines guidelines for structured telecommunications wiring within TSA facilities or buildings. This includes all components from work area connections to local inter-building facilities. Deviation is discouraged, although, designers will review and document if necessary.

1.2 Structured Cabling Systems

The specifications contained in this document originate from the recommended use of structured cabling systems for all communications wiring requirements. These systems are composed of cabling segments that generally correspond to the vertical and horizontal dimensions of buildings and campuses. By interconnecting these segments to one another in prescribed ways, complete end-to-end connections exist to support the physical wiring needs of various systems. Standards refer to each such segment of cabling as a subsystem.

When at all possible, install structured cabling systems as fully as possible in their plant and administrative buildings. This may lead to a certain degree of pre-wiring at workstations where present equipment needs are minimal or even nonexistent. Pre-wiring at work positions initially free of equipment will help to avoid the predictably higher costs of doing so in the future.

The cabling specifications revolve around the use of high-quality unshielded twisted pair (UTP) and fiber optic cabling. Each workstation will have two or more modular jacks in an applicable faceplate. Each jack will include a separate four-pair UTP cable.

1.3 Telecommunications Wiring System Subsystems

Several elements comprise a structured telecommunications wiring system. The subsystems addressed in this document include:

- Equipment Subsystem Horizontal Subsystem
- Intermediate Distribution Frame (IDF) Equipment (Telecommunications Closet) Subsystem
- In-Building Backbone (Vertical) Subsystem
- Main Distribution Frame (MDF) Equipment Subsystem
- Campus Backbone Subsystem

1.4 Site Preparation Guidelines

1.4.1 General Information

A proper wiring plan begins with a good site survey. The survey should address items such as floor plans, power requirements, telecommunications closet plans, environmental considerations, grounding, etc.

It is the responsibility of the LAN Designers and Communication Consultants to coordinate this pre-survey and work with the architects, building operations management, local I&M forces and current occupants to secure the necessary information so that the site survey becomes a meaningful planning document.

All cables and materials used must comply with all relevant local standards for building and electrical materials and construction. Surveyors and/or designers should contact Real Estate Management to verify any exceptional requirements. Safety will never be compromised in any installation.

1.4.2 Specifications

A detailed site survey should include the following items:

The user should provide a floor plan with descriptions of communications locations and types of services, as necessary. This may be in the form of a descriptive grid sheet.

The floor plan should provide room sizes, new or existing telecommunications wiring facilities, planned types of office furniture, HVAC, power locations, and requirements.

Standards recommend that all premise data equipment be mounted in a standard 19" Closed, Open, or Wall-Mount IT Cabinets, in a secured telecommunications closet within the TSA controlled space. If located in Shared IT Communications or Equipment Rooms, Closed Floor or Wall Mount Racks are recommended. These cabinets should include power strips, side panels, and fans for ventilation if required. **TSA standards state the necessity for bolting all full size racks to the floor for seismic requirements and security or local earthquake zone standards if greater.**

If access floors exist for cable routing, there shall be a minimum of 6 inches of clear space from the bottom of the floor panel to the deck below.

The cabinet with data equipment and rack with patch panel shall be connected via cable ladder for cable routing.

2. EQUIPMENT SUBSYSTEM

2.1 Definition

The Workstation Equipment Subsystem consists of all active or passive media and related components required to form physical connection between station (terminals, copiers, scanners, printers, PC's, and telephone handsets) and the communications outlets provided at the workstation (or office). The components used will be highly variable, depending on the type of equipment used at a particular time and place.

2.2 General Information

2.2.1 Equipment Specifications

Each of the four-pair UTP Category 5E/6 cables will terminate in the MDF, or IDF, on the same numbered port on the appropriate patch panel. For example, workstation number 1's cable from jack position 1 will terminate on port 1 of the **red** patch panel and the cable from jack position 2 will terminate on port 1 of the **blue** patch panel. In this example, each jack position could be color coded, as follows:

Jack	Color	Application Position
1	Red	Data 1
2	Blue	Data 2

Below are **Examples** of Cabling and Power requirements – Actual requirements are based on specific location determinations:

2.2.1.1 Each workstation (office, cubicle) will have two modular jacks (RJ-45) within a 2-port faceplate, with each jack supported by a separate four-pair UTP Category 5E/6 cable. (It is important to note that all Category 5E/6 jacks, regardless of color, will accommodate any voice or data technology.). Use of existing Category 5/6 cable is allowed provided that it meets all cable testing specifications. (Refer to Section 9.3.2). There should be a minimum of 1 120 VAC circuit that will provide facilities (space, power, grounding, etc.) for passive or active devices used to interconnect the horizontal wiring to the backbone wiring.

2.2.1.2 Each copier room will have six modular jacks (RJ-45) within three, 2-port faceplate, with each jack supported by a separate four-pair UTP Category 5E/6 cable. (It is important to note that all Category 5E/6 jacks, regardless of color, will accommodate any voice or data technology.). Use of existing Category 5/6 cable is allowed provided that it meets all cable testing specifications. (Refer to Section 9.3.2). There should be a minimum of 4 120 VAC circuits that will provide facilities (space, power, grounding, etc.) for passive or active devices used to interconnect the horizontal wiring to the backbone wiring.

2.2.1.3 Each printer area will have four modular jacks (RJ-45) within a 4-port faceplate, with each jack supported by a separate four-pair UTP Category 5E/6 cable. (It is important to note that all Category 5E/6 jacks, regardless of color, will accommodate any voice or data technology.). Use of existing Category 5/6 cable is allowed provided that it meets all cable testing specifications. (Refer to Section 9.3.2). There should be a minimum of 4 120 VAC circuits that will provide facilities (space, power, grounding, etc.) for passive or active devices used to interconnect the horizontal wiring to the backbone wiring.

2.2.1.4 Each conference room will have 16 modular jacks (RJ-45) within eight, 2-port faceplate, with each jack supported by a separate four-pair UTP Category 5E/6 cable. (It is important to note that all Category 5E/6 jacks, regardless of color, will accommodate any voice or data technology.). Use of existing Category 5/6 cable is allowed provided that it meets all cable testing specifications. (Refer to Section 9.3.2). There should be a minimum of 18 120 VAC circuits that will provide facilities (space, power, grounding, etc.) for passive or active devices used to interconnect the horizontal wiring to the backbone wiring. Four of these circuits will be centrally located under the conference table. Two of these circuits will be centrally located in the ceiling of the room for an Audiovisual projector.

2.2.2 UTP Patch Cords.

Patch cords will adhere to the same physical and transmission specifications as outlined in section 8.3.8. The maximum length of the patch cord for workstations will be 3 meters (9.8 ft.) and will be pre-constructed "Category 5E/6" compliant. **TSA Standards prohibit the use of installer-manufactured patch cords.** The use of installer-manufactured patch cords significantly increases trouble reports and associated down time.

3. HORIZONTAL SUBSYSTEM

3.1 Definition

The Horizontal Subsystem is one of the three subsystems that are permanent within facilities. It consists of all communications media, including cables, faceplates and terminating equipment installed between the workstations and the supporting Telecommunications Closets' Intermediate Distribution Frames (IDF's).

3.2 General Information

When designing the horizontal wiring system, consider all services, such as voice telecommunications service, premise switching equipment, data communications, Local Area Networks (LAN), Video Teleconferencing (VTC) and other building signaling systems.

The horizontal wiring shall be a star topology. Directly connect each work area outlet (home run) to a telecommunications closet. Terminate the horizontal cabling in a telecommunications closet on the same floor as the work area it is serving. Construct terminations at the telecommunications closet with Category 5E UTP 568B patch panels to assist with organization and flexibility of design.
The use of non-plenum rated cable within EMT conduit homerun from the workstation to the telecommunications closet, will only be utilized, when required by local code.

Within TSA office space, use plenum rated cable (no conduit required) in controlled spaces. In all cases, cable should be run in EMT conduit, only if required by local code.

4. MAIN DISTRIBUTION FRAME (MDF) and INTERMEDIATE DISTRIBUTION FRAME (IDF) EQUIPMENT SUBSYSTEM AND TELECOMMUNICATIONS CLOSETS

4.1 Definition

The Main Distribution Frame (MDF) is the primary hub for all outbound Ethernet cables to their designated hardware devices. The MDF holds the TSA Router, Servers, Switches, and UPS. The recommended length for a Cat5E/6 cable is 295 feet. If a device is more than 295 ft from the MDF, how do you reach it? You pull a fiber optic cable and set up an Intermediate Distribution Frame (IDF) in the direction of the distant device and run the required wires from there.

A. Telecommunications – MDF – Main Distribution Frame

This room shall be designed/sized to serve the entire building/facility/location. This room is to be centrally located so as to ensure that all copper voice and data cable sheath lengths out to the outlets are less than 90 m (295 ft). The MDF contains the TSA Data Network equipment (Router, Servers, and Switches). If required, this room shall interconnect with each Intermediate Distribution Facility (IDF) via distinct, dedicated multimode and/or single-mode fiber optic backbone cabling. In smaller buildings, where only one telecommunications room is required, the MDF will also function as the IDF. The MDF is supported by a UPS.

B. Telecommunications – IDF – Intermediate Distribution Frame

This room shall be designed/sized to serve any spaces or areas of the building/facility/location, which are in excess of 90 m, (295 ft.), of the MDF. The IDF typically only contains Patch Panels and Switches. This room is to be centrally located so as to ensure that all copper voice and data cable sheath lengths out to the outlets are less than 90 m (295 ft). The IDF is supported by a Surge Suppressor.

Recommended telecommunications closet (MDF or IDF) sizes are shown in the table below:

Recommended Sizes	
MDF	10 ft. x 15 ft. or larger
IDF	8 ft. x 8 ft or larger

4.2 General Information

The following are general requirements for the telecommunications closet:

- It should be as close as possible to the core of the area it is serving.
- It should be for communications equipment only.
- There should be a minimum of one telecommunications closet per floor.
- All telecommunication closets within a building should align vertically (stack).
- It should contain a telephone for communications.
- It should be of sufficient size to accommodate all passive or active premise video, data and voice equipment.
- Power requirements must meet manufacturer specifications. This may include a conditioned power supply or UPS with an isolated AC ground.
- There should be a minimum of 1 120 VAC circuit or 1 208 VAC circuits depending on the cabinet UPS requirements. It shall provide facilities (space, power, grounding, etc.) for passive or active devices used to interconnect the horizontal wiring to the backbone wiring.
- Environmental factors (temperature and humidity) should conform to the equipment with the most stringent requirements.
- All active equipment (i.e., wiring hubs, concentrators, controllers, switches, etc.) placed in telecommunications closets should only serve devices on the *same* floor. In the case of multiple telecommunications closets per floor, active equipment located in one of the telecommunications closets should only serve devices normally supplied from that closet.

4.3 Specifications

The MDF and IDF should comply with EIA/TIA-569. Additionally, all voice-related cross-connections should utilize IDC-type connecting hardware. Cross-connections for data-related UTP should utilize plug-ended patch cords. All patch cords should be in accordance with EIA/TIA 568B polarization sequences and comply with TSB 36 and 40. All cross-connections involving the use of fiber optic cabling should be made using single mode fiber optic patch cords with ST compatible plugs on both ends.

Closets or spaces housing secure equipment cabinets should have a minimum of 8 x 8 x 8 (feet) clear space in which to house the cabinet. All IT Room sizes should be discussed with a TSA HQ IT FRM (Field Region Manager). Based on numerous considerations, TSA IT Rooms may vary widely, and each configuration, should be discussed to alleviate a too large, or too small room sizes.

4.3.2 Floor Loading (Floor Mount Cabinets)

The weight of a configured MDF/IDF ranges between 1050 and 1400 lbs., for the largest Floor Mount Cabinets. Floor loading capacity in the MDF/IDF shall be sufficient to bear both the distributed and concentrated load of installed equipment. The recommended minimum distributed loading bearing capacity shall be 150 lb/ft. This is for the largest model of Closed Cabinet (42RU). Smaller locations may be able to use Wall-Mount IT Cabinets, which will require a plywood backboard, for mounting.

4.3.3 Provisioning

Cover a minimum of two walls with rigidly fixed 20mm (3/4") A-C plywood; preferably void free, 2440mm (8 feet) high, painted with light colored fire retardant paint, capable of supporting attached equipment.

Lighting will be a minimum of 50 foot-candles measured 3 feet above finished floor, mounted 2600 mm (8.5 feet) above finished floor.

Standards recommend against false ceilings, unless local codes specify otherwise. There should be a minimum clearance height of 2440mm (5 ft.) throughout the room.

Doors shall be a minimum of 910mm (36") wide and 2000mm (80") high, without a doorsill and hinged to swing outward (unless in violation of local code), or slide side-to-side and fitted with a lock.

Standards state to treat floors, walls and ceilings to eliminate dust. Finishes will be in light colors to enhance room lighting.

The installed equipment determines the electrical power requirements for the cabinets. The Uninterruptible Power Supply (UPS) in the 25 Rack Unit (U) cabinets requires a 120Volt 30Amp electrical circuit terminating to a NEMA L5-30R locking receptacle. The power cord for the 3kVA UPS, is 6 feet long. The UPS in the 42U cabinets requires a 208Volt 30Amp electrical circuit terminating to a NEMA L6-30R locking receptacle. The power cord for the 6kVA UPS, is 8 feet long.

According to the National Electrical Code (NEC) 645.5(B)(2), the electrical supply must be located such that the UPS can be plugged in without the cord lying on the floor to be tripped over or walked on which could damage the supply cord or unplug it.

All active equipment, such as wiring hubs, concentrators, controllers, switches, etc., which provide support to campus or critical subsystem equipment, shall connect to a UPS, or a Surge Suppressor (MDF requires a UPS; and IDF requires a Surge Suppressor). A review of the proposed equipment for the telecommunications closet will determine any other environmental settings, such as cooling and humidity.

5. IN-BUILDING BACKBONE SUBSYSTEM

5.1 Definition

The In-Building Backbone Subsystem is another of the three permanent subsystems within the facility. It consists of all passive cabling media and related connecting hardware required to provide connectivity between IDF's and other IDF's as well as between IDF's and Main Distribution Frames (MDF's or building hub room).

IDF's are where the remote end of in-building backbone cables terminate. These cables originate from other IDF's or the MDF.

5.2 General Information

Data-related applications may utilize a fiber optic (single-mode with SC connectors) in-building backbone subsystem. A fiber optic system (using the same standard) will also be used to interconnect multiple IDF's located on a single floor. ALL fiber optic cables should terminate in fiber optic patch panels in IDF's and MDF. (Note: An ST to SC conversion cable may be required to utilize existing fiber infrastructure; all new equipment being installed will use SC connectors.) **In all cases, cable should be run in EMT conduit, only if required by local code.**

The general design of the in-building backbone system will be a star topology. There shall be no more than two hierarchical levels of wiring cross-connects in the backbone wiring. Interconnections between any IDFs shall pass through three or fewer cross-connects. Wiring may pass through only one cross-connect to reach the main cross-connect. Cross-connects may be in telecommunications closets, equipment rooms, or at entrance facilities. All wiring cross-connects will be in secured rooms/closets.

5.3.1 Site Selection

When selecting a site for the MDF and/or IDF, avoid restricting the location by placing it next to building components that would limit expansion, such as; elevators, outside walls, cores and other fixed building walls. There should be accessibility for delivery of large equipment to the MDF.

5.3.2 Floor Loading (Floor Mount Cabinets)

The weight of a configured MDF/IDF ranges between 1050 and 1400 lbs., for the largest Floor Mount Cabinets. Floor loading capacity in the MDF/IDF shall be sufficient to bear both the distributed and concentrated load of installed equipment. The recommended minimum distributed loading bearing capacity shall be 150 lb/ft. This is for the largest model of Closed Cabinet (42RU). Smaller locations may be able to use Wall-Mount IT Cabinets, which will require a plywood backboard, for mounting.

5.3.3 Water Infiltration

The MDF, and/or IDF, shall not be located at or below water level unless employing preventive measures against water infiltration. If local code permits, the room shall be free of water or drain pipes not directly in support of equipment within the room. If there is a sprinkler requirement, consider a pre-action system. A floor drain shall be within the room if risk of water ingress exists.

5.3.4 Heating, Venting and Air Conditioning (HVAC)

The MDF shall be located with ready access to main HVAC delivery system. In some instances, a separate unit may be required. HVAC shall be available on a 24 hours-per-day, 365 days-per-year basis. If the building HVAC system cannot assure continuous operation, provide a stand-alone HVAC unit. The temperature and humidity shall provide continuous operating ranges of 65ºF to 80ºF with a 20% to 60% relative humidity. Humidification and dehumidification equipment may be required depending on local conditions. Measure ambient temperature and humidity at a distance of 1.5m (5 ft.) above floor level, after equipment is operational, and at any point along equipment aisle centerline.

5.3.5 Electromagnetic Interference

The room shall be away from sources of electromagnetic interference at a distance that will reduce the interference to 3.0 V/m throughout the frequency spectrum. Give special attention to power supply transformers, motors and generators, radio and induction sealing devices. It is desirable to locate the MDF close to the main backbone pathway.

5.3.6 Vibration

The MDF will be designed to meet the vibration specifications listed below:

Frequency (Hz)	Vibration Amplitude
5 - 22	0.01 inches double amplitude displacement
22 – 500	0.25 g peak acceleration
500 - 22	0.25 g peak acceleration
22 - 5	0.01 inches double amplitude displacement

5.3.7 Size

The size of the MDF shall meet the known requirements of specific equipment. If information is absent, then allow for 0.75 ft. of floor space in MDF for every 100 ft. of workstation space. The MDF is recommended to be a minimum of 150 square ft. Optimum size is based on installed equipment, as well as relative cabling requirements. TSA IT Rooms may also contain other TSA entities, such as TSA Physical Security, and/or other elements related to TSA mission.

Environmental control equipment, such as power conditioning or distribution systems, and UPSs up to 100 KVA, are allowable in the MDF. Locate UPSs larger than 100 KVA in a separate room.

5.3.8 Provisioning

Cover a minimum of two walls with rigidly fixed 20mm (3/4") A-C plywood, preferably void free, 2440mm (8 feet) high, capable of supporting attached equipment.

Lighting will be a minimum of 540 lux (50 foot candles) measured 3 foot above finished floor, mounted 2600 mm (8 ft. 6 in.) above finished floor.

Standards recommend against false ceilings, unless local codes specify otherwise. There should be a minimum clearance height of 2440mm (5 ft.) throughout the room.

Doors shall be a minimum of 910mm (36') wide and 2000mm (80') high, without a doorsill, hinged to swing outward (unless in violation of local code), or slide side-to-side and fitted with a lock secured for authorized personnel only. If anticipated that large equipment will be delivered to MDF, a double door 1820mm (72") wide by 2280mm (90") high without a doorsill or center post is recommended.

Standards state to treat floors, walls and ceilings to eliminate dust. Finishes will be in light colors to enhance room lighting.

The MDF shall be void of contaminants and pollutants that could affect operation of installed equipment. When contaminants are present in concentrations greater than those indicated below, vapor barriers, positive room pressure or absolute filters shall be provided.

Contaminant	Concentration
Chlorine	0.01 ppm
Hydrogen Sulfide	0.05 ppm
Nitrogen Oxides	0. 1 ppm
Sulfur Dioxide	0.3 ppm
Dust	100 ug/cubic meter/24 h
Hydrocarbons	4 ug/cubic meter /24 h

Adequate ventilation must be available if using batteries for UPS.

A separate supply circuit serving the MDF shall terminate on its own electrical breaker. LAN Designers will determine the ultimate power requirements via a review of all proposed active equipment in MDF. Lighting fixtures and telecommunications equipment within the MDF should not be on the same electrical circuit breaker. Standards do not allow dimmer switches. There will be appropriate emergency lighting.

Especially noisy equipment shall be outside of the MDF

6. *FUTURE INFORMATION*

7. CAMPUS BACKBONE SUBSYSTEM

7.1 Definition

The Campus Backbone Subsystem is the last of the three permanent subsystems within the facility. It consists of all passive cabling media and related connecting hardware required to provide connectivity between IDF's and MDF's of one building to the IDF's and MDF's of another building hub room within campus. The campus backbone subsystem will use an appropriate building entrance facility.

8. INSTALLATION AND ONGOING MAINTENANCE

8.1 Physical Routing

Whenever possible, routing of cable shall be over corridor areas or along lines that are parallel to contours of building. All deviations from straight runs should be made at right angles. Use pre-constructed distribution systems designed to support and protect standard cable plant when penetrating through wall partitions or between floors.

8.1.1 Separation from Sources of Electromagnetic Interference (EMI)

The planning of telecommunications pathways and spaces shall give consideration to nearby noise sources such as electric power wiring, radio frequency (RF) sources, large motors and generators, induction heaters, arc welders, etc. The NEC governs co-installation of telecommunications cable and power cable for safety but take additional precautions to protect the integrity of information carried by copper telecommunications cable.

Closed metal pathways, (i.e., EMT conduits), generally provides adequate protection from nearby capacitive and inductive coupled (rapid changes in large voltages) noise sources typically found in commercial buildings. In cases where inductively coupled (rapid changes in large currents) noise sources are a problem, the closed metal pathway section in proximity to the source shall be of ferrous type material.

Open or non-metal pathways (i.e., open tray or plastic wire ways) shall have sufficient separation from noise sources to eliminate any potential coupling problems. These pathways shall be a minimum of 5 inches away from fluorescent fixtures, ballasts, and high-intensity discharge devices.

Standards state to route all cabling in such a way that complies with the minimum separations from ≤ 480V power sources listed below.

Condition	< 2 KVA	2 - 5 KVA	> 5KVA
1. Unshielded power lines or electrical equipment in proximity to open or non-Metal pathways	5 in (127 mm)	12 **in** (305 mm)	24 in (61 0 mm)
2. Unshielded power lines or electrical equipment in proximity to grounded metal pathways	2.5 in (6 mm)	6 in (152 mm)	12 in (305 mm)
3. Power lines enclosed in grounded metal conduit (or equivalent shielding) in proximity to grounded metal pathways		3 in (76 mm)	6 in (152mm)

In general, IDF's (telecommunications closets) and MDF's (building hubs) should not be in close proximity with motors, transformers or other high voltage equipment.

8.1.2 UTP Splices and Bridge Taps

Standards strictly prohibit the use of splices and bridge taps within UTP segments. Doing so creates conditions in which signal reflections and other distortions can combine to negatively affect the integrity of transmissions.

8.1.3 UTP Cable Bends

UTP cable bends, or radii, shall be no less than 4 times the cable diameter.

8.1.4 Patch Cords

All cables used for cross-connection purposes need to meet or exceed the requirements of the adjoining cabling segments. Only use RJ-45 plug-ended patch cords to make cross-connects within IDF/MDF equipment subsystems. The cable manufacturer will certify the patch cords.

Additionally, no patch cord or jumper wires will exceed 7m (22.9 ft.) in length. **TSA Standards prohibit the use of installer-manufactured patch cords.** The use of installer-manufactured patch cords significantly increases trouble reports and associated down time.

8.2 Conduit

8.2.1 General

Use the conduit requirements as a reference to ensure proper transmission properties of Cat 5E/6 UTP.

8.2.2 Types of Conduit

If local code requires conduit, types include electrical metallic tubing (EMT), galvanized rigid steel (GRS) conduit, and schedule 40 PVC (for outside use only). Conduit shall be of the type permitted under the appropriate electrical codes. Standards recommend against flexible metallic conduit due to cable abrasion problems.

8.2.3 Use of Conduit

No use of conduit unless required by local code.

8.2.4 Minimum Requirements

If conduit is required, appropriate electrical codes state the minimum requirements for conduit regarding support, end protection, and continuity. No section of conduit shall be longer than 100 ft. nor contain more than two 90 degree bends between pull points or pull boxes.

8.2.5 Bends

The inside radius of a bend in conduit shall be at least 6 times the internal diameter. When the conduit size is greater than 2 in., the inside radius shall be at least 10 times the internal diameter of the conduit. For fiber optic cable, the inside radius of a bend for fiber optic cable shall always be at least 10 times the internal diameter of the conduit. No 90 degree bends of fiber optic cable shall occur within the confines of a pull box.

8.2.6 Fish-tape or Pull-cord

For ease of pulling future cable, place a fish tape or pull-cord in installed conduit.

8.2.7 Conduit Runs

Any single conduit run extending from a telecommunications closet should not serve more than three outlets. The size of conduit shall be per the table below and incrementally increase in size from the farthest outlet towards the telecommunications closet.

Conduit		Number of Wires **or** Cables									
Internal Diameter mm (in)	Trade Size (in)	Wire Outside Diameter mm (in)									
		3.3 (.13)	4.6 (.18)	4.6 (.22)	6.1 (.24)	7.4 (.29)	7.9 (.31)	9.4 (.37)	13.5 (.53)	15.8 (.62)	17.8 (.70)

15.8 (0.62)	1/2	1	1	0	0	0	0	0	0	0	0
20.9 (0.82)	3/4	6	5	4	3	2	2	1	0	0	0
26.6 (1.05)	1	8	8	7	6	3	3	2	1	0	0
35.1 (1.38)	11/4	16	14	12	10	6	4	3	1	1	1
40.9 (1.61)	11/2	20	18	16	15	7	6	4	2	1	1
52.5 (2.07)	2	30	26	22	20	14	12	7	4	3	2
62.7 (2.47)	21/2	45	40	36	30	17	14	12	6	3	3
77.9 (3.07)	3	70	60	50	40	20	20	17	7	6	6

8.2.8 Conduit Termination

Ream conduit to eliminate sharp edges and terminated with an insulated bushing. Terminate conduit protruding through the floor 25-50 mm (1-2 in) above the floor surface.

8.3 Physical Media Specifications

8.3.1 Technical Reference

Standards for 100 ohm UTP cable come from EIA/TIA-568-A UTP media specification and TSB 36 and 40.

8.3.2 Length

The cable length from the termination point in the telecommunications closet to the telecommunications outlet in the work area shall not exceed 90 meters (295 feet) independent of the media type.

NOTE: In establishing maximum distance, there is an allowance for 3 additional meters (9.8 ft.) from the telecommunications outlet to the workstation as well as an additional 7 meters (22.9 ft.) from patch panel to active (LAN/data) or passive (voice) components in telecommunications closet.

8.3.3 Construction

There are Eight 24-Gauge thermoplastic insulated solid copper conductors formed into four individually twisted pairs and enclosed by an overall plenum (or non-plenum) rated jacket. There is no distinction between voice and data cable. Voice and data services shall not share the same cable sheath. **Cables are of non-plenum type for facilities (enclosed in conduit) and plenum type for any cables installed in other offices. No use of conduit, unless required by local code.**

8.3.4 Twisted Pairs

Individual pairs twist variably, relative to one another within each four-pair cable with a minimum of two twists per inch per pair. The cabling manufacturer is to ensure compliance with all EIA/TIA-568 requirements in regards to actual pair twists.

8.3.5 Cable Diameter

Overall diameter of jacketed four-pair cable shall not exceed 6.35 mm or.25 in.

8.3.6 Breaking Strength

Ultimate breaking strength of completed cable should be 40.82 kg or 90 lbs minimum.

8.3.7 Bending Radius

Four-pair cable should withstand a bend radius of 25.4 mm (1 in) minimum at a temperature of -20ºC +/- 1ºC without jacket or insulation cracking.

8.3.8 UTP Polarization

The 568 "standard" is not to be confused with 568A or 568B wiring schemes, which are themselves, part of the "568A standard".

Each of the eight conductors contained within each four-pair cable should be color-coded and terminated in accordance with EIA/TIA-568A polarization (568B wiring scheme) sequence as listed below:

Conductor ID*	RJ-45 Pin ID*	UTP Color Code
Pair 1 Tip	5	White/Blue * *
Pair 1 Ring	4	Blue/White * * *
Pair 2 Tip	1	White/Orange * *
Pair 2 Ring	2	Orange/White * * *
Pair 3 Tip	3	White/Green * *
Pair 3 Ring	6	Green/White * * *
Pair 4 Tip	7	White/Brown * *
Pair 4 Ring	8	Brown/White * * *

The pin-pair positions are identical to those contained in the IEEE 10BASE-T standard.
* * Wire insulation is white, and a colored tracer is added for identification.
* * * Wire insulation has a solid color (stated first) with an optional white tracer.

8.4 Transmission Characteristics

8.4.1 Technical Reference

Standards are from EIA/TIA-568A and TSB 67 "Category 5" for UTP media specifications.

8.4.2 DC Resistance

The resistance of any conductor shall not exceed 9.38 ohms per 100m (328 ft.) at or corrected to a temperature of 20ºC.

8.4.3 DC Resistance Unbalance

The resistance unbalance between the two conductors of any pair shall not exceed 5% when measured at or corrected to a temperature of 20ºC.

8.4.4 Mutual Capacitance

The mutual capacitance of any pair at 1KHZ and measured at or corrected to a temperature of 20ºC shall not exceed 5.6 nF per 100m (328 ft.).

8.4.5 Capacitance Unbalance: Pair to Ground

The capacitance unbalance to ground at 1KHZ of any pair measured at or corrected to a temperature of 20ºC shall not exceed 330 pF per 100m (328 ft.).

8.4.6 Characteristic Impedance and Structural Return Loss (SRL)

The characteristic impedance of horizontal UTP should be 100 ohms +/- 15% in the frequency range from 1MHz up to 100 MHz.

8.5 Data-Related UTP Connecting Hardware: Physical Specifications

8.5.1 Technical Reference

The data-related UTP connecting hardware standards are from EIA/TIA-568 standard for UTP Connecting Hardware.

8.5.2 Overall Construction

Terminate all data-related UTP cables in the horizontal subsystem on RJ-45 jack panels (patch panels) configured with Insulation Displacement Contact-type connectors for UTP wiring terminations. Include an internally hard-wired connection from each IDC-type connector to a corresponding RJ-45 type jack on the front of the panel for cross-connection purposes. These RJ-45 jacks should serve as the primary interface to equipment or media contained in the IDF Equipment or In-Building Backbone subsystems. Use rack-mounted Jack panels when possible.

8.5.3 RJ-45 Construction

Use WECO-style eight-wire modular jacks with 24AWG solid of 50 microns in hard gold, with a minimum contact force of 100 comb. conductors. Each contact surface should have a minimum of 8 separate conductors aligned internally by the jack.

8.6 Fiber Optic Cabling: Physical Specifications

8.6.1 Technical References

The fiber optic cabling physical specifications comply with the ANSI X3.166-1990.

8.6.2 Construction

Single mode graded index fibers, riser or plenum rated.

8.6.3 Quantity

Locations with one MDF and one or more IDF:
A minimum of one (1) 6-strand fiber optic cable is required between each IDF and MDF.
Locations that require an additional MDF for fiber distribution (IE: locations with multiple buildings or multiple terminals) and one or more IDF:

A minimum of one (1) 6-strand fiber optic cable is required between each IDF and fiber distribution MDF.

A minimum of one (1) 12-strand fiber optic cable is required between each fiber distribution MDF and the core MDF.

8.7 Fiber Optic Cabling: Transmission Specifications

8.7.1 Technical Reference

The fiber optic cabling transmission specifications comply with the ANSI X3.166-1990 standard.

8.7.2 Transmission Characteristics

All fiber optic cables should comply with the following transmission characteristics:

Operating Wavelengths:	1310 and/or 1550 nm
Maximum Attenuation:	0.3 to 1.0 dB/km at 1310 nm and 1550 nm

8.8 Fiber Optic Connecting Hardware: Physical Specifications

8.8.1 Technical Reference

The fiber optic connector types specified in this section are based on the ST connector specification.

8.8.2 Construction

TSA standards state the necessity to terminate all fiber optic cables installed in the backbone subsystem at the time of initial installation. Equipment used to do so should consist of ST interconnect centers (i.e., fiber patch panels) containing at least enough positions to support installed fiber terminating at the MDF or IDF. All ST type connectors should terminate with interconnect sleeves to facilitate patching and cross connections. Fiber patch panels should be rack-mounted whenever possible. Wall mounting will be allowed only when rack mounting space is not available.

8.9 Fiber Optic Connecting Hardware: Transmission Characteristics

(Note: An ST to SC conversion cable will be required to utilize existing fiber infrastructure, based on all new equipment being installed will use SC connectors.)

8.9.1 Technical Reference

The fiber optic connector types specified in this section are based on the SC/ST connector specifications.

8.9.2 Attenuation

Fiber patching or interconnect equipment should support individually terminated single-mode fibers into ST type connectors. All connectors shall comply with the following specification for attenuation: Maximum loss of 0.8 dB per pair of mated connectors using SC/ST type connectors with single-mode fibers.

9. ACCEPTANCE TESTING

9.1 Definition

Before acceptance of any newly installed communications wiring, the cable will undergo several levels of testing to ensure that all materials and installation conform to standards included in this guide. This will include both the UTP and Fiber Optics systems. Failure to meet the attached guidelines shall constitute reason to reject entire site installation until all problems are resolved.

9.2 General

All recorded testing results should remain in the appropriate telecommunications closet. Follow the guidelines outlined in Section 10 in regards to the labeling of all cables and components. In general, test both cables and their corresponding connecting systems as a whole unit to ensure system integrity.

9.3 Unshielded Twisted Pair Testing

9.3.1 Visual Inspection

Visually inspect connections on cable to insure proper compliance with EIA/TIA 568B termination:

1. Connectors marked as Cat 5E compliant (Cat 5 when utilizing existing Cat 5 cables)
2. Proper color-coding checked on connectors.
3. Pairs shall have no more than 1/2" of factory twist at any connecting point.
4. Outer sheath shall extend beyond the point of physical restraint or clamp on any connector.

Inspect all exposed portions of the cable to insure a minimum of 4 times the cable diameter bend radius at any point.

Ensure no cable bundles or tie points display kinks, sharp bends, creasing or deformation of outer sheath, or signs of excessive pulling force.

Equip all conduit ends with bushings or other abrasion preventing devices. Cat 5E, fire rating, and UL classifications shall be present on all cables.

No conduit is needed, unless required by local code.

Ensure proper cable identification number, wiring closet, and other necessary markings are visible at each end of singular cables and at each multi-pair transition or cross-connect point or jumper. Labels shall be made with a factory printer approved for the purpose and will be placed as close as practicable to the

termination point at each end (not more than 2 inches from end of the sheath and the exposed twisted pair). Printed information on label should face upward for ease of reading.

9.3.2 Certification Requirements

All existing Category 5 (CAT5e/6) cable must be tested and shall be in compliance to CAT5e/6 standards as per TIA/EIA TSB 67. Category 5E cable shall be in compliance to 5E standards as per TIA/EIA TSB 67. All cable testing shall be accomplished with a Level 2-test set capable of 155 MHz or higher for certification.

9.4 Fiber Optic Circuits

Testing will involve all fiber optic material and components comprising the Backbone system. Testing should include all SC/ST connecting hardware in the IDFs and MDF. Acceptable levels of attenuation for terminated fiber cables are defined as those that are equal to or fall below expected levels. Expected levels are determined by calculating the attenuation of the cable according to manufacturer's specifications (and its known length) and by adding to that value 0.8 dB loss for each pair of mated ST connectors. If attenuation values of the equipment are in excess, the installer will correct and retest.

Test all fibers in both directions. The proper tool to perform fiber optic testing is an Optical Time Domain Reflectometer (OTDR) or approved optical loss test set operating at both 1310 and 1550 nm wavelength.

10. LABELING, CABLE STADANDARDS AND CABLE MANAGEMENT

10.1 Introduction

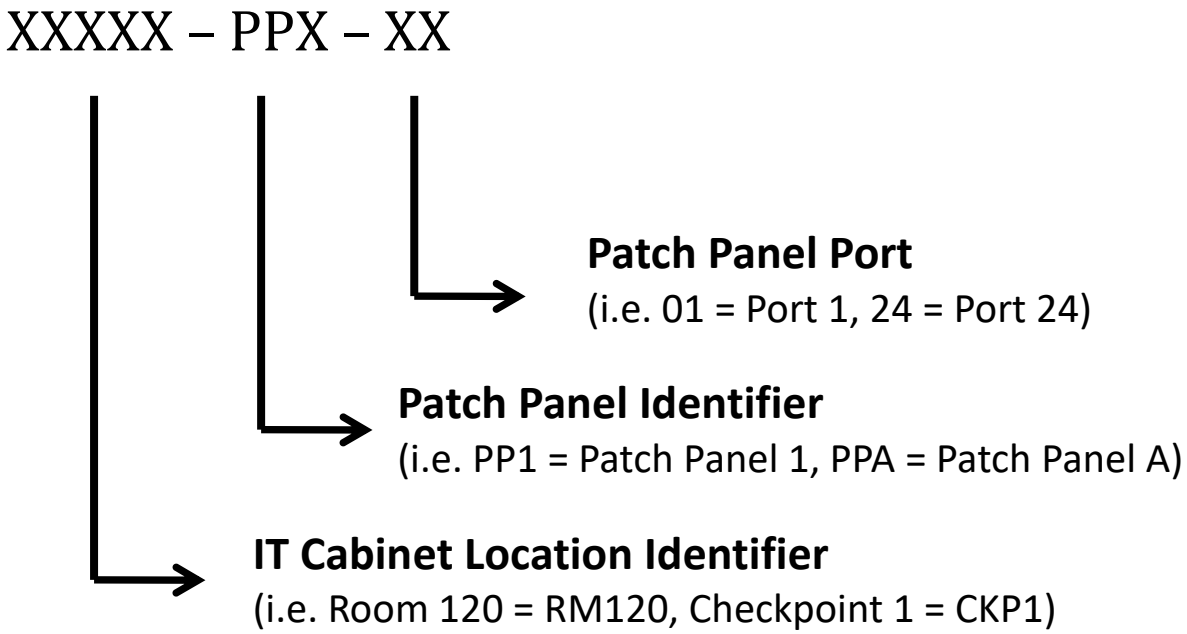
Physical labeling for all cables and related components is mandatory. The ability to locate, isolate, and manage required components will depend heavily on adhering to a logical labeling scheme to enable expedient patch panel, data jack and switch port identification. Additionally, installers should create records to retain labeling information to aid in the trouble shooting process. At a minimum, these should be manual paper records including the following components:

1. A permanent record of each CAT 5E/6 cable and fiber test shall be in each telecommunications closet.
2. A floor plan indicating telecommunications closets, cable pathways and work area outlets shall be in each telecommunications closet.

10.2 Labeling

Data Jack Labeling

Each data jack label will include information pertaining to the cabinet location, patch panel number and patch panel port. The label scheme below is required to be placed on all data jacks and on the horizontal cable near the termination point of the patch panel.



EXAMPLE: RM120-PP1-24 would denote the horizontal cable terminated to this data jack is also terminated to the IT cabinet located in Room 120 on patch panel 1 port 24.

Patch Panel Designation

Each patch panel shall be labeled from top to bottom ensuring the upper most patch panel is designated as either ‘A’ or ‘1’ and preceding panels follow in sequential order.

Patch Cable Labeling

An IT cabinet may have several hundred patch cable connections between multiple patch panels and network switches. In order to ensure traceability between patch panel ports and the switch ports, patch cables are required to be labeled at both ends. The patch cable will be labeled with the appropriate patch panel and patch panel port designation at the switch end as well as the switch, switch blade and switch port at the patch panel end (see the below diagram).

Patch Panel & Port Designation

The patch panel and port designation will follow the same naming convention notated above.

'PPX' identifies the appropriate patch panel (i.e. PP4 – patch panel 4)

'PXX' identifies the specific patch panel port (i.e. P22 - patch panel port 22)

EXAMPLE: PP3-P22 would denote Patch Panel 3 - Port 22

Switch, Switch Blade & Port Designation

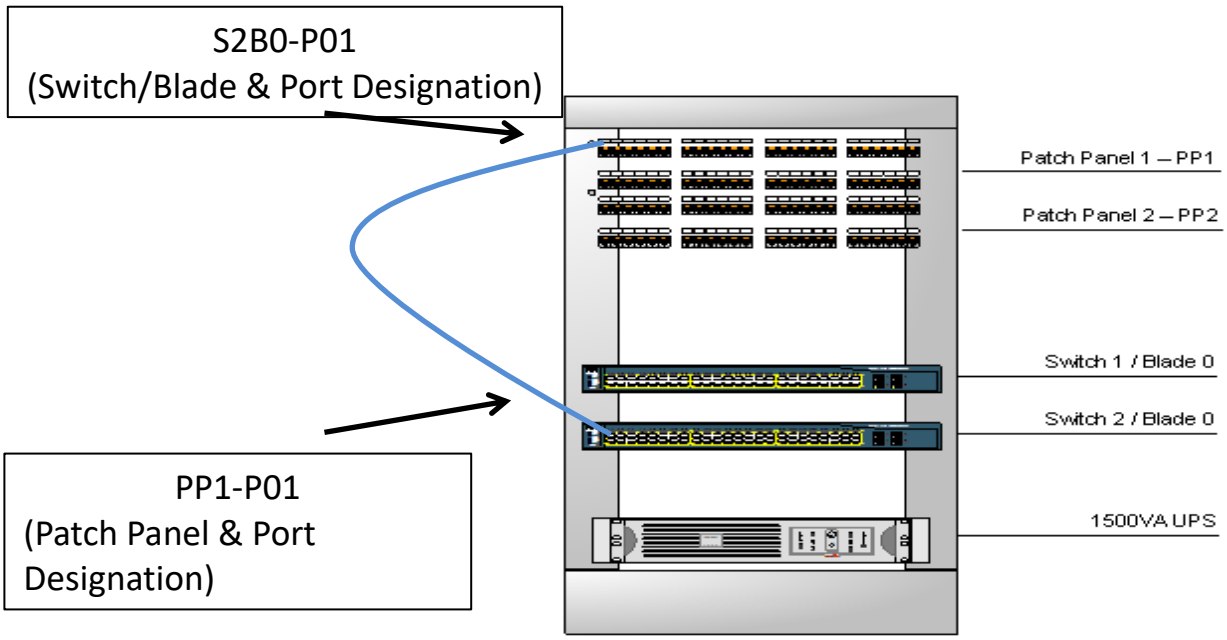
SXBX-PXX is the required labeling scheme to designate the switch, switch blade and switch port on a patch cable. The switch and switch blade identifiers are similar to a patch panels following a sequential order by their placement in the rack from top to bottom. The blade designation is only required when a switch houses multiple blades within its chassis. When a switch does not contain a blade a zero shall be used as a place holder.

'SX' denotes the switch (i.e. S1 = the top most switch)

'BX' denotes the switch blade (i.e. B4 = the fourth blade within a single switch)

'PXX' identifies the appropriate switch port (i.e. P13 = port 13 on the switch)

Typical IT Cabinet Patch Cable Labeling Scheme



Proper cable management would ensure accurate air flow, ease of troubleshooting and maintenance, not to mention, aesthetically pleasing. (See Figure 1)

10.3 Cable Standards

- Cable Category: Cat 6 or Cat5e cables will be required for all horizontal cabling.
  a. Local code and pre-existing cable type will dictate cable specifications

- Cable Types
  a. Straight-through Cable Gray, Bootless, Snagless
  b. Crossover Cable Blue, Bootless, Snagless

- Cable organizers shall be organized between a patch panel and a switch as reflected in Figure 3

- Cable Length
  a. Use only proper length cable between devices in order to minimize excess cable in the wire management trays.

10.4 Cable Management

- Straps
  a. Only use network cable approved straps. (See Figure 2)
  b. Zip ties or twist ties should not be used on network cables.
  c. Straps should be spaced at appropriate distance to ensure cables are held tight together.

- Cable management
  a. Vertical and horizontal cable organizers should be used where appropriate to ensure cables are organized in orderly fashion.

- Cable management arms
  a. Cable management arms are discouraged, since they restrict air flow.

- Cable flow directions.
  a. Cables should be divided in the middle, where half flows to left and half flows to right (Figure 3).
  b. Network switch top row cables should go to upper cable management organizer (Figure 4).
  c. Network switch bottom row cables go to lower cable management organizer (Figure 4).

- Labeling Device
  a. Manufacturer labeler is required (i.e. Dynamo, Brother) that prints in a clear typed font. (Hand written cabling identification information is NOT permitted.)
  b. Label type: Nylon
  c. Colors: Black letters on white background

Figure 1. Proper Cable Management

Figure 2. Network Cable Straps

Figure 3. Cable Flow directions

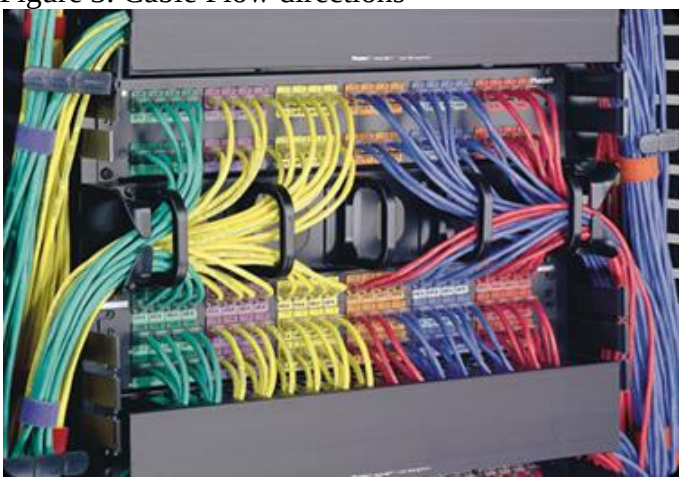
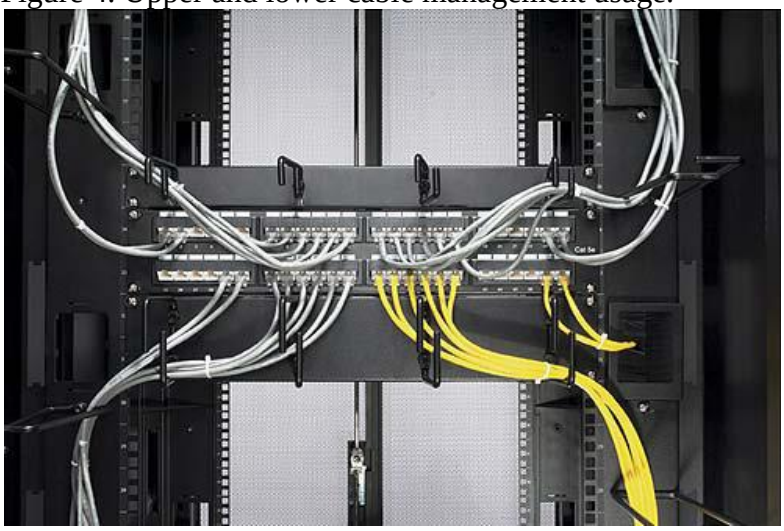


Figure 4. Upper and lower cable management usage.



11. FIRESTOPPING

11.1 Definition

This section describes methods, materials and considerations for re-establishing the integrity of fire-rated architectural structures and assemblies (i.e. walls, floors, ceilings) when pipes, conduits, inner-duct, cables, cable tray, ducts, and other items penetrate these barriers.

11.2 General information

Firestop systems need to provide a complex balance of thermal resistance, thermal conductivity, adequate sealing at high temperatures, and durability to survive the turbulence of fire and the rapid cooling and erosive impact of a hose stream. A firestop system must provide an appropriate balance between durability, ease of installation, and ease of maintenance.

11.3 Requirements

Firestop all penetrations with appropriate materials in accordance with manufacturer's specifications, NFPA practices, applicable codes, statutes and ordinances with NELSON, 3M or HILTI CIBA products.

11.4 Specifications

Firestop systems can be divided into two broad categories:

Mechanical systems consist of pre-manufactured elastomeric components, shaped to fit around standard cables, tubes, and conduit. The elastomeric modules fit around the penetrating elements and arrayed within a frame.

Non-mechanical systems come in a variety of forms, each having desirable properties for a specific situation. Several firestop materials are available in the form of putty and may be in a variety of forms; i.e., bars, pads, sticks, tubes, or cans.

11.5 Approved Material Types

- Elastomeric components - used in pre-manufactured mechanical systems.
- Putties - may use in conjunction with ceramic fiber or rock wool.
- Caulks - dispensed in tube form.
- Cementitious materials - supplied as a dry powder to be mixed with water or, in some cases, premixed.
- Intumescent sheets - usually used in conjunction with caulk or putty, to fabricate a honeycomb-partitioned opening for cable or conduit.
- Intumescent wrap Strips - used to wrap plastic or metal piping, or cable bundles that may burn away and leave a significant void.
- Pre-manufactured pillows - contain a specially treated, compressible matrix, which, when exposed to fire, the matrix within the pillow swells to provide further sealing.
- Silicone foam - dispensed from pressurized containers.

11.6 Selection criteria

When selecting a qualified system, take into account the following:

- Consider the actual conditions tested and covered by the system.
- When substituting one manufacturer's system for another manufacturer's system, ensure the firestop materials selected are appropriate for the actual conditions.
- Never substitute products of a qualified firestop system with another manufacturer's products. (Products from one manufacture's system are not interchangeable with products from another manufacturer's system.)
- A firestop material capable of sealing against the passage of smoke and toxic gases through the penetration is highly desirable.

12 TELECOMMUNIATIONS BONDING AND GROUNDING REQUIREMENTS

Use the information set forth in this standard to design and install the telecommunications bonding and grounding system for all TSA structured cabling system installations. The primary intent of this standard is to provide direction for the design of new buildings as well reference for the renovation or retrofit of existing buildings (rehabs and upgrades). Telecommunications bonding and grounding is additional bonding and grounding specifically designed to support a multi-vendor, multi-product environment. Communications bonding and grounding serves to minimize electrical surge effects, augment electrical bonding, and lower system ground reference potentials.

The telecommunications grounding and bonding infrastructure originates with a connection to the main electrical service grounding electrode conductor and extends throughout the building to serve the LAN hub rooms and wiring closets. The five major components of the telecommunications grounding and bonding infrastructure are:

1. Telecommunications Main Grounding Busbar (TMGB)
2. Telecommunications Grounding Busbar (TGB)
3. Telecommunications Bonding Backbone (TBB)

4. Telecommunications Bonding Backbone Interconnecting Bonding Conductor (TBBIBC)
5. Bonding conductor for telecommunications

The TMGB and TGB are copper busbars that allow for the termination of the TBB conductor. The TMGB size should be in accordance with the immediate requirements of the application and with consideration for future growth. Typically, there should be a single TMGB per building. Minimum dimensions shall be .25 inches thick x 4 inches wide x 12 inches long. Minimum dimensions for the TGB shall be .25 inches thick x 3 inches wide x 12 inches long. Both TMGB and TGB shall be pre-drilled copper with standard NENIA bolthole sizing and spacing for two-hole compression type connectors. The TMGB and TGB shall be wall mounted and isolated from the supporting structure by a minimum of 2 inches.

Bond all metallic raceways for telecommunications cabling located within the hub room or closet to the TMGB or TGB. All connections of TBBs to the TGMB and TGB shall utilize listed two-hole compression connectors. If an electrical panel board for telecommunications is within the hub room or closet, bond the panel board's Alternating Current Equipment Ground (ACEG) bus (when equipped) or the enclosure to the TMGB or TGB. Bond each equipment rack within the hub room or closet to the TGB with a separate #6 AWG insulated stranded or solid copper conductor. Locate the TGB so the grounding conductors are as short and straight as possible.

The TBB is a conductor that interconnects all TGB's with the TMGB. The system designer may allow the installation of the TBB in the same pathway (cable tray) as the telecommunications backbone pathways. The TBB's main function is to reduce or equalize potential differences between telecommunications systems bonded to it. The TBB shall be an insulated copper conductor marked appropriately by a distinctive green color. Install the TBB in a metallic raceway if it passes through a plenum rated air space. The minimum size TBB conductor used to interconnect the hub rooms and/or closets shall be 3/0 AWG. The minimum size TBB conductor used to bond the equipment racks and conduits within the hub rooms and closets shall be #6 AWG. Protect the TBB conductors from physical and mechanical damage. If metallic conduit is used it shall be bonded at both ends with a minimum #6 AWG conductor.

Permanently label each 3/0 AWG TBB used to interconnect the hub rooms and closets as close as practicable to their point of termination. The label should indicate either source or destination and will include the statement "Do not disconnect". Bond the TBBs together with a TBB interconnecting bonding conductor (TBBIBC) at the top floor and at a minimum of every third floor in between when two or more vertical TBB's are used within a multistory building. The minimum size of the TBBIBC shall be 3/0 AWG.

Additionally, TSA standards require an RJ-45 grounding receptacle located within the Flex Panel that has all pins connected together and bonded to the TGB. This connector should be green and labeled "Static Discharge".

13. TSA CABINET SPECIFICATIONS

13.1 Cabinet Electrical Specifications

The installed equipment determines the electrical power requirements for the cabinets. The 25U cabinet requires an L5-30R receptacle, a locking 120V 30A receptacle. The power cord for the 3kVA uninterruptible power supply (UPS) is 6 feet long. The 42U cabinet requires an L6-30R receptacle, a locking 208V 30A receptacle. The power cord for the 6kVA UPS is 8 feet long.

Locate the electrical supply so the UPS can be plugged in without the cord lying on the floor to prevent tripping or walking on, which could damage the supply cord or unplug it (National Electrical Code NEC). Install the electrical supply circuits originating from over the equipment cabinets to terminate with the receptacles being approximately 24 inches from the floor. This enables the electrical connection to be inside the security of the cabinet. Ideally, the 42U cabinet should hardwire directly to the UPS electrical power input terminals. This would be a two-wire plus ground, 208V 30A circuit using #8 sized conductors.

13.2 Cabinet Size Specifications – Open Racks

Examples associated with this information, are not to be construed, in any way, as of any type of an endorsement, for any Vendor and/or Product. Examples are for example information only.

Note: "Open Racks" can only be used when an independent TSA MDF or TSA IDF IT Room (10'x10' or larger), is being utilized, and is also "TSA Controlled Space". Smaller dimension rooms, may be adequate, if only 1 cabinet is used.

Use of "Open Racks" is preferred in new Office Building or Airport MDF/IDF environments, to contain the TSA Router, Cisco Switches, UPS, Patch Panels, and other miscellaneous TSA IT related equipment.

Keep in mind, that Open Racks are only to be used when there are only TSA entities, (TSA IT and/or TSA Physical Security) in the IT Room. When outside entities are also in the Room, a Closed Cabinet or Closed Rack is preferable. Consult the TSA OIT FRM (Field Region Manager), for additional information.

When Open Racks are utilized, the **45U**/4-Post Frame is used to house the Switches, Verizon Router, TSA Network Server, UPS, and other TSA Network connectivity associated devices. In smaller installations, these can also contain the Patch Panels. There will be 1, or more of these installed, based on requirements.

An **example** of the **45U**/4-Post is the *Chatsworth 50120-703* *or* https://objects.eanixter.com/PD375912.PDF

For the Cat5E/Cat6 **Patch Panel** management, at locations with larger cabling requirements, a **45U**/4-Post or **45U**/2-Post Relay Rack, can be used. One of these, can easily accommodate 8 Patch Panels, which can manage 384 Cable Runs (Cat6). POTS lines and Fiber Patch Panels can be terminated into in this Rack, as well.

An **example** of the **45U**/2-Post is the *Chatsworth 55053-703* *or* https://objects.eanixter.com/PD375937.PDF

13.3 Cable Management for Open Racks

When using these Open Racks, appropriate Vertical / Horizontal Cable management, should be utilized.

Note: Either Double-Sided or Single Sided sections are used, based on specific requirements.

- Below are some **Examples** of Vertical Cable Management for the **45U** Racks:

Cabling Sections	
Part Number	**Description For 7'H (2.1 m) 45U Racks W x D - in (mm)**
MCS Master Cabling Section	
30092-703	MCS, Single-Sided, 6 x 8.08 (150 x 205)
30093-703	MCS, Single-Sided, 10 x 8.08 (250 x 205)
30095-703	MCS, Double-Sided, 6 x 16.15 (150 x 410)
30096-703	MCS, Double-Sided, 10 x 16.15 (250 x 410)

Links – 30092-703 (6" Single) 30093-703 (10" Single) 30095-703 (6" Double) 30096-703 (10" Double)
Vertical Cable Management Spec Sheet

- Below are some **Examples** of Horizontal Cable Management for the **45U** Racks:

Universal Horizontal Cable Manager, Single-Sided	
30130-719	UHCM, Single-Sided, 2U x 5.14 (130)

Universal Horizontal Cable Manager, Double-Sided	
30530-719	UHCM, Double-Sided, 2U x 11.73 (297)

Links – 30130-719 (Single Sided) / 30530-719 (Double Sided) / Horizontal Cable Management Spec Sheets

Examples of Open Cabinets:

MDF with 1 Open Rack - Using 4-Post	MDF with 2 Open Racks - Using 2 and	3 Open Rack Elevation and Comp	IDF Options - 1ea 4-Post Rack or 26U \

13.4 Cabinet Sizes Specifications – Wall-Mount Cabinets

In some circumstances, due the limited IT Room Sizes, Shared IT Rooms, no separate IT Rooms available, etc., the use of a Wall Mount IT Cabinet is appropriate. These can be used for both TSA MDF and IDF applications. Minimum Room size requirements for these installations is 8'x8'. In many cases, the IT Room will need to accommodate both TSA IT and TSA Physical Security equipment, as well an outside entity, such as when ASL (Automated Screening Lane) Servers/Cabling, are being installed. In these cases, the IT Room will need to be more in the 10' x 15' size, or larger.

These are standard size 19" Wide "Mounting Width", (24" – 27" overall) Wall-Mount IT Cabinets, which can range from 12U, and go up to 40U. The commonality of these cabinets, is that they are typically 30' Deep. This is to accommodate the current depth of the TSA/Cisco 3650 Switch.

There are numerous manufactures of these models, but here are some **Examples**:

CHATSWORTH PRODUCTS INC (CPI) | 12419-724 Wall Mount, **12U**, 24" Width x 30" Depth x **24**" Height

CHATSWORTH PRODUCTS INC (CPI) | 12419-736 Wall Mount **18U**, 24" Width x 30" Depth x **36**" Height

CHATSWORTH PRODUCTS INC (CPI) | 12419-748 Wall Mount **26U**, 24" Width x 30" Depth x **48**" Height

CHATSWORTH PRODUCTS INC (CPI) | 13496-760 Wall Mount **33U**, 27" Width x 30" Depth x **60**" Height*

CHATSWORTH PRODUCTS INC (CPI) | 13496-772 Wall Mount **40U**, 27" Width x 30" Depth x **72**" Height*

*The 60" and 72" Wall Mount Cabinets have the option to have an internal Vertical Cable Manager installed.

These are the Product Data Sheet w/Specs for this particular vendor, with complete specs for these Wall Mount Cabinets.

Another good resource **Example**, is the CPI Solutions Guide, which covers a wide variety of products and accessories. Other manufacturers also have similar guides, products, and solutions, which are permissible.

Vertical Cabinets are also permitted, when required, and here is an **Example**:

5U Vertical Wall-Mount Rack Enclosure Cabinet, Low-Profile, Server Depth, 36" Deep (SRWF5U36) – Cabinet is lockable. Approximate dimensions 10"D X 43"H X 26"W
https://www.tripplite.com/smartrack-5u-low-profile-vertical-mount-server-depth-wall-mount-rack-enclosure-cabinet~SRWF5U36

13.5 Cabinet Sizes Specifications - Closed Racks

The three (3) cabinet sizes approved for creating the secure physical environment for the TSA network electronic are designated as 42U, 32U and 25U. These are used for both MDF and IDF applications. The complete dimensions of the cabinets are shown in the following table:

Cabinet	Height (in.)	Width (in.)	Depth (in.)	Weight (lbs.)	Access (in.)	Footprint (in.)
25U	51.70	23.50	35.50	245	30.00	83.5w *x* 95.5d
32U	63.50	26.00	42.88	295	30.00	86w *x* 103d
42U	81.50	23.50	42.20	359	30.00	83.5w *x* 103d

Table Notes:

The (U) identifier in the Cabinet field speaks to the useable vertical space available in the cabinet to install the electronic equipment. A U is equivalent to 1.75 vertical inches.

The weight is the dry standing weight of an empty cabinet.

The access dimension is representative of the depth of the largest piece of electronic equipment in the cabinet. The access number represents the additional space necessary to allow equipment installation from the front and rear of the cabinet.

The required footprint for a cabinet would consist of the width and the depth plus twice the access distance (recommended). (Accurate access dimensions are determined in the lab by which piece of equipment is installed from the front and from the back of the cabinet).

All floor-standing cabinets will have a seismic kit shipped with them. All cabinets will be secured to the floor or wall and meet seismic zone 4 rating.

Equipment must be loaded into the rack at the location where the cabinet is installed. Equipment is loaded into the cabinet from the front and the back.

Side access is not required though it may increase the ease of cabinet configuration.

13.6 Cabinet Air Conditioning Requirements

A fully loaded 42U rack will generate 15,500 BTUs of heat per hour. That will require approximately 1 ton of air-conditioning per hour of conditioned air to maintain the 85° maximum temperature in the space. A fully configured 25U cabinet will generate 5,500 BTUs of heat per hour. That will require approximately .5 tons of air-conditioning per hour or 225 cubic feet of conditioned air per hour to maintain the 85° maximum temperature in the space.

14. GLOSSARY

ADAPTER - A device that enables different sizes or types of plugs to mate with one another or to fit into a Telecommunications outlet, provides for the rearrangement of leads, allows large cable with numerous wires to fan out into smaller groups of wires, or makes interconnections between cables.

ADMINISTRATION - The method used for labeling, identification, documentation and usage to implement moves, additions and changes of the telecommunications infrastructure.

BACKBONE - A facility between telecommunications closets, the entrance facilities, and the equipment rooms within or between buildings.

Balun – A small passive device that provides the physical and electrical interfaces between electrically balanced twisted pair and electrically unbalanced coaxial cable.

CABLE - An assembly of one or more conductors or optical fibers within an enveloping sheath, constructed to permit use of the conductors singly or in groups.

COMMERCIAL BUILDING - A building that is office oriented.

CROSS-CONNECT - A group of connection points, wall or rack mounted, used to mechanically terminate and administer building wiring.

MINIMUM POINT OF ENTRY - This is either the closest practical point where the carrier facilities cross the property line or the closest practical point where the wiring enters a multiple-unit building or buildings.

OPTICAL CROSS-CONNECT - A cross-connect unit used for circuit administration. It provides for the connection of individual optical fibers with optical fiber patch cords.

OPTICAL INTERCONNECT - An optical administration field that provides for the direct connection of individual optical fibers of an optical fiber cable to another cable or to an equipment cable without a patch cord.

OPTICAL FIBER CABLE - An assembly consisting of one or more optical fibers (glass or plastic) with strengthening material, and an outer jacket.

PATCH CORD - A length of wire or optical fiber cable with connectors on each end used to join communications circuits at a cross-connect.

PATCH PANELS - A system of terminal blocks, patch cords, and backboards that facilitates administration of cross-connect fields for moves and rearrangements.

PRIVATE BRANCH EXCHANGE (PBX) - A private switching system usually serving an organization, such as a business or government agency, and located on the customer's premises. It switches calls both inside a building or premises and outside to the telephone network and can sometimes also provide access to a computer from a data terminal.

TELECOMMUNICATIONS - Any transmission, emission, or reception of signs, signals, writings, images, and sounds, or information of any nature by wire, radio, visual, optical, or other electromagnetic systems.

TELECOMMUNICATIONS CLOSET - A telecommunications closet is a floor-serving facility for housing telecommunications equipment, cable terminations, and cross-connect wiring. The closet is the recognized transition point between the backbone and horizontal pathway facilities.

TELECOMMUNICATION OUTLET - A connecting device located in a work area on which horizontal wiring system cable terminates and which can receive a mating connector.

TOPOLOGY - The physical or logical configuration of a telecommunications system; i.e., a local area network,

TRANSITION POINT - A location in the horizontal wiring where flat cable connects to round cable.

WORK AREA - A building space where the occupants interact with telecommunications terminal equipment.

WORKSTATION - A workstation is a building space where the occupant normally interacts with telecommunications equipment. The telecommunications outlet in the work area is the point at which end-user equipment "plugs into" the building telecommunications utility formed by the pathway, space, and building wiring system.

15. ACRONYMS

ANSI American National Standards Institute
ASTM American Society for Testing and Materials
AWG American Wire Gage
DTE Data Terminal Equipment
EIA Electronic Industries Association

IC Intermediate Cross-connect
IDF Intermediate Distribution Frame (Telecommunications Closet)
IEEE The Institute of Electrical and Electronics Engineers

ISO International Organization for Standardization
LAN Local Area Network
MC Main Cross-connect
MDF Main Distribution Frame (Hub Room)
NEC National Electrical Code
NEXT Near End Crosstalk
NFPA National Fire Protection Association
SCS Structured Cabling System

TC Telecommunications Closet
TIA Telecommunications Industry Association
UTP Unshielded Twisted Pair
VTC Video Teleconferencing

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