DIIT
Voice/Data Cable Infrastructure Specifications

Version 7.3.5 (8-22-13)
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## About this Revision

<table>
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<th>Version</th>
<th>Description</th>
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<tbody>
<tr>
<td>Version 7.2:</td>
<td>This document, Version 7.2, modifies Revision 7.1 in one significant way: the diagram of Full School Cabling, now on page 13 (formerly on page 12), shows only one (1) 30 amp outlet on its IPDVS cabinet instead of the former two (2), to reflect changes in the current version of the IPDVS document.</td>
</tr>
<tr>
<td>Version 7.3</td>
<td>This document, Version 7.3, modifies Version 7.2 in the following ways: Sections 9, 10 and 11 have been revised, with a considerable amount of appended text. The diagram of the IDF in Section 10 has been thoroughly revised. And, APPENDIX 4 has been revised to make its description of cable labeling and termination practices more accurate and concise.</td>
</tr>
<tr>
<td>Version 7.3.1</td>
<td>This document, Version 7.3.1, modifies Version 7.3 in the following ways: new fiber standards for connection of the IDF to the MDF for voice have been added. Clarification has been made regarding the minimum square footage of the MDF and IDF room with minor revisions made to various diagrams in the main body of the text.</td>
</tr>
<tr>
<td>Version 7.3.2</td>
<td>This document, Version 7.3.2, modifies Version 7.3.1 in the following ways: it changes certain specifications, so that six (6) Category 6 cables will be used for the copper voice riser; the Cat-3 riser and its associated 110 block termination have been eliminated.</td>
</tr>
<tr>
<td>Version 7.3.3</td>
<td>Added text to clarify the use of Category-6 cables installed between the MDF and each IDF.</td>
</tr>
<tr>
<td>Version 7.3.4:</td>
<td>This document, Version 7.3.4, modifies Revision 7.3.3 to update new fiber cable standard and fiber connector standard to support the expected 10 Gbps bandwidth requirement</td>
</tr>
<tr>
<td>Version 7.3.5</td>
<td>Due to the new telephony requirement for PRI service, it is now necessary to increase the electrical requirements in the IDF room. In Section 13, “Power Requirements for the MDF and IDF,” “Concerning the IDF,” item 1) has been changed from “three (3) duplex” to “three (3) quads”</td>
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Voice/Data Cable Infrastructure Specifications

I. Overview

The Department of Education is committed to providing a high bandwidth backbone in each building and school. All new cabling in buildings and schools must adhere to the latest specification of requirements for voice and data cabling published by the Division of Instructional and Information Technology (DIIT). This document specifies cabling infrastructure standards for various NYCDOE locations. Some are made in the context of new building construction, and some in the area of existing construction. Readers should discern the differences and use the sections that apply to their particular areas of discipline/concern. Although each site is different, and care must be taken to account for special needs if they exist, for the most part these standards conform to ANSI TIA/EIA-568-B documents. There are some additional requirements, and, in some cases, minor exceptions to the published TIA/EIA standards.

The Division of Instructional Information Technologies/Office of Telecommunications Services (DIIT/OTS), the School Construction Authority (SCA), and Contractor(s) will provide project management for all phases of installation activity. They are responsible for coordinating job actions, all communications pertaining to the job site and act as the principals through which deliverables and job progress are monitored.

In new construction, it is advisable that the OTS be included in the Design Development Review process from the 50% submission phase to the 100 % review. This will help ensure that any scope of work includes the parameters defined in this voice standard.

In addition to core requirements, this document also contains guidelines for implementation practices. These guidelines were developed through the course of many school installations. Each site is different and care must be taken to account for special needs, on a site-by-site basis. The SCA, Contractor and OTS project management teams must work closely with the School's principal, the site administrators, and custodians to insure a successful installation of voice/data infrastructure.

Reference is also made to the Main Telecommunications Closet and Intermediate Telecommunications Closet. These rooms are also known as the equipment room, MDF and IDF. Typically, the main telecommunications closet houses centrally located voice and data (LAN) cabling and equipment as well as other electronic equipment including cabling for video surveillance system, and various building alarm systems. The Intermediate Telecommunications Closet houses voice and data station wiring plus some passive and active LAN equipment. Project managers/officers should be cognizant that future hardware may be located in these rooms, and should familiarize themselves with DIIT installations that have fully populated equipment rooms. The MDF should never be located in the basement, cellar, top floor or the roof of a building. This requirement is necessary to avoid water damage and other hazards to the equipment.
This standards document is an evolving document. The references within this document are subject to revision and modification 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 prior to development of construction requirements and/or installation or construction of voice- and data-related cabling in the Department of Education locations.

2. **Cabling Infrastructure for Voice and Data**

These cabling specifications include horizontal and backbone wiring for both a telephone system and building-wide LAN infrastructure. All “horizontal” copper wiring from an MDF / IDF to a classroom, office or other will utilize Category 6 cabling for both voice and data drops. Riser cabling, for both voice and data, will utilize 50μ Multi-Mode (50 Micron OM3 spec) Fiber. In addition to this fiber backbone, six (6) Category-6 cables will be installed between the MDF and each IDF to provide a copper voice backbone for analog and/or other out-of-band network devices that require copper connectivity to the MDF room. Details will be provided later in the document.

The Department of Education expects the SCA cabling contractors to adhere to specifications found in the latest revision of the ANSI/TIA/EIA Standard entitled, "Commercial Building Telecommunications Cabling Standard", TIA/EIA-568-B and all relevant Addenda. The Department requires that all components including cable, connectors, outlets and patch cords meet or exceed applicable performance standards adopted by the TIA/EIA.

All station wiring shall be four 4-pair, Unshielded Twisted Pair (UTP), Category-6 cable with legible color coding of conductors, and in specific instances, 50/125μ, multi-mode, and multiple strand fiber optic cable. All UTP, fiber optic cable, patch panels and other components must adhere to performance levels specified in the TIA/EIA-568-B Standard. All cable must be approved by the Underwriters Laboratories, Inc. and must bear exterior jacket markings indicating type, category classification if applicable, fire rating of jacket material, number of conductors/strands, and gauge or thickness of copper or fiber pairs. In addition, patch panels and other components will be documented and labeled for compliance. All station outlets and MDF/IDF terminations must be labeled and all circuits clearly identified utilizing designation strips in compliance with the EIA/TIA 606 standards. A permanent-labeling machine, compliant with TIA/EIA 606 labeling standards must be used. Please refer to Cable Tags and Termination Labels detailed in Appendix B.

At the telecommunication room’s MDF and/or IDF (depending upon cable design), the SCA cabling vendor will terminate every pair of every voice and data cable on Category-6 compliant patch panel(s). Voice and Data cables will be cut down on Category-6 compliant patch panels with Cat-6 RJ-45 type, eight conductor, and modular receptacles.

3. **Horizontal Cabling and Terminations – Administrative Areas**

Voice and data drops in Administrative Areas shall consist of two (2) four-pair cables; one a Category-6 designated for voice, and the other a Category-6 cable designated for data for each
user in the general office. Additional Category-6 cable station runs may be required for administrators located in offices throughout the building and other school staff responsible for some aspect of school operations. Some examples include custodial work areas, nutritionist, school nurse, school safety, elevator equipment rooms, boiler rooms, fan rooms and building entrance and exit doors. Specific locations will be determined during the building design phase by the school contact and the SCA Project Manager.

The station shall be terminated on a duplex combination faceplate consisting of two of the Cat-6 RJ-45 type, modular, and eight conductors, outlets configured and terminated as per EIA/TIA jack designation T568B.

The voice and data modular Cat-6 RJ-45 inserts shall be color coded to differentiate the two. Consistency must be maintained from site to site in a series of installations. A blue insert for voice, a red insert for data, and an orange insert for IPDVS are recommended,

4. **Horizontal Cabling and Terminations – Instructional Areas**

Wall phone station cable in the classrooms shall be Category-6 cable. All (4) pairs of the cable will be terminated on a wall mount. Generally, this outlet will be placed in a lock-box, on the far, window-side of the classroom, near the classroom instructor’s desk, so as to provide greatest accessibility. The exact location of the outlet will be as specified by the DOE during K-plan preparation. The lock-box used must provide a means to connect a modular ITT 2554-type wall telephone with a message-waiting lamp. Data cable stations within classrooms and high-density areas shall be six Category-6 cables and in some isolated cases (defined later in this section) a six-strand, multi-mode 50/125µ fiber optic cable. To the extent possible, the Category 6 cable runs should be run near allocated electrical outlets. Specifically, the cabling runs should be allocated as follows, illustrated in Figure 4-1:

- One run placed near an electrical outlet nearest to the classroom entrance
- Two runs placed near an electrical outlet nearest the corner of the room that has the teacher’s desk
- Two runs located near the cluster of electrical outlets dedicated for classroom computers in the back of the room
- One run to be terminated directly in the Wireless AP NEMA enclosure. Occasionally, rooms larger than 1250 square feet will require a second wireless access point (WAP). This represents a change from current practice in which large rooms always required at least two WAPs. The change is a consequence of the new Next Generation Wireless architecture currently being deployed. With Next Generation Wireless, one WAP will often be adequate, even in large rooms. Rather than have integrators perform their own RF survey in large rooms to determine the best location for the second WAP as has been done in the past, SCA will work with DIIT engineering to determine the location of WAPs in large rooms in ever school before any wiring is done.
At the telecommunication room end, all cable and pairs shall be terminated on Category-6 patch panels. All termination points shall be Cat-6 RJ-45 type, modular, eight conductors, with outlets configured as per TIA/EIA jack designation T568B.

Figure 4-1: Typical Classroom Wired Drop Layout

5. **Patch Panels**

The patch panels provide physical connectivity from the MDF/IDF to desktop locations. Each desktop location is equipped with a category six (Category-6) wiring receptacle. Workstations use a Category-6 patch-cable that extends from the LAN adapter to the local wiring receptacle. The patch panel also provides easy cross connections to the core network equipment that is
housed in the MDF/IDF cabinets. The patch panels are housed in the Main Telecommunication Room patch panel rack.

There are separate patch panels installed for voice and data, with the voice patch panel installed above the one for data.

**All patch panels should be Category-6. Be sure to fully populate all jacks, even if all are not in initial use.**

6. **Horizontal Cabling and Terminations – High Density Areas**

Computer Labs and libraries/media centers are referred to as high density areas. These rooms often support multiple desk-top computers connected to a small switch. These rooms will receive a fiber run to guarantee a high speed connection from the switch in addition to the Category-6 data drops described above. The fiber run will consist of a six strand 50/125-μ multi-mode fiber optic cable (50 Micron OM3 spec), run from the designated classroom/office directly to the MDF. Termination of fibers in high-density areas must be with LC connectors mounted within a duplex fiber communication outlet or a combination faceplate in conjunction with one or more of the Category-6 cable(s). **The fiber optic cable shall be terminated within the Wall Cabinet.** In general, this fiber run will include one termination in each high-density area. The DOE Project Manager will work with site administration to determine the appropriate numbers on a site-by-site basis.

7. **Riser Cabling and Terminations**

Riser cabling for data consists of 24 strands of 50/125-μ multi-mode fiber optic cable, running from the main telecommunications room or MDF to each intermediate telecommunications room or IDF. **Fiber Optic Cable (24-Strand) – shall be terminated at the MDF in rack mounted interconnect units with LC type connectors and shall be terminated at the IDF in rack mounted interconnect units with LC type connectors**

Additionally, 6 strands of multi-mode fiber should be used for voice connectivity. Termination at Intermediate Telecommunications Room and Main Telecommunications Room shall be at a rack-mounted interconnecting unit. Individual strands will be fanned out and terminated with LC connectors in an interconnect plate with twelve interconnect sleeves, following proper manufacturer's specifications for bend radius and strain relief.

In addition to the fiber backbone, six (6) Category-6 cables will be installed between the MDF and each IDF to provide a copper voice backbone for analog and/or other out-of-band network devices that require copper connectivity to the MDF room. The Category-6 cables will be terminated on a 24 port Category-6 patch panel in each IDF; at the MDF these cables will also be terminated on Category-6 patch panels, port count dependent upon the total number of copper riser
cables installed. In all cases, the patch panel(s) will be mounted in the voice communication rack directly under the fiber optic interconnect enclosure. One (1) 1U horizontal wire manager will be installed immediately below the category 6 patch panel(s) in each room.

Refer to Figure 7-1 on the following page for an illustration of voice and data horizontal/riser cabling.

![Figure 7-1: Voice & Data Horizontal / Riser Cabling](image)

8. **Testing and Certification**

Category-6 station cable will be tested end-to-end (from jack faceplate to associated IDF or MDF termination) according to the methods and criteria defined in TIA/EIA-568-B and any subsequent addenda. The vendor must use the latest Cat 6 default test provided with the test equip-
ment. The SCA cabling vendor shall comply with TIA/EIA standards applicable at the time of job start-up, and price the installation accordingly.

Tests of UTP cable shall be conducted with Level II-E Field Test Equipment (FTE). Test results shall be printed for every cable run and results reviewed for pass/fail by the SCA cabling vendor prior to formal submission to the DOE for acceptance. Any cable run not meeting minimal requirements must be repaired or replaced, and then re-tested for compliance.

Fiber cable installation shall comply with the TIA/EIA component standards described in TIA/EIA-568-B.3. All strands shall be tested for end-to-end attenuation loss at 850 nm and 1300 nm. Procedure for the test shall use Optical Time Domain Reflectometers (OTDRs) and shall comply with EIA/TIA 526-14, Method B: Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant. Failed strands shall be corrected or replaced and re-tested. Test results shall be printed for each cable run and results reviewed for pass/fail by the SCA cabling vendor prior to formal submission to the DOE for acceptance.

9. **Main Telecommunication Room Requirements**

The SCA cabling vendor shall submit a drawing of the telephone equipment room, showing layout of all components including necessary electrical outlets, conduits, and environmental requirements and wire termination fields prior to the start of the job. The Main Telecommunications Room or Main Distribution Facility should be centrally located, be dedicated as a single-purpose room, and be located at building ground level or above.

The **MDF** will measure at least 300 sq. ft., and be dedicated as a single-purpose room. The MDF room may house any combination of a telephone, LAN/WAN, telco, video surveillance, and various building alarm systems. It should be dry, and at or above ground level. The room should also be accessible for wiring to and from the IDF. The MDF should not typically be located in the basement or cellar or on the top floor or roof of a building.

The MDF requirements include the following:

1) Should be centrally located, and measure at least 300 sq. ft.
2) Wherever possible, it should house entrance facilities and demarcation points for the various telecommunications systems serving the building and the central grounding equipment for the telecommunications equipment.
3) Access to this room should be tightly controlled via a non-master key or access control card reader.
4) The data, voice, security and intercom/master clock systems should have their head-end equipment located within this facility.
5) Consideration should be given to the room's layout to allow for expansion of the data network, location of additional systems as they come online, and possible location of technician work space to repair equipment, troubleshoot network problems, or assemble new equipment.

6) Floor-mounted standard open data equipment racks may be used in spaces where student/staff access is limited; otherwise data equipment cabinets should be used.

7) The MDF should be interconnected with all other telecommunications rooms with minimum of two (2) 3-inch conduit assemblies. Guidelines for these conduit systems can be referenced from TIA/EIA- 569-A.

8) The MDF should be located to minimize the number of IDFs, but not violate the "300-foot rule" (restriction of horizontal cable links to less than 100 meters or approximately 300 feet).

9) The MDF must contain three 42U open racks and one 42U equipment cabinet with appropriate vertical cable management between each rack. Space should be provisioned for a second cabinet and a cabinet installed if/when IP Digital Video Surveillance is implemented at the school. The set of racks and cabinets (including an IPDVS cabinet) should be aligned side-by-side and must have an open area measuring, at minimum, 3 feet around the perimeter of the equipment racks/cabinets. Refer to Figure 11-1 for the network equipment cabinet space and layout in the main telecommunications room.

10. **Intermediate Telecommunication Room Requirements**

The Intermediate Telecommunications Rooms (or Intermediate Distribution Facilities (IDF)) are single purpose rooms that are minimally 100-sq. ft. When choosing locations for new IDFs, they should be placed dedicated rooms without water/wash facilities. In addition to meeting footprint requirements, the location should have enough space, power capacity and HVAC to support infrastructure expansion. If wall mount cabinets are to be used, they are to be mounted, at most, 3 feet from the floor. If multiple Intermediate Telecommunication Rooms are utilized, stacked rooms or rooms located above each other are preferred. If wall mount cabinets are to be used, they are to be mounted, at most, 3 feet from the floor. If multiple Intermediate Telecommunication Rooms are utilized, stacked rooms or rooms located above each other are preferred. Ideally, horizontal Unshielded Twisted Pair (UTP) cables should be designed to run no more than 220 feet horizontally, measured from the IDF patch panel to the end-point/termination/jack. Consideration should be given for future expansion of telecommunication spaces and other systems without the need to assign new rooms for equipment. Adhering to industry standards for sizing IDFs based upon square footage of service area is recommended.

**IDF Data and Voice Racks**

Currently, there is a data rack in each IDF Room in a school. Moving forward, we wish to provide the room with a second rack to support voice equipment, and to provide enough space to walk around these two racks. For this reason, we require a minimum area of approximately 100 square feet for each IDF. A sample of a typical IDF configuration is shown in Figure 10-1, on the next page. Precise dimensions and interior placement will vary by school.
Figure 10-1: Sample IDF Configuration

Figure 10-2, on the next page, indicates a possible configuration of equipment in both the IDF Data and Voice Racks. The actual configurations of both IDF racks vary from school to school, depending upon the needs of a particular building.

There is a 24-fiber interconnect panel terminating at the top of the data rack riser termination, as shown in Figure 10-2. The IDF data rack contains 48-port patch panels and switches. These devices support both wired and wireless equipment (e.g., desktop computers, printers, wireless access points, etc.). Switches supporting wireless equipment must provide in-line power. The number of patch panels and switches will vary by school, and scale in direct proportion to the number of devices that must be supported. Fiber-optic cable connects the IDF data switches to the MDF.

There is a 24-fiber interconnect panel terminating at the top of the voice rack riser termination, as shown in Figure 10-2. The IDF voice rack will contain 48 port patch panels and various configurations of voice switches. In the case of a large high school, the rack may also include voice server equipment. The number of patch panels and switches will vary by IDF, school, and scale in direct proportion to the number of devices that must be supported.
Figure 10-2: IDF Data and Voice Racks
11. **Equipment Placement Guidelines**

1) Distribution racks and cabinets should be placed with proper consideration to clearances around the equipment, taking into account sources of EMI (electromagnetic interference), technician workspace, and sufficient walkways to avoid accidental disruption of service.

2) When IDF's cannot be dedicated to technology equipment, the data equipment should be partitioned away from other material or equipment by use of a lockable separation. If the space cannot be divided, then equipment cabinets for data equipment should be used instead of equipment racks.

3) Diagram 10-1 above is only illustrative; not every IDF will be precisely 10’x10’. As the dimensions of IDFs vary, so will rack placement within the IDF. Also, other equipment (e.g., cabinets for LONWORKS) may be required in some IDFs. However, some aspects of Diagram 10-1 apply to all IDFs:
   a) There will be two, free-standing 7-foot data racks, one for voice, and one for data, in each IDF.
   b) Space must be provided so that staff can get to all sides of the voice and data racks. The diagram shows spacing of 3 feet. If required, this can be reduced to 2 feet, but 2 feet on each side is an absolute minimum. Please note that these requirements apply only to the IDF. As indicated in section 9, voice and data racks in MDFs require 3 feet of clearance all the way around.
   c) Overhead ladder racks will be used to run cables to all the racks. These ladder racks will also be used for running power lines for the equipment placed in the racks.
   d) When IPDVS is deployed in a school, the IPDVS rack in the IDF is three feet high, and wall-mounted. It requires a minimum of 2 feet of clearance in front, allowing the front door to open, and a minimum of 6 inches of clearance on either side. These requirements apply only to the IDF. As indicated in section 9, MDFs require 3 feet of clearance all the way around.

4) Equipment that should be located within each IDF/MDF should include:
   a) Distribution racks or cabinets for mounting hardware.
   b) Termination fields for fiber optic, UTP, and coaxial cables.
   c) Core network equipment
   d) Switches for the Local Area Network.
   e) Amplifiers and other equipment for the CATV Distribution.
   f) Rack-mounted Uninterruptible Power Sources (UPS).

Figure 11-1: Full School Cabling / New Construction Cabinet Space and Layout, on the next page, is applicable only to the MDF.
Figure 11-1: Full School Cabling / New Construction Cabinet Space and Layout
12. **Telecommunication Rack Grounding**

The SCA cabling vendor will be responsible for properly grounding equipment in accordance with ANSI/TIA/EIA-607 and the NEC, including Article 800. All communications cabinets and racks at the Main Telecommunications Room and Intermediate Telecommunications Room must be grounded to a common earth ground with a minimum #6 AWG stranded copper line. Telecommunications Ground Bars must be installed in each rack/cabinet and on every IDF/MDF backboard.

13. **Power Requirements for the MDF and IDF**

The appropriate power must be provided in the Main Telecommunication Room and Intermediate Telecommunication Room to accommodate the planned equipment to be installed. The telephone system must have a dedicated 24-hour circuit, which is separately fused. A school’s duplex, 20amp dedicated AC outlet is required to power the peripheral equipment (i.e., call accounting PC, printers, MAT terminal, additional power supplies, etc.) and must be provided by the SCA cabling vendor in the Main Telecommunications Room. In addition, ten - (10) quad, dedicated, 110Volt 20 amp AC circuits with type 5-20R receptacles, 2 dedicated 220Volt 20 amp AC circuits with type L6-20R receptacles and two L5-30R receptacles will be installed in the MDF. These circuits will be located behind each of the three racks and two cabinet locations. The L6-20R receptacles shall be located behind the rack containing the Cisco 6500 chassis and the L5-30R receptacles shall be located behind the rack dedicated for IPDVS. Each rack and cabinet will also have two 5-20R quads, with dedicated 20 amp AC circuits. Each rack/cabinet will also be equipped with one 16-port vertically mounted power strip. One (1) Quad Receptacle is attached to the telecom plywood backboard in the MDF.

Concerning the IDF:

1) Three (3), quad, dedicated, 20-amp A/C receptacles (type 5-20R), located at least two feet apart must be provided within three (3) feet of the data cabinet in all Intermediate Telecommunications Room.

2) The PBX system shall be provided with a wall mounted surge protector that meets UL 1449 specifications. It shall protect (with automatic reset) connected equipment against transient surges and noise, delivering heavy-duty transient clamping within 5 nanoseconds with EMI/RFI filtering from 50dB attenuation at 340KHz. Peripheral equipment (e.g. call accounting systems and MAT terminals) should be similarly protected.

14. **Security and Environmental Concerns**

The Main Telecommunications Room must be air-conditioned 24 hours a day 365 days a year. At a minimum, a 34,000 BTU (approx. 3 ton) cooling system shall be installed. However, if other equipment specified by the school contact will be located in the Main Telecommunications
Room, additional cooling must be provided. The SCA Engineer of Record will ensure that the HVAC system installed will meet the cooling requirements for the installed equipment and allow for a margin of growth. For efficiency, a “staged” system may be used to support future cooling capacity. This cooling request is driven by the heat dissipation requirements of the hardware to be placed in the MDF. When designing the air conditioning plant, SCA will take into account the location of the Classroom Connectivity (formerly Project Connect) equipment rack, which contains equipment likely to require significant cooling. The SCA Engineer of Record will also ensure that the cooling system provides proper air flow in the MDF so as to assure proper environmental conditions for equipment operation. Please refer to Appendix F for detailed information regarding typical MDF component heat dissipation.

Intermediate Distribution Facilities must also be air-conditioned 24 hours a day, 365 days a year. At a minimum, a 7000 BTU cooling system shall be installed. As is the case with the MDF, if other equipment specified by the school contact will be located in the Intermediate Distribution Facility, sufficient cooling must be provided in addition to the stated DIIT’s minimum request.

Physical security for access to the Main Telecommunications Room and Intermediate Telecommunications Room must be provided. Both room types must be enclosed and locked at all times. Keys to these rooms should be held by the school principal or custodial staff and should be made readily available for service and maintenance staff.

15. Circuit Installation and Demarcation Boundaries

To ensure the ability to add lines in the future, the SCA cabling vendor will require Verizon to place, at a minimum, a 100-pair cable from the outside plant to the building Point of Entrance. The local carrier or Verizon must provide a 100 or 200-pair feeder cable from the telecommunications provider building Point of Entrance to the Main Telecommunications Room. Appropriate conduit must be provided by the SCA cabling vendor from the building point of entrance to the Main Telecommunication Room.

16. POTS Circuit Requirement

To ensure high availability for mainframe applications, a dial back up solution has been implemented. To facilitate this solution, a POTS Circuit is required in the MDF.

17. Voice Cabling Infrastructure Specification

These specifications include horizontal and backbone cabling for a telephone system and its related infrastructure. DIIT requires that all components, including cable, connectors, outlets and patch cords, meet or exceed applicable performance standards adapted by the ANSI/TIA/EIA Standard entitled "Commercial Building Telecommunications Cabling
Standard", TIA/EIA-568-B. The Contractor will provide all new voice-related cabling and terminal blocks.

In some cases, pre-existing TIA/EIA-568-B infrastructure has been installed at existing School structures. In these cases and prior to job start-up, the SCA, Contractor and OTS project management teams will meet on-site and identify best practices to integrate the pre-existing infrastructure to the new addition/design.

All station wiring shall be four (4) pair, Unshielded Twisted Pair (UTP), Category 6, 24-gauge cable with legible color coding of conductors, and in specific instances, 50/125µ, multi-mode, multiple-strand fiber optic cable. All UTP, fiber optic cable, patch panels and other components must adhere to performance levels specified in the TIA/EIA-568-B Standard. All cable must be approved by the Underwriters Laboratories, Inc. and must bear exterior jacket markings indicating type, Category classification if applicable, fire rating of jacket material, number of conductors/strands, and gauge or thickness of copper or fiber pairs. In addition, patch panels and other components will be documented and labeled for compliance. The Contractor must supply the OTS with specification sheets for all low voltage cables to be installed prior to job start-up. If a change is to be made to either the lot or manufacture of the cable, DIIT shall be notified and supplied with specification sheets for the new cable.

It is not necessary to use plenum grade cable in non-plenum spaces. In plenum spaces and dust chutes, the cable must be of Type MPP/CMP (plenum rated), and have a jacket label indicating the same.

All Category 6 station cable (voice) will be tested end-to-end (from jack faceplate to associated MDF or IDF termination) according to the methods and criteria defined in TIA/EIA-568-B. The Contractor will test for Wire Map, Length, and Attenuation NEXT, return loss and ELFEXT, delay and delay skew. The Contractor shall comply with TIA/EIA standards applicable at the time of job start-up, and price the installation accordingly.

18. **The House Book**

The Contractor shall supply two complete “House Books”, one for the Main Telecommunications Closet and an additional copy for the OTS project manager. The House Book is to be provided in electronic media (disk or flash thumb drive) and shall minimally detail pair counts per IDF/MDF, copy of installation K-plans, floor plans showing jack locations and numbers, and printouts of all cable certifications tests.

All pre-approved, printed test results shall be incorporated into the House Book and left on site prior to soft cutover (or phased payment). An additional copy shall be given to the OTS project manager at the same time. System Acceptance and subsequent phased payment shall not be approved until the House Books are provided. The OTS project manager is responsible for instructing the Department Site Administrator both to the
location and use of the site House Book. The OTS project manager shall locate the second House Book at the designated Office location.

Failure to amend fiber optic or copper cable(s) that have not passed testing, and/or failure to provide printed test results as described above, will be grounds for delaying System Acceptance pending completion of these items.

Tests of UTP cable shall be conducted with Level II-E Field Test Equipment (FTE). Test results shall be printed for every cable run and results reviewed for pass/fail by the SCA and/or the Contractor prior to formal submission to the DIIT for acceptance. Any voice-related cable runs that fail to meet minimal requirements must be repaired or replaced, and then re-tested for compliance. Final results will be incorporated into the “House Book”. The House Book must document the FTE used for testing.

Fiber cable installation shall comply with the TIA/EIA component standards described in TIA/EIA-568-B.3. Fiber station cable shall be tested for end-to-end attenuation loss at 850 nm and 1300 nm. Procedures and documentation of fiber testing shall comply with the current TIA/EIA defined specifications at the time of job start-up. Test results shall be printed for each cable run and results reviewed for pass/fail by the SCA and/or Contractor prior to formal submission to DIIT for acceptance. Failed cable shall be corrected or replaced and re-tested. Final test results are to be compiled into the House Book. This section must indicate the FTE used for testing the fiber links and document proper test procedures.

At the closet end (MDF and/or IDF – depending upon cable design), the Contractor will terminate every pair of voice cable on a Category 6 compliant patch panel. All terminations in closets and station ends will be RJ-45 type, modular, eight-conductor, with outlets configured as per TIA/EIA jack designation T568B. All terminating backboards, patch panels, connecting cable, patch cords, wire management rings and trays, ladder racks for overhead wire management, labeling, 19 inch racks, and any and all other hardware necessary will be provided by the Contractor.

Cabled Administrative Stations, and pre-wires in Administrative Areas shall consist of two (2), four-pair cables; one Category 6 cable for voice, and one Category 6 cable for data. This administrative workstation shall be terminated on a duplex combination faceplate consisting of two RJ-45 type, modular, eight-conductor outlets configured and terminated as per EIA/TIA jack designation T568B. The voice outlet will be located on top; the data on the bottom. The voice and data modular RJ-45 inserts will be color coded to differentiate between the two. Consistency will be maintained from site-to-site. The DIIT standard color coding for jack inserts are as follows: blue insert for voice; red for data; and orange for IPDVS. The Contractor shall document connecting hardware (Part number, Manufacturer, Category 6 Certification) in the House Book.

Wall phone station cable in the classrooms shall be Category 6 cable. All four pair cable will be terminated on a wall mount assembly (see APPENDIX 2A). Generally, this outlet will be placed in a lockbox, on the far, window-side of the classroom, near the classroom
instructor’s desk, so as to provide greatest accessibility. Exact location of outlets will be specified by the OTS project manager during K-plan preparation.

There may be exceptional, single Category 6 cable station runs. Some examples include: custodial work areas, elevator equipment rooms, boiler rooms, fan rooms and unique areas such as multipurpose or cafeteria. The OTS project manager will determine the location of these runs during K-plan preparation. These cables are for analogue devices, and shall be terminated in the closets on Category 6 patch panels, as described previously in this section.

All station outlets and MDF and IDF terminations must be labeled, and all circuits clearly identified, utilizing designation strips in compliance with TIA/EIA 606 standards. A permanent labeling machine, compliant with TIA/EIA 606 labeling standards must be used. Handwritten labels will not be accepted. APPENDIX 4, Cable Tags and Termination Labels, includes additional details concerning labeling. At the closet end, all cable will be terminated at an IDF or MDF (if cable is ‘homerun’). All Category 6 cable designated for voice cable in Administrative Areas will be cut down on patch panels located in a full 19” open rack. Voice cable shall be located at the top of the rack. The sizing for the administrative voice patch panels will be determined by working with the DOE Project Manager, and is determined by the number of stations wired back to that particular closet. The patch panel sizing will be determined as the base number of stations plus 25% growth.

Single patch panels will be limited to a maximum 48 ports (larger panels create congestion of patch cords). Each patch panel will have below it a ‘2U’ wire management unit.

Example 1: an IDF supporting 65 administrative phones on that particular floor requires 120 patch panel ports. (65 ports + 50% growth is 97.5 ports. Two 48-port panels are just short of covering the growth factor. It is therefore necessary to add an additional 24-port patch panel for a total 120 ports). This configuration would have three (3) ‘2U’ wire management units, one below each of the three patch panels.
Example 2: an IDF supporting 6 administrative phones on that particular floor requires one 24 patch panel. (6 ports + 25% growth is 7.5 ports. Rounding up there is a need for 14 ports. A single 24-port panel is sufficient to address the specification.) This configuration would have one (1) ‘2U’ wire management unit located the single patch panel.

19. Fiber Rising Cabling

When 6-strand 62.5/125 µ multi-mode fiber optic cables are used, their installation shall adhere to the same guidelines applied when cable is installed in vertical shafts or risers. This is exclusive to voice cabling infrastructure only. The riser cabling for voice consists of 6-strand 62.5/125µ multi-mode fiber optic cable run from the main
telecommunications room (MDF) to each intermediate room (IDF). Termination at IDF and MDF shall be at a rack-mounted interconnecting unit. Individual strands will be fanned out and terminated with SC connectors in an interconnect plate with six interconnect sleeves, following proper manufacturer’s specifications for bend radius and strain relief.

Ladder racks will be required in both IDF and MDF equipment rooms for cable in cases where a bundled group of cables span a horizontal space of greater than 18 inches. The recommended part number is Chatsworth Black Universal Runway 10250-712 or its equivalent.

Where cable distances are exceeded, IDF closets will be created as needed to supplement the voice (and data) infrastructure. The ANSI TIA/EIA requires that total cable length not exceed 100 meters from closet to end device.

All vertical (floor-to-floor) risers (or cable runs, in the case of all metal risers or cable runs) shall be run in appropriately sized conduit. Riser conduit, EMT, pull boxes and horizontal raceways (if used) must be installed with 30% free space for additional cable runs. Proper workmanship is essential to insure a durable cable plant. When running cable through dropped ceiling space, the Contractor shall use rings or black iron to suspend cable at minimum six-foot intervals, and assure proper strain relief. Fire-resistant tie wraps and loop fasteners shall be secured per ANSI TIA/EIA compliance, and not over-tightened. Care will be taken to preserve twists in UTP, minimize stretching, prevent abuse, and preserve integrity of cable and cable jacket. The minimum size of Wiremold (if utilized) approved for use is V-700. Bend radius requirements for Category 6 and fiber optic cable may dictate larger than 700-type molding, in which case larger molding shall be used.

The Contractor shall provide detailed design drawings of all cabling, telecommunication closets and riser paths prior to commencement of work. If, during the course of the installation it becomes necessary to modify plans, the SCA and/or the Contractor will work with the OTS project manager to identify alternative design(s), and document the changes. All cable must be concealed in ceilings or walls wherever possible. When such concealment is not possible, cable must be within metal raceway/molding. Cable must be properly supported and provided with strain relief in all cases. In cases where there are existing moldings on the walls at the 10 to 12 foot level, it may be acceptable to neatly and securely affix the cables on top of the molding, but only with authorization by the DIIT Project Manager, on a case-by-case basis. Other exceptions may be granted at DIIT Project Manager’s discretion. Proper hardware must be used for installing and finishing raceways. Self-adhesive hardware, double-sided tape, duct tape, etc. are unacceptable. All floor and wall drilling necessary for running telephone cables must be performed by the SCA and/or Contractor. Cable runs through walls and floors must be in EMT or rigid conduit sleeves with ½” lips at each end. All plans affecting building construction must be submitted to DIIT prior to installation for advanced approval. In cases where ceiling crawl space will be used for running cables, every
effort should be made to locate existing ceiling access doors or holes. If such access
doors/holes don't already exist, the Contractor may create an opening no wider than 2’ x
2’. Subsequently, the Contractor is then required to cover the opening with a metallic
access panel. Telephone mounting cords shall not be draped across floors. Where floor-
mounted jacks cannot be avoided, they are to be installed in recessed areas as close to
the wall as possible or directly under desks or furniture away from the occupants' chairs
and feet.

20. **Inter-building Pathway Design**

The Entrance Facility consists of the telephone service entrance to the building,
including the entrance point and/or the point of entry through the building wall and
continuing to the Main Distribution Frame Room (MDF). The entrance facility may
contain the backbone pathways/infrastructure that links other buildings in a campus
environment. The ANSI/TIA/EIA 569-A defines an entrance facility as any location
when telecommunications service enters into a building and/or where backbone
pathways link to other buildings in a campus community, i.e., a physical connection
between buildings, linking MDF to MDF in each campus facility.

A service entrance pathway shall be provided. The basic methods for provisioning are
underground, buried and aerial pathways. The OTS Project Manager will work with the
SCA and/or Contractor to determine the pathways and all shall account for the
following:

- Type and use of building
- Growth
- Difficulty of adding pathways in the future
- Alternate entrance
- Type and size of cables likely to be installed

The entrance room or space is the component of the entrance facility that provides space
for the termination of the entrance backbone cable. In accordance with NEC Article 800
Section 800-50, exception No.3, the entrance or outside building cable shall be
terminated and protected on a listed primary protector within 50 ft. of entering the
building, where the PBX and other voice-related equipment is located in the MDF/IDF
room.

The SCA, Contractor and OTS project management teams shall develop and find
agreement on a drawing of the MDF/IDF room prior to active construction. The
drawing will show layout of all components including necessary electrical outlets,
conduits, and environmental requirements and wire termination fields prior to the start
of the job. See Figures 20-1 and 20-2, below for sample drawings.

In the equipment room, a separately fused, dedicated 24-hour circuit of the proper
amperage necessary to power the telephone system and a separate one (1) quad, 20amp
double duplex, 20 amp dedicated A/C outlet to power the peripheral equipment (i.e., call accounting PC, printers, MAT terminal, additional power supplies, etc.) must be provided. In addition, two (2) quad, four (4) duplex dedicated, 20 amp A/C receptacles (type 5-20R) located at least two feet apart must be provided near the 19” rack in a Main Distribution Closet. One (1) quad, two (2) duplex dedicated, 20 amp A/C receptacles (type 5-20R) located at least two feet apart must be provided in all Intermediate Telecommunications Closet(s). The telecommunications systems shall be provided with a wall-mounted surge protector that meets UL 1449 specifications. It shall protect (with automatic reset) connected equipment against transient surges and noise, delivering heavy-duty transient clamping within five nanoseconds with EMI/RFI filtering from 50dB attenuation at 340KHz. Peripheral equipment (e.g. call accounting systems and MAT terminals) shall be similarly protected. Recommended Brand: Best SP 6.

The MDF shall be air-conditioned 24 hours a day, 365 days a year. The manufacturers’ suggested PBX environmental specification for maintaining air temperature, in combination with the requirements for all other devices in the room, shall be used to determine the appropriately sized air conditioner. Minimally, a 34,000 BTU system shall be installed. The vendor must be prepared to install doors, locks and/or cylinders for the security of the Main Telecommunications closet and Intermediate Telecommunications Closets. If an existing MDF/IDF door is adequate, but has no lock, a new lock or cylinder must be installed at the start of installation, and keys must be supplied to the site administrator, the custodian and the OTS project manager. Two complete sets of keys for each phone lockbox in the School will be formally given to the school Principals. One set will be given to the School custodian. The lockbox keys will always be universal.
Grounded 19" x 7' Racks
4" Thru-Wall Sleeves

Representative MDF Room Layout

Figure 20-1 - Sample MDF
Grounded 19" x 7' Racks

Representative IDF Room Layout

4" Thru-Wall Sleeves

4' x 8' x ¾" Fire Rated Plywood

Door

19" x 7' Racks

Figure 20-2 - Sample IDF
21. **General Installation Specifications**

Generally speaking, much of the following applies to Contractors working existing/retrofit jobs. The SCA and OTS project management teams will be familiar with these guidelines and monitor Contractors for compliance where applicable. Prior to the beginning of the work, a job meeting will take place. Typically, the meeting members will consist of representatives from the following offices: the OTS project manager, the Contractor and Subcontractor(s), the School Principal, the site Custodial Engineer, the telecommunications vendor, and where applicable, the data integration contractor. Key sheets, floor plans, Main and Intermediate Telecommunications Closets, cabling plans, and all schedules will be finalized at this meeting. Further meeting(s) may be necessary for finalizing all items.

The Contractor will minimize disruption to the School. Potential disruptions shall be discussed and reviewed with the OTS project manager, who will then communicate all pertinent information to School staff. There shall be no interruption of telephone service without written consent from DIIT.

The Contractor shall consult with the Custodial Engineer at the site regarding scheduling of deliveries and installation of equipment. The Contractor and OTS project manager shall be responsible for arranging the acceptance of all deliveries to the sites.

The Contractor is required to broom clean work areas at the end of each work shift so as to remove all dust and debris caused by drilling or nailing. The Contractor will not be required to mop. The Contractor will, however, make every effort to coordinate dust control with the OTS project manager and the School custodial staff. The Contractor will take necessary steps to protect furniture from dust and debris during installation activities. The Contractor shall take all necessary precautions so that occupants are not exposed to loose paint dust or materials that may contain lead as per the Division of School Facility guidelines.

For the most up-to-date guidelines, please access the DSF (Division of School Facilities) Dust Control Protocol, at: [http://www.opt-osfns.org/dsf/vendors/vendortools.aspx](http://www.opt-osfns.org/dsf/vendors/vendortools.aspx).

The Contractor is required to utilize Contractor’s tools, equipment, brooms, dustpans, and ladders. The School staff will not loan any tools or equipment. The Contractor must dispose of garbage, empty cartons and any other refuse in a manner acceptable to the custodian.

All Contractor personnel must wear company identification tags when working in DOE buildings.
Regarding installation activity that is potentially disruptive (i.e. drilling, running cables, mounting lock boxes and raceway, use of ladders, etc.): Contractor's installation price must reflect work scheduled between 3 PM to 11 PM, Monday to Friday. Contractor must include pricing that covers all custodial fees for work to be performed during non-school hours and days.

Lockbox installation - Refer to APPENDIX 2 Lockbox Specifications for current lockbox installation requirements.

22. **Warranty and Maintenance**

All telephone systems are maintained by vendors and administered by the DIIT, Office of Telecommunication Services. The maintenance agreements cover telephones and any components attached to the system such as voicemail. All equipment will be repaired or replaced provided it was not abused or vandalized.

Schools experiencing equipment or telephone problems should contact their respective vendor. Vendors will issue a service ticket and, when necessary, report affected phone lines directly to Verizon Repair. If the issues remain unresolved, or vendors are unresponsive, please email the Office of Telecommunication Services at telecom@schools.nyc.gov or call 718 935-2255.

23. **New Phone Lines**

For new building construction, the OTS project manager will meet with a Verizon Outside Plant Engineer to ascertain adequate cable and pairs feeds to satisfy all new service requirements. A contractor will be required to install appropriately sized EMT conduit from the MDF to the point of entrance in the new building construction. This will be a pathway for feeding Verizon cable to voice and data communications equipment in the MDF. The SCA and DIIT project managers will coordinate with the electrical or other SCA Contractors to insure the proper design and installation of this conduit. Working with the SCA project manager, the DIIT project manager will coordinate the installation of the Verizon cable from building entrance point to the MDF once the conduit is built and qualified as completed.

Once the above is accomplished, all requests for new School phone lines are submitted to the Office of Telecommunications by the OTS project manager via the following website:

[https://www.nycenet.edu/Administration/Offices/FinanceandAdministration/DIIT/Telecom/telecomorders/](https://www.nycenet.edu/Administration/Offices/FinanceandAdministration/DIIT/Telecom/telecomorders/)

Alarm Line Requests are submitted by either DSF or SCA, via the same link.

Once submitted, installation is tracked to completion by the Office of Telecommunications Services.
APPENDIX 1

Asbestos Testing and Protocol

To protect students, school personnel and contractors from accidental exposure to asbestos, the following procedures will be followed:

The Contractor and DIIT project manager will review AHERA report prior to commencement of work in a school.

If AHERA report is positive for ACM on surfaces that will be penetrated, the following steps will be taken:

- An alternative cabling route avoiding ACM surfaces will be found.
- If ACM material is so pervasive that a reasonable alternate route cannot be found then, the Department project manager will recommend and pursue the installation for special handling.

If during the course of the installation the original cable route/design is modified, the Department project manager must be notified and the AHERA report referenced again for ACM.

Please see the DSF Asbestos Compliance (AHERA) rules, at:


HEALTH AND SAFETY MUST BE NOTIFIED OF ALL CABLE ROUTES, REGARDLESS OF AHERA FINDINGS.
APPENDIX 2

Lockbox Specifications

The lockbox must be a painted, 16-gauge metallic enclosure. The lockbox door shall have a key lock installed so that a key is required to open and close the door. External mount lockbox (see APPENDIX 2-B and 2-C) or semi-recessed lockbox (Sub Appendix 2-D) will house wall mount phones. Exceptions to this standard must be discussed between SCA, Contractor(s) and DIIT prior to installations.

The lockbox shall be provided with means to connect a modular ITT 2554-type wall telephone. The phone itself shall be secured with a screw through the back plate (chassis) into the jack assembly and the lockbox.

External lockbox (see APPENDIX 2-B and 2-C) must have knockouts - three on top and three on bottom - to accept Wiremold type V-700 raceway. Proper lockbox/raceway interface hardware must be used to prevent tampering with the cables.

Two (2) keys shall be provided with each lockbox and distributed as previously specified. All boxes are to be keyed alike.

Lockboxes will be mounted so that the center of the phone, when installed, is 48" inches from the floor.

Lockboxes shall be installed away from high traffic areas. No lockbox shall be mounted within six (6) inches of any hall or closet edge in high traffic areas. Exact location of lockboxes shall be determined during a site survey with the DIIT and SCA project managers and/or Contractor, and/or a designated School/site representative.

The following is acceptable for mounting lockboxes: Toggle Bolts - Molloy Bolts - Lead Anchors.
SUB-APPENDIX 2(A) Category 6 Wall Phone Faceplate with Keystone Module for Lockbox

ISOMETRIC VIEW
SUB-APPENDIX 2(B)
Lockbox without Flange

ISOMETRIC VIEW

NOTES:
- TYPE 1 HC CONSTRUCTION
- UL LISTED
- STD. PACKING
- SPECIAL KEY LOCK CAT 60

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REVISING

32
SUB-APPENDIX 2(C)
Lockbox with Jack Plate Fixture

ISOMETRIC VIEW
SUB-APPENDIX 2(D)

Lockbox with Flange
APPENDIX 3

Loud Bell

The loud bell must be industrial grade Wheelock TB-593 Tellbell Loud or industry equivalent. It is for use in noisy areas such as the auditorium, gymnasium, student cafeteria, kitchen and the boiler room. A loud bell may be required in other noisy areas. This will be determined by the OTS project manager working with the SCA and/or Contractor.

The loud bell is designed to provide a loud, attention-getting sound for use in noisy locations or for wide-area coverage. It includes an external volume control. All loud bells must be FCC registered for use with the public telephone network, PBX and key systems that use interrupted ring voltages from 55-130 VAC 20-3- Hz.

Series TB - Telbells or Industry Equivalent

Available Features and options:
Aluminum bell housing
Shell Size: 6”
Integral RFI suppression
Screw terminal connections and RJ-11 plug
Approvals Include: TB-593 is UL Listed
Motor Driven
Tamper resistant volume control
Applications: Telephone Ringers
Weatherproof backbox for indoor/outdoor
Mounting included

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TB-593 or industry equivalent for phone systems with a programmed contact closure, DCI-24-24 power supply required.
APPENDIX 4

Data & Voice Cable Tags and Termination Labels

Cables are to be tagged at both ends with an alpha and four-digit number beginning with (V or D) 001 and increasing in increments of 1. If the cable is designated for a voice station, the alpha will be a “V” and if designated for data, then the alpha should be a “D”. This tag is applied at both the station and closet ends. It should be a sticky tag that is wrapped and secured to the cable behind both the jack faceplate and patch panel.

All cable and termination labels are unique identifiers, which should be permanent and comply with TIA/EIA 606 labeling standards. At the closet end, the patch panel termination is labeled at the corresponding panel port with two points of information concerning the far end and each separated by a dash: 1) the room at the other end of the cable; and 2) the cable number.

In addition, every patch panel within the building complex is to be identified with a unique 2-digit number permanently stamped, painted or labeled on the front middle top of each patch panel.

At the station side, the jack faceplate is labeled with two points of information pertinent to the cable far end and each separated by a dash: 1) the room number from the IDF or MDF; 2) the cable # on the jack faceplate (four digits). The cable numbers will be in sequence for each closet. For example, if there are 50 data cables coming from IDF 1, then the cable numbers will be D001 through D050. Each closet would start over from D001.

All cable and termination labels are unique identifiers, which should be permanent and comply with TIA/EIA 606 labeling standards. At the closet end, the patch panel termination is labeled with two points of information concerning the far end and each separated by a dash: 1) the room at the other end of the cable; and 2) the cable number on the jack plate (four digits). The cable numbers will be in sequence for each closet. For example, if there are 50 voice cables coming from IDF 1, then the cable numbers will be V001 through V050. Each closet would start over from V001.
At the station side, the jack faceplate is labeled with two points of information pertinent to the cable far end and each separated by a dash: 1) the room number that the cable terminates from (IDF or MDF); and 2) the port number on the patch panel.

Cable Labels

[Diagram of cable labels with room numbers and cable numbers]

Closet Termination Labels

Room number  cable number

129-V001

Jack Faceplates

Room number  cable number

101-V001

This method will allow the technician to easily identify both ends of the cable while keeping the label size small enough to fit over the patch panel ports.