

# Charleston County School District

## **LAN Cabling Specifications** (includes PA system cabling)

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## I. GENERAL INFORMATION

The Charleston County School District telecommunications cabling system supports a number of non-vendor specific systems. The Technology Department is responsible for designing and implementing the following cabling systems:

- 1) Data communications
- 2) Video Distribution (formerly ETV)
- 4) Telephone systems
- 5) Public Address system

This document is intended to provide guidance for the installation contractor. The specifications contained herein will apply to all CCSD projects, and will be the basis for acceptance, prior to final payment.

### B. Regulations and Code Compliance

All work specified within this document shall comply with the applicable requirements of (based on the latest published revision)

ANSI/TIA/EIA-568-B. (Except as noted)

ANSI/TIA/EIA-569a.

ANSI/TIA/EIA-606a.

TIA/EIA-607a

FCC - Federal Communications Commission.

OSHA (Standards-29 CRF) Telecommunications -1910.268

BICSI Telecommunications Distribution Manual

NFPA-National Fire Protection Association

South Carolina Department of Education- Office of School Facilities (OSF)

South Carolina Department of Labor Rules and Regulations

NESC - National Electrical Safety Code

Safety requirements must be met. In the event of conflict between or among such codes/requirements, the more stringent will apply.

### C. Acronyms / Definitions

ADA	Americans with Disabilities Act of 1990
Approved	Written permission to use a material
Backbone	Intra-building and inter-building connections
Building Entrance	Cable termination equipment where an outside plant enters the building.
Buried Cable	A cable installed under the surface of the ground (not in conduit) in such a manner that it cannot be removed without disturbing the soil.
CCSD/IT	Charleston County School District, Information Technology Staff
CF/CI	Contractor furnished / Contractor installed
District	Charleston County School District
Equivalent	Equally acceptable as determined by CCSD
Exposed	Not concealed
Furnish	Supply and deliver to installation location
MTR	Main Telecommunications Room. This room may also serve as the "Server Room"

OF/CI	Owner furnished / Contractor installed
OF/OI	Owner furnished / Owner installed
Provide	Furnish, install, test, place in operation and service, and connect ready for use.
TR	Telecommunications Room (previously IDF or HC)
VDS	Video Distribution System
WAO	Work Area Outlet

## II. GENERAL INSTALLATION REQUIREMENTS

All new and remodeled areas will conform to the Americans with Disabilities Act of 1990 with respect to the functionality of telecommunications devices and accessibility to telephones and communications devices.

### ***A. Ceilings and Walls***

1. In new construction cabling should be scheduled before ceiling tiles are installed. However, if that does not occur the vendor will be responsible for damages to the ceiling grid, tiles or hard ceiling as a result of the cabling work. Any repairs to tiles, grid or hard ceiling must be made by the vendor or arrangements acceptable to the on-site construction manager must be made. Approval of any repairs must be made by the on-site construction manager.
2. Do not modify the grid structure in any way.
3. Any tiles that are damaged during the installation process must be replaced and installed by the contractor. New tiles must match the type, color and design of the adjacent areas.
4. All wall surfaces shall be restored to their original finish if damages occur. (i.e. must match the appearance of the adjacent surfaces)
5. Brick penetrations must be patched with a mortar that matches the color of the brick.
6. Firestop products and Silicone type sealants shall not be used to seal masonry penetrations.

### ***B. Working Environment***

1. It is preferred that all contractor employees wear an identification badge with photograph. This badge should have the company name as a minimum. Shirts with the company logo will be accepted as an alternate means of identification.
2. All work will be performed in a neat and workman like manner. All methods of construction, details of workmanship that are not specifically described or indicated shall be subject to the approval of CCSD/IT.
3. Daily clean up is required of all site areas.
4. Rope off any areas that may become a safety concern, especially if they are not monitored overnight, or on a weekend.
5. Store equipment and supplies only in areas designated by CCSD/IT or the school staff.
6. CCSD is a tobacco/drug free work place. The use of tobacco products at CCSD facilities is prohibited.

### **C. Abandoned Cables**

1. All unused (abandoned) cables shall be removed from the ceiling and riser areas.
2. Any cables that are identified outside the scope of each project should be reported to CCSD/IT. The additional cables may be added as an alternate to the original scope if deemed necessary.
3. The contractor will remove the debris, and arrange for off-site disposal.
4. All open wall penetrations that result from the removal of abandoned cables shall be properly sealed.

### **D. Sleeves**

1. Each contractor is responsible for identifying sleeves installed for the purpose of their trade. Any cables that are installed in improper sleeves will be removed and replaced at the expense of the contractor.
2. Openings to accept sleeves in new building construction will be installed during building construction by the General Contractor for general construction work.
3. Where sleeves are required to be installed by the cabling vendor, the district prefers that EZ Path fire rated pathways be used according to manufacturer's instructions.
4. In floor penetrations, extend sleeve 3" above finished floor unless noted otherwise.
5. The Contractor shall be fully responsible for final and correct location of sleeves.
6. Corridor sleeves will have a minimum diameter of 3" .
7. A minimum of six (6) 3" sleeves is required into all TR's. Additional sleeves will be installed as needed.
8. All sleeves must have an approved uncut bushing on each end, provided by the GC.

### **E. Penetrations of Building Surfaces**

#### **1. ABOVE GRADE LEVEL OR NON-WATERPROOF AREAS (INTERIOR)**

*Seal each annular space between conduits or cable and building surfaces. Pack space with ceramic fiber, wool, or backer rod materials and cover with appropriate fire-resistant sealant or other protection materials per the manufacturer.*

*Provide sleeves as specified in Article, SLEEVES in this Section for conduit and cable penetrations. Seal each space between conduit or cable and sleeve.*

#### **2. WATERPROOF AREAS (ABOVE AND BELOW GRADE)**

*In new and existing construction for penetrations through concrete below grade, ground water level or in other waterproof areas, provide through-wall and floor penetrations with appropriate systems.*

## **F. Grounding**

1. Grounding shall conform to ANSI/TIA/EIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code® and manufacturer's grounding requirements as minimum.
2. Ground equipment racks, housings, messenger cables, conduits, and raceways.
3. Connect cabinets, racks, and frames to single-point ground that is connected to the building ground system via #6 AWG (minimum) copper grounding conductor.
4. Any connection to building steel must be annotated on the as-built drawings.
5. Ground all points of contact on building steel prior to fastening grounding lugs.

## **III. INFRASTRUCTURE PATHWAYS AND SPACES**

### **A. Conduits**

1. In new construction, all conduit pathways and pull stings shall be installed prior to the communications cabling contractor's arrival under the direction of the General Contractor.
2. All conduits must meet applicable codes and guidelines to determine material, type, and sizing.
3. All conduits should be marked "Communications Cabling."
4. Each conduit must be attached to building structure. Conduit systems shall not attach to other trade work. Conduit ends will be terminated within 6" from the cable tray but should not cross the plane of the tray..
5. All cables must be installed in conduit or cable tray.
6. All conduits must have a nylon pull string both before and after cable installation.
7. There shall be no more than two (2) 90° bends between any pull points.
8. The use of "LB's" is strictly prohibited.
9. The minimum conduit size for station wiring is 1".

### **B. Cable Trays**

1. Cable trays with solid bottoms or covers shall not be used unless required to meet codes. CCSD specifies a basket type tray with dimensions of approximately 4" x 18". In new construction, all cable tray will be installed prior to the cabling contractor's arrival under the direction of the General Contractor
2. Cables must follow a consistent routing through the trays. Please refer to **Figure 1** for proper cable placements.
3. Cable bundles must be attached to the tray at all elevation changes. Attach the bundles with a loose fastener to keep the cables on the tray through the entire run. Refer to **Figure 2 & 3** for the proper and improper attachment methods.
4. Cable trays shall be installed in all main corridors, and any other area that will have a large cable count.
5. Each cable trade must be bundled and separated in the trays.

6. Cables that are not bundled, or poorly managed in the cable trays will be removed and replaced at the contractor's expense.

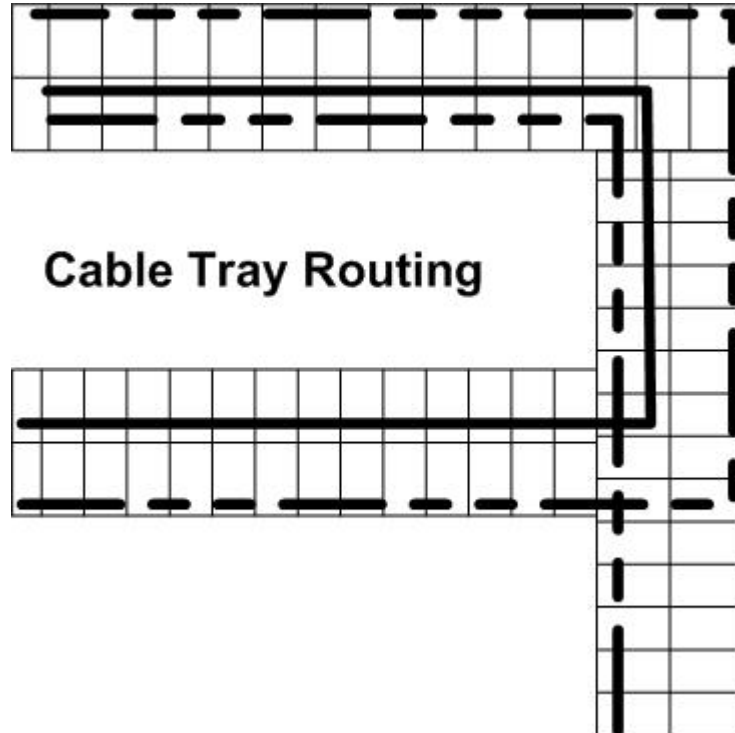


Figure 1.

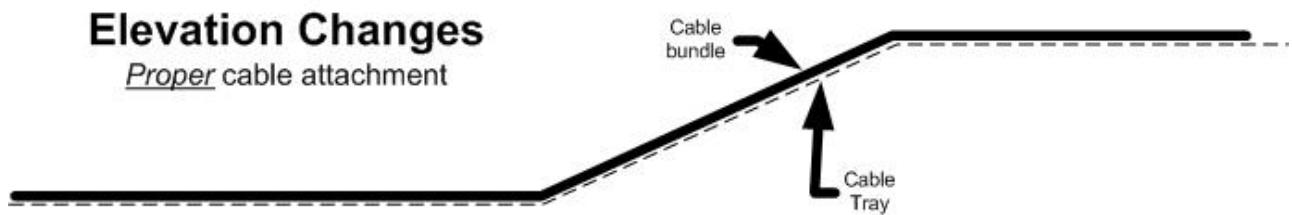


Figure 2.

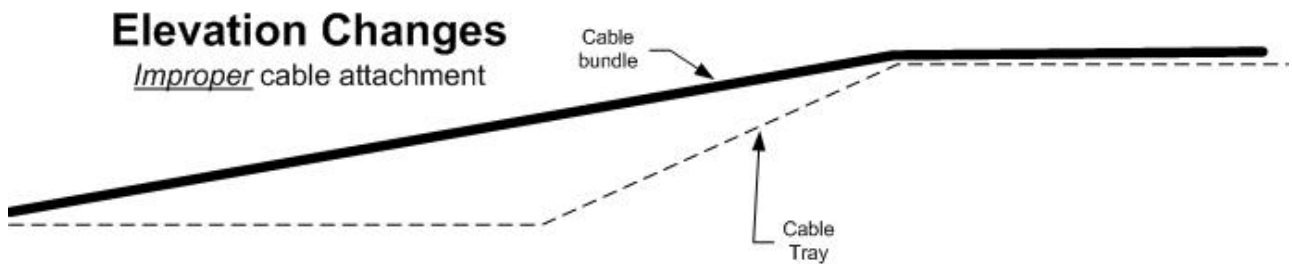
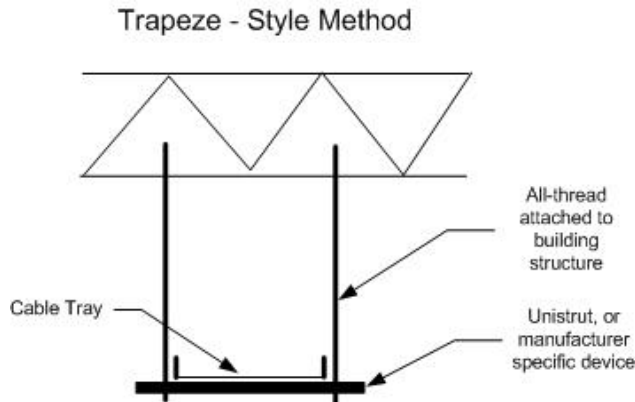


Figure 3.



**Figure 4.**

**Figure 5.**

### **C. Exterior Pathways**

1. Manholes / Handholes – These devices shall be installed by the general contractor where necessary, to provide pulling points, and splicing access. The maximum distance between manholes/handholes shall not exceed 200'. All covers are to be marked with a “Communications” label. These devices shall be noted on the architectural drawings.
2. Aerial cables – All aerial cables will be self-supporting (figure eight) cable, or must be attached to a messenger. Contact CCSD/IT prior to design completion. Contractor must show proof of proper training, and attaching hardware for each application.
3. Transition Points – Any outdoor rated cable that enters the building must be transitioned to an indoor rated cable. Ensure that the 50' ruling is followed. Fusion splices must be utilized, and splice cases shall not be installed above the ceiling. Coordinate locations with the CCSD/IT.
4. Provide and install all necessary building entrance protectors when any OSP cables are installed.

## **IV. FIRESTOPPING**

### **A. General Guidelines**

1. New and existing raceways, cable trays, and cables for power, data, and communications systems penetrating *non-rated* and *fire-rated* floors, walls, and other portions of building construction shall be fire stopped where they penetrate new or existing building construction.
2. Fire stopping shall be accomplished by using a combination of materials and devices, (caulks, putties, cementitious materials) to make up a complete fire stop. Cabling contractors must coordinate with the electrical contractor on site to ensure compliance with other fire stop systems. Contractor shall provide documentation of the ULI system information for each type of sleeve installed.

3. Verify that cabling and other penetrating elements and supporting devices have been completely installed and temporary lines and cables have been removed.
4. Products may be in the form of caulk, putty, strip, sheet, or devices that shall be specifically designed to fill holes, spaces, and voids at communications penetrations. EZ Path products may be installed.
5. Each sleeve shall be labeled with the UL system, "F" & "T" rating, and the manufacturer's name and products used. If all sleeves are identical in design, this information may be listed on the as-built documentation.

## ***B. Firestopping References***

- ❖ ASTM E814, Standard Method of Fire Tests of Through-Penetration Fire Stops.
- ❖ ASTM E 119, Fire Tests of Building Construction and Materials (for fire-rated architectural barriers).
- ❖ 2005 NFPA National Electrical Code, Section 800-52, Paragraph 2(b), Spread of Fire and Products of Combustion.
- ❖ 10<sup>th</sup> edition of the BICSI Telecommunications Distribution Methods Manual, Chapter 11, Fire stopping.

1. Installed fire stopping systems shall meet approval of Charleston County School District

## ***C. Firestopping Products***

1. Select appropriate type or types of through penetration fire stop devices or systems appropriate for each type of communications penetration and base each selection on criteria specified herein.
2. Selected systems shall not be less than the hourly time delay ratings indicated in the Architectural drawings for each respective fire-rated floor, wall, or other partition of building construction.
3. Fire stop for each type of communications penetration shall conform to requirements of the design drawing.
4. Use materials that have no irritating or objectionable odors when fire stopping is required in existing buildings and areas that are occupied.
5. Provide damming materials, plates, wires, restricting collars, and devices necessary for proper installation of fire stopping. Remove combustible installation aids after fire-stopping material has cured.
6. All fire stops shall be installed in accordance with the manufacturer's instructions in order to maintain the specific rating assigned by the independent testing laboratory.
7. All fire stops shall be documented with the manufacturer name and system used. This information should be noted in the delivery documents and the appropriate manufacturer label should be posted next to the sleeve.

## V. LABELING

### A. Labeling Standards

1. Labeling shall meet the intent of ANSI/TIA/EIA-606-A Administration Standard for Commercial Telecommunications Infrastructure standards. In addition, provide the following:
  - a) Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters.
  - b) Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in the following locations:
    - Inside receptacle box at the work area.
    - Behind the TR patch panel or termination block.
  - c) Provide labels on face of data patch panels with large letters A,B,C,D, etc..
  - d) Provide as-built records at each telecommunications room location that is specific to the facilities terminated therein. CCSD will provide vinyl pouches for each rack location.
2. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.
3. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to CCSD/IT two (2) weeks prior to move in to allow the CCSD/IT personnel to connect and test equipment in a timely fashion.

### B. Telecommunication Room (TR) Labeling Format

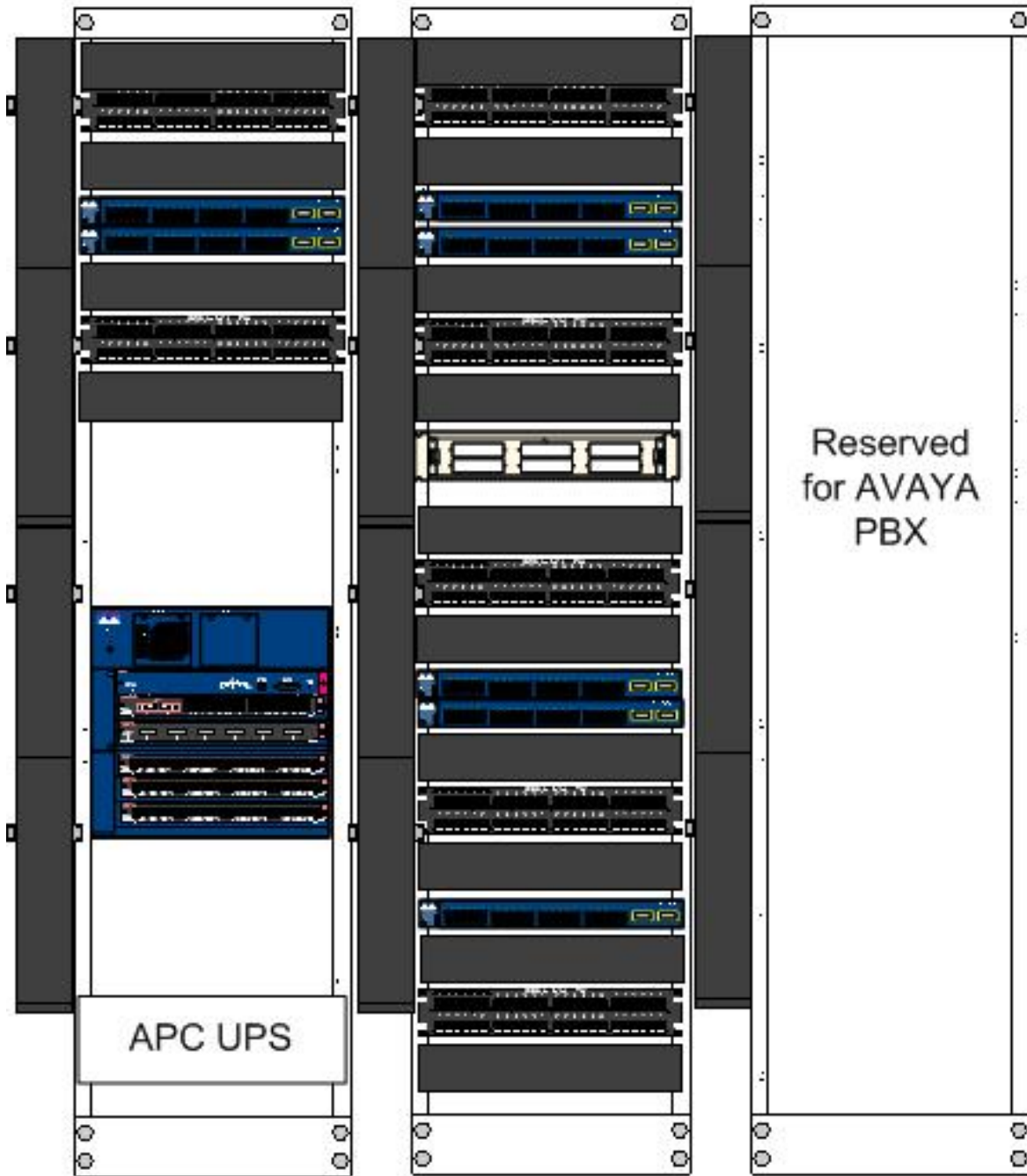
1. Each TR will have a numerical designation assigned during the initial design. If TR assignments have not been provided, use the following guidelines to create the labeling assignments.
2. The Main Telecommunications Room (MTR) will always be considered TR#1. The terms MTR and TR# 1 are synonymous.
3. The assignment of additional TR numbers should provide a flowing sequence. Number any TR's on the same floor first, then add additional floors. TR's in separate buildings can then be added. Each building will have a designation as well. Refer to **Figure 7** in next section.

### C. Rack / Patch Panel Format

1. All racks must be labeled to show the TR number. Place a large label near the top of the rack, usually on the top wire manager cover.
2. All racks must be configured in a similar manner throughout each project. Refer to **Figure 6** and **Figure 7** for an example.
3. Racks shall be built based on the Panduit NetFrame™ Rack System (part #NFR84). Additional accessories should be utilized as needed.
4. Panduit Cable Management Troughs shall be used to connect multiple racks together. (part# CMUT19)
5. Panduit Network Cable Managers (part# NCMH2) shall be installed between each rack mount device, or as shown in **Figure 6**.

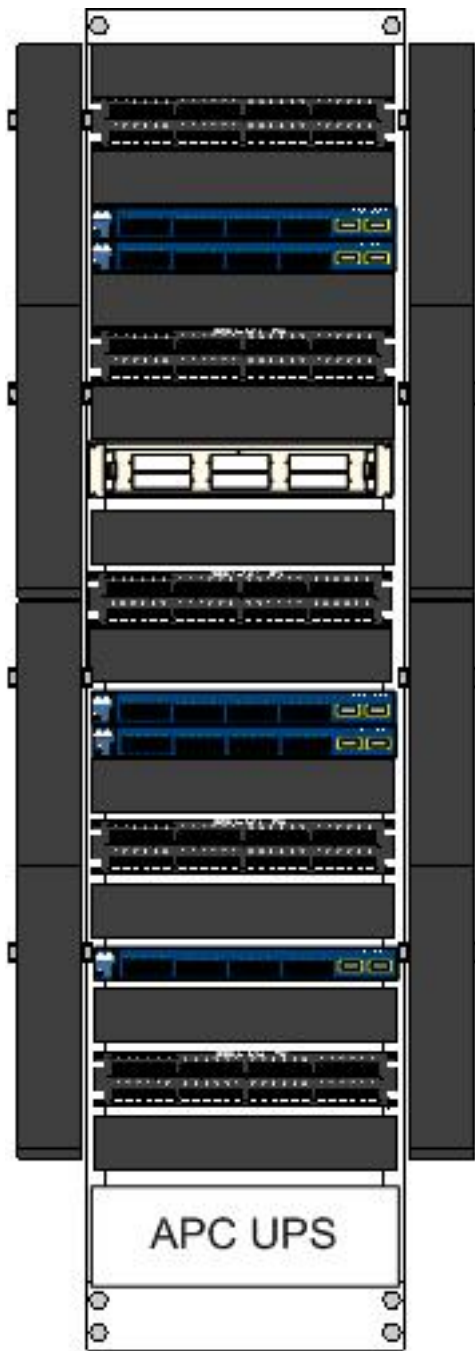
6. The use of cable ties, “zip strips”, tie wraps, etc. shall not be allowed anywhere on the rack system. The contractor shall use “Velcro”, “hook and loop”, or similar product to manage cables beneath the ceiling.
7. Patch panels will be labeled consecutively starting with “A” and continuing for each patch panel. Each TR will have an “A” panel.
8. Cables shall be neatly dressed in the overhead cable trays, wire managers, and at the attachment point. All cables shall be labeled at the termination point on the patch panel.
9. Each MTR shall have a minimum of three (3) racks. Each ITR shall have a minimum of one (1) rack. Consult the project specifications for details on the TR’s for each project.

# CCSD Typical Telecommunications Rack Layout



Typical Primary TR

**Figure 6.**

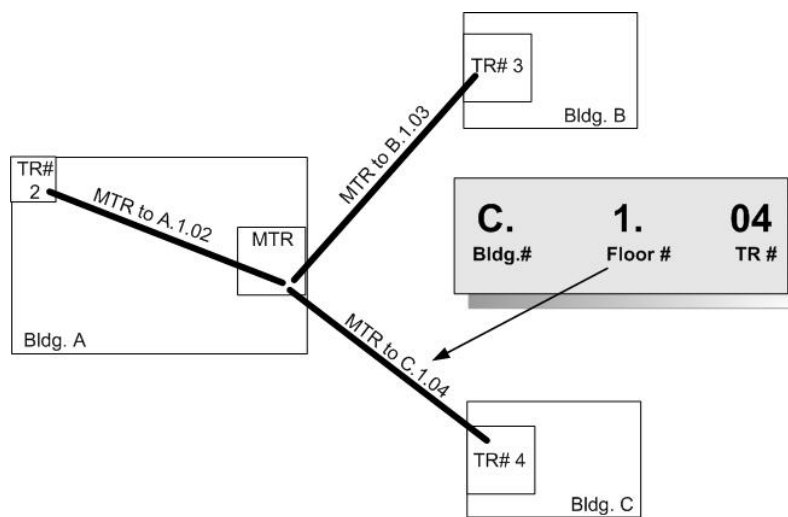


Typical Intermediate TR

**Figure 7.**

## D. Backbone (feeder) Cable Labeling Formats

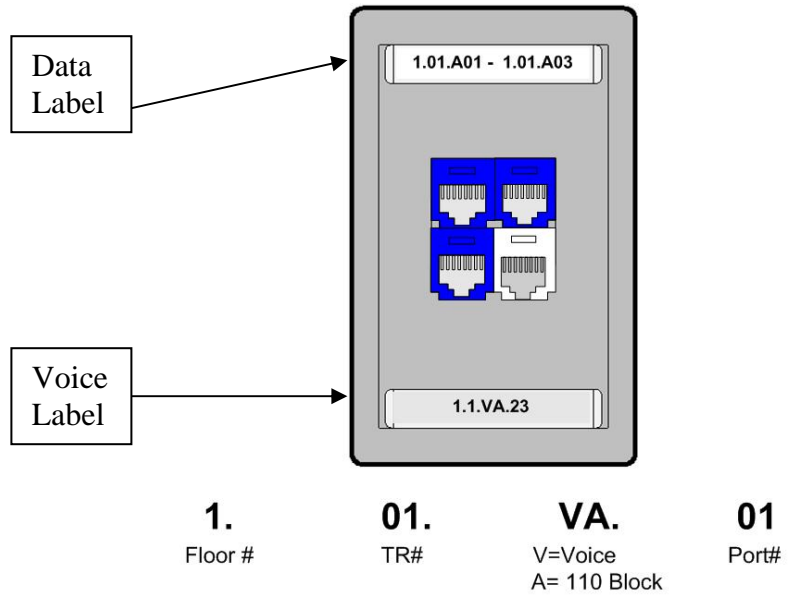
- 1) If buildings have no alpha designation (i.e. Bldg A) then assign designations and annotate on the as-built drawings. Contact CCSD IT Project Manager if assistance is needed.
- 2) All backbone cables will be clearly marked at each termination point showing the local TR, and the far end TR. See **Figure 7**.
- 3) Fiber optic cables shall be fusion spliced, unless directed otherwise by the CCSD/IT staff.
- 4) Fiber optic cables should terminate in rack mount enclosures..
- 5) Each strand of the fiber bundle shall be terminated unless directed otherwise by CCSD/IT staff.



### Sample Backbone Labeling Format

Figure 7.

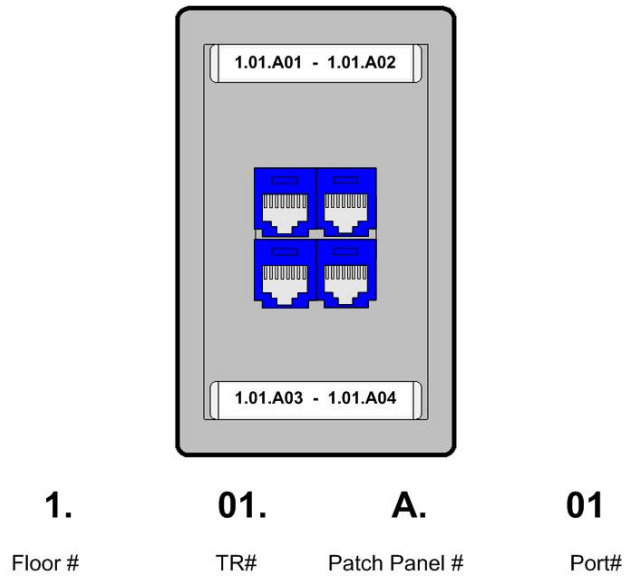
### E. Voice Cable Labeling Format



**Sample voice labeling format**

**Figure 8.**

### F. Data Cable Labeling Format

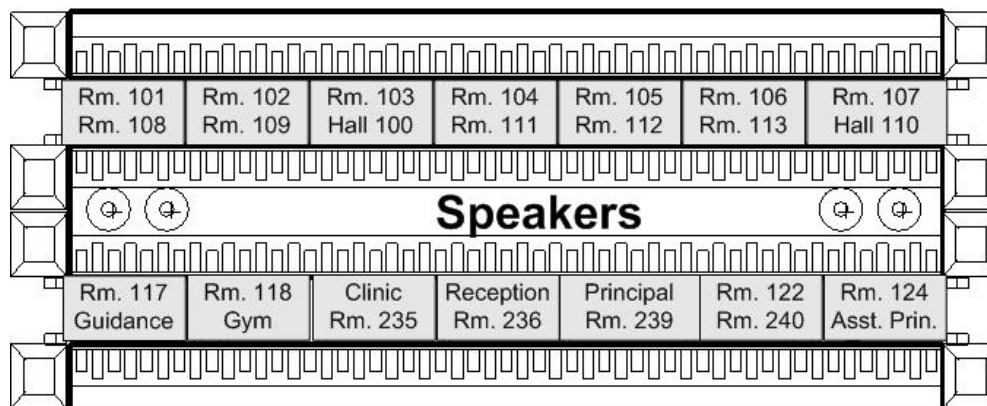


**Sample data labeling format**

**Figure 9.**

## G. PA Cabling Format

1. **Figure 10** shows the 110 block layout for PA cable termination, and termination method for outdoor speaker cables using terminal blocks.
2. Coordinate placement of 110 blocks with CCSD/IT prior to installation.
3. Callback buttons will be used in special situations only.



## VI. LAN CABLING – Horizontal Distribution

### A. General Information

LAN cabling consists of the following infrastructure:

- 1) Data cabling – workstation outlet to patch panel, necessary intra-building / inter-building connections.
- 2) Voice cabling – device outlet to 110 blocks, necessary intra-building / inter-building connections.
- 3) PA cabling – device outlet to 110 style block in each TR, speaker cables, and speaker placement.
- 4) Video Distribution cabling – all video drops will be treated as traditional data drops

**\*\*SPECIAL NOTE\*\*** Unless specified otherwise, all LAN cabling shall be plenum rated.

Cable trays are provided in new construction to support multiple services. Contractors should familiarize themselves with the installation requirements contained in this document to protect their cables from damage by others.

The design and installation of the four cable types listed above are the direct responsibility of the IT department. Any cables that use the common cable tray for support will be inspected by the IT staff for compliance.

## **B. Horizontal Distribution of Data Cabling**

It is the goal of the district to have a complete Panduit end to end solution, backed by Panduit's warranty. All components must be installed by the cabling vendor to meet the requirements of the warranty by Panduit.

1. All copper connectivity hardware shall be Panduit Mini-Com®, TX6™ PLUS components.
  2. CCSD utilizes 48 port patch panels to match the configuration of the Ethernet switches (48 port switches).
  3. All terminations shall follow the EIA/TIA 568B wiring scheme using Panduit Mini-Com®, TX6™ PLUS modules. All data modules shall be Blue in color.
  4. At the present time CCSD has standardized on Category 6E (550 MHz) cables for data applications. Data cables will be from the same manufacturer throughout each project, and will be from one of the following list of cables:
    - Berkteck           Blue
    - General Cable    Blue
    - Mohawk            Blue
  5. Data cable installation shall adhere to all previous sections of this document as well as the "CCSD Technical Design Specifications" located at [www.ccsdschools.com](http://www.ccsdschools.com)
  6. The BICSI guidelines are the preferred installation methods. Whenever a conflict in guidelines exists, the more stringent shall prevail.
  7. All horizontal distribution cable shall be installed in one continuous run from the TR, to the workstation outlet. No splicing will be allowed.
  8. All pull-strings in cable trays and conduits will be replaced when cables are installed.
  9. Following the BICSI TDMM guidelines, the contractor shall provide a minimum of 10 feet of cable slack at each TR, and a minimum of 1 foot of cable slack for each workstation outlet.
- NOTE:** *Do not form a loop with the cable slack at either end of the run. A serpentine design should be used whenever possible.*

## **C. Horizontal Distribution of Voice Cabling**

1. All copper connectivity hardware shall be Panduit Mini-Com®, TX6™ PLUS components. Because of the large installed base of this product, there shall be no substitutes.
2. Terminate voice cables on Panduit 110 blocks in each TR. Maintain a separate 110 block for each separate system.
3. All terminations shall follow the EIA/TIA 568B wiring scheme using Panduit Mini-Com® TX6™ PLUS modules. All voice modules shall be White in color.
4. At the present time CCSD has standardized on Category 6E (550 MHz) cables for voice applications. These cables will support Voice Over IP Digital and TDM systems. Voice cables will be from the same manufacturer throughout each project, and will be from one of the following list of cables:
  - Berkteck           White

- General Cable -- White
- Mohawk -- White

5. Voice cable installation shall adhere to all previous sections of this document as well as the “CCSD Technical Design Specifications” located at: [www.ccsdschools.com](http://www.ccsdschools.com)
6. The BICSI training guidelines are the preferred installation methods. Whenever a conflict in guidelines exists, the more stringent shall prevail.
7. All horizontal distribution cable shall be installed in one continuous run from the TR, to the workstation outlet. No splicing will be allowed. The District must approve consolidation points, or Zoned Cabling.
8. All pull-strings in cable trays and conduits will be replaced when cables are installed.
9. Following the BICSI TDMM guidelines, the contractor shall provide a minimum of 10 feet of cable slack at each TR, and a minimum of 1 foot of cable slack for each workstation outlet.

***NOTE:*** *Do not form a loop with the cable slack at either end of the run. A serpentine design should be used whenever possible.*

#### **D. Horizontal Distribution of Public Address (PA) Cabling**

1. All copper connectivity hardware shall be Panduit Mini-Com®, TX6™ PLUS components. Because of the large installed base of this product, there shall be no substitutes.
2. Terminate PA cables on Panduit 110 blocks in each TR. Maintain a separate 110 block for each separate system (i.e. handsets, speakers, etc).
3. All terminations shall follow the EIA/TIA 568B wiring scheme using Panduit Mini-Com® TX6™ PLUS modules. All voice modules shall be Gray in color
4. At the present time CCSD has standardized on Category 3 cables for PA applications for speakers. PA cables may be from different manufacturers depending on the type of cables to be installed.

- Berkteck -- Gray
- General Cable -- Gray
- Mohawk -- Gray

*Substitutes must be approved prior to the bid award. Various West Penn multi-pair 22 AWG shielded cables may be required for PA .Public Address cable installation shall adhere to all previous sections of this document as well as the “CCSD Technical Design Specifications” located at: [www.ccsdschools.com](http://www.ccsdschools.com)*

5. The BICSI training guidelines are the preferred installation methods. Whenever a conflict in guidelines exists, the more stringent shall prevail.
6. All pull-strings in cable trays and conduits will be replaced when cables are installed.

## **VII. LAN CABLING – Backbone Distribution**

### ***A. Fiber Optic Cable***

1. All Telecommunications Rooms shall have as a minimum one (1) fiber cable with twelve (12) multimode fibers, running back to the MTR. Larger TR's may require a higher fiber count and will be specified.
2. When fiber optic cable passes through a vertical riser closet secure fiber to wall vertically every 48" or follow manufactures recommendations.
3. High density fiber termination cabinets shall not be installed. Fiber termination cabinets that allow three (3) six port modules in a horizontal fashion for a total port count of no more than 36 ports should be used. Add additional cabinets as needed.
4. All fiber strands should be terminated using an SC style connector.
5. Do not include fiber optic patch cords unless otherwise specified.
6. All fiber optic cables that are to be installed in cable trays shall have a metal clad jacket. Indoor-Outdoor plenum rated metal clad cables may be used to inter-connect buildings.
7. Any design that includes a splice of any kind must be approved by CCSD/IT prior to installation. All splices shall be performed using a fusion splice method.
8. Corning is the specified fiber manufacturer by CCSD. Any substitutions must be approved by CCSD at the time the project is bid.

### ***B. Copper Cable***

1. Copper backbone cables will be used primarily for voice and PA applications. Copper cables will not be used for data applications unless specified by CCSD/IT.
2. Copper backbone cables shall have the same color designation as the horizontal distribution cables (Voice = white; PA = Gray). OSP cables are an exception to this requirement. All OSP cables shall be labeled at the entrance and exit of each building, and transitioned to the appropriate colored indoor cable.
3. Backbone cables for PA will be Category 3 or better with the appropriate jacketing for the specific application. .
4. All terminations of copper cables will be performed on an IDC, 110 style block. The use of "66" blocks will not be allowed. The only exception to this specification is the use of terminal blocks for the 18/2 cables used for outdoor speakers.
5. LAN Cabling contractor is responsible for cross-connecting all Voice and PA cables from the outlet, through the ITR, into the MTR. A wire map and/or continuity test is required to ensure there are no crossed pairs
6. All blocks shall be clearly labeled by block and pair.

### ***C. Copper Testing (horizontal and backbone)***

1. Testing shall conform to TIA/EIA TSB-67 Transmission Performance Specifications for Field Testing of Unshielded Twisted Cabling Systems and ANSI/TIA/EIA-568-A-1, Propagation Delay and Delay Skew Specification for 100 ohm 4-pair cable. Testing shall be accomplished using level II field testers.

2. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on as-built drawings.
3. If copper backbone cables contain more than 5% bad pairs, or if outer sheath damage is the cause of bad pairs, remove and replace the entire cable.
4. If horizontal cable contains bad conductors or shield, remove and replace cable.
5. All test results must be presented to CCSD/IT in printed and electronic format. The test results **MUST** be in the original form provided by the manufacturer's software. Printed results may be in "Summary" format.
6. As part of the Scope of Work, the Contractor shall list the proposed test sets, and test methods to CCSD/IT prior to testing. If the devices and methods are not approved prior to their use, CCSD/IT may require the contractor to perform the tests again with the approved equipment. This will be at the cost of the contractor.
7. If any portion of the system does not meet the specifications, correct deviation and repeat applicable testing. This additional testing shall be at the cost of the contractor.

#### ***D. Fiber Optic Testing (horizontal and backbone)***

1. Contractors shall provide the results of attenuation tests performed by the manufacturer prior to shipping. The test results shall be provided on the original form provided by the manufacturer.
2. CCSD/IT highly recommends the testing of optical cable on the spool with a light source and power meter utilizing procedures as stated in **ANSI/TIA/EIA-526-14A: OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant**. This will prevent additional costs after installation if damage occurred during shipping.
3. CCSD/IT requires attenuation and/or OTDR test results of every terminated fiber after installation is completed.
4. The fiber optic installation and testing procedures must comply with ANSI/TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard.
5. All test results must be presented to CCSD/IT in printed and electronic format. The test results **MUST** be in the original form provided by the manufacturer's software. Printed results may be in "Summary" format.
6. As part of the Scope of Work, the Contractor shall list the proposed test sets and test methods to CCSD/IT prior to testing. If the devices and methods are not approved prior to use, CCSD/IT may require the contractor to perform the tests again with the approved equipment. This will be at the cost of the contractor.
7. Maximum dB loss at a multimode connector shall be 0.75 dB per connector pair at 850 nm as viewed by the OTDR.
8. Maximum dB loss at a splice shall be 0.3 dB at 850 nm, as viewed by the OTDR.
9. A minimum 200 foot fiber test lead shall be used between the OTDR and the fiber under test.
10. No fiber optic cable installation will be accepted without the following tests being performed:

- a) For every multimode fiber installed end-to-end attenuation loss testing shall be performed at both 850 nm and 1300 nm wavelengths.

*The results must be recorded and delivered on CD.*

*OTDR tests need to be taken only at one wavelength (850), and they are also to be recorded and delivered on CD.*

- b) For every single-mode fiber installed end-to-end attenuation loss testing shall be performed at both 1310 and 1550 nm wavelengths.

*The results must be recorded and delivered on CD.*

*OTDR tests need to be taken only at one wavelength (1310 nm), and they are also to be recorded and delivered on CD.*

*Contractor shall follow the ANSI/TIA/EIA-598-A Optical Fiber Cable Color Coding guidelines.*

11. Provide a loss budget of proposed multi-mode fiber cable plant and single-mode fiber cable plant. Measured results shall be plus/minus 1 dB of submitted loss budget calculations. If loss figures are outside this range, test cable with OTDR to determine cause of variation. Correct improper splices and replace damaged cables at no charge to the owner.

12. Where any portion of system does not meet the specifications, correct deviation and repeat applicable testing at no additional cost to the owner

## **VIII. PATCH CABLES**

1. Panduit TX6™ PLUS Patch Cords shall be provided for each cable network cable that is installed.

2. Patch Cord color shall match the guidelines described in Section VI of this document (i.e. Blue – Data)

3. Provide two patch cords per horizontal distribution run in all quotations. One will be used in the TR for active equipment, and the other will be used at the workstation.

4. Patch Cord lengths shall be limited to the shortest possible length needed to perform the patching function.

5. Patch Cord lengths should be limited to:

*1',3',5',7' for Patch Panels to Switches*

*10' for workstations*

LAN Cabling contractor shall deliver 100% of the rack device patch cords to the project site. Delivery must be accepted by the CCSD IT Project Manager.

## **IX. ACCEPTANCE**

1. Contractor shall coordinate a site visit with CCSD/IT to perform a site visit.

2. Any items that are found to be in error will be documented, and the contractor will provide a date that all items will be corrected. See diagram 11 for an example of the inspection list.

3. A second site visit will be scheduled. Any items that remain at this time will be documented. CCSD/IT reserves the right at this point to employ a separate contractor to make corrections at a cost to the original contractor.

4. Once all punch list items have been resolved, CCSD/IT will sign the project release form, and authorize payment.



**Charleston County School District**

**Cabling Project Check Sheet – Final Inspection**

**Project Name** \_\_\_\_\_ **Vendor** \_\_\_\_\_

**Vendor’s Project Manger** \_\_\_\_\_

**A. Site Inspection**

- Ceiling tiles in place.....
- Closets free of debris.....
- Classrooms free of construction debris .....

**B. Cabling**

- Service loop – copper properly installed.....
- Service loop – fiber properly installed .....
- Racks properly labeled .....
- Faceplates properly labeled.....
- Patch cords provided .....
- Racks grounded.....
- Trays grounded.....
- Patch panels properly terminated .....
- Classroom jacks properly terminated.....

**C. Miscellaneous**

- Site drawings attached to rack in MDF .....
- Work completed according to the Scope of Work .....
- Project completed on time.....
- ...if not, please note the number of days beyond deadline \_\_\_\_\_
- As-builts provided .....
- Certification/test results received .....

**CCSD Project Manager Responsibilities**

- Drawings forwarded to CCSD Facilities Group.....
- Notification of cabling completion to Network Administrator .....
- Project Status communicated with School Principal.....
- Documentation provided for IT retention .....

**Notes** (please note any previous failed inspections)

**Payment Approval**

**Project Manager** \_\_\_\_\_ **Date** \_\_\_\_\_

Figure 11