

Charleston *excellence is our standard*  
County SCHOOL DISTRICT

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*LAN CABLING SPECIFICATIONS FOR  
NEW CONSTRUCTION, ADDITIONS, AND MAJOR RENOVATIONS*

*Department of Information Technology*

*Charleston County School District*

*Charleston, South Carolina*

*November 3, 2010*

*Version 2010.1*

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## Revisions

Version	Date	Author	Revision Comments
2007.0	03/21/2007	Department of Information Technology, CCSD	
2010.0	07/15/2010	Department of Information Technology, CCSD  Chris Heironimus, Connie Britton, Elliott Pace, Winchester Brown, Judith Wyndham, Kathleen Roberts	
2010.1	08/2010	Department of Information Technology, CCSD  Chris Heironimus, Connie Britton, Elliott Pace, Winchester Brown, Judith Wyndham, Kathleen Roberts	Incorporated final comments and made minor edits.

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## General information

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

- Data communications
- Facility security
- Public Address system
- Sound
- Telephone systems
- Video distribution

This document is intended to provide guidance for the installation contractor. These specifications apply to all CCSD projects and are the basis for acceptance prior to final payment.

In most construction projects, the general contractor is responsible for providing the cable pathways. In certain situations, the cable installation contractor may be required to provide pathways. This requirement will be dictated in the scope of work. For reference purposes, the pathway specifications are available on pages 4 through 15.

Individual specifications will be posted for each system. Please refer to the documents published at [www.ccsdschools.com](http://www.ccsdschools.com).

- Regulations and Code Compliance
- All work specified within this document must comply with the applicable requirements of:
  - 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)

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- 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.

## Acronyms and definitions

	Definitions
<b>ADA</b>	Americans with Disabilities Act of 1990
<b>Approved</b>	Written permission to use a material
<b>Backbone</b>	Intra-building and inter-building connections
<b>BEP</b>	Building Entrance Protection
<b>Building Entrance</b>	Cable termination equipment where an outside plant enters the building.
<b>Buried Cable</b>	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.
<b>CCSD/IT</b>	Charleston County School District, Information Technology Staff
<b>CF/CI</b>	Contractor furnished / Contractor installed
<b>Cable</b>	An assembly of one or more electrical conductors or optical fibers within an enveloping sheath, constructed to permit. Use the conductors singly or in groups.
<b>Cable Tray</b>	A ladder, trough, solid-bottom or channel raceway intended for the support of telecommunications cables.
<b>District</b>	Charleston County School District
<b>Equivalent</b>	Equally acceptable as determined by CCSD
<b>Exposed</b>	Not concealed
<b>Furnish</b>	Supply and deliver to installation location
<b>MTR</b>	Main Telecommunications Room (previously MDF) This room may also serve as the Server Room.
<b>OF/CI</b>	Owner furnished / Contractor installed
<b>OF/OI</b>	Owner furnished / Owner installed
<b>PA</b>	Public address
<b>Provide</b>	Furnish, install, test, place in operation and service, and connect ready for use.
<b>TR</b>	Telecommunications Room (previously IDF or HC)
<b>WAO</b>	Work Area Outlet

## General installation requirements

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

### Ceilings and walls

- Carefully remove existing tiles as required. Store removed tiles in a location specified by CCSD/IT or school staff.
- Do not modify the grid structure in any way.
- Replace and install any tiles that are damaged during installation by the contractor. New tiles must match the type, color and design of the adjacent areas.
- Replace and install any grid members that are damaged by the contractor during the installation process.
- Repair any solid ceiling area that becomes damaged by the contractor during the installation process. Notify the CCSD/IT Project Manager of any damages. The CCSD/IT Project Manager can help the vendor contact the District Maintenance office to recommend a contractor skilled in this area.
- Restore all wall surfaces to their original finish and match the appearance of the adjacent surfaces.
- Patch brick penetrations with a mortar that matches the color of the brick.
- Do not use firestop products and silicone type sealants to seal masonry penetrations.

### Working environment

- Ensure all contractor employees sign in at the office each working day. A visitor's badge (or sticker) is required at all times.
- 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 a company logo are an acceptable alternate means of identification.
- Perform all work in a neat and workman like manner. All methods of construction and details of workmanship that are not specifically described or indicated are subject to the approval of the CCSD/IT Project Manager.
- Cover all computer equipment and furniture during the project to reduce the debris residue on the equipment.
- Daily clean up is required of all site areas.
- Ensure that no equipment, cables, or contractor personnel are in the hallways during classroom changes.



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- Rope off any unsafe areas.
- Store equipment and supplies only in areas designated by the CCSD/IT Project Manager or the school staff.
- Schedule and coordinate any disruption in data, phone, ETV, public address (PA), and other services with the CCSD/IT Project Manager and school staff.
- Work schedules typically starts at 3:30 p.m. when the students have left for the day. Coordinate any other schedules with the CCSD/IT Project Manager and the school staff.

### Abandoned cables

- Remove all unused (abandoned) cables from the ceiling and riser areas.
- Report any cables that are identified outside the scope of each project to the CCSD/IT Project Manager. The additional cables may be added as an alternate to the original scope if deemed necessary.
- The contractor removes the debris and arranges for off-site disposal.
- Properly seal all open wall penetrations that result from the removal of abandoned cables.

### Sleeves

- Ensure that sleeve assemblies are from an approved manufacturer. **Note:** Some site conditions require field fabricated sleeves. All field fabricated sleeves must be approved by the CCSD/IT Project Manager in writing and prior to installation.
- 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.
- The general contractor for general construction work is responsible for creating the openings to accept sleeves in new building.
- Use galvanized rigid conduit/sleeves for penetrations through exterior masonry/concrete walls and foundations, concrete floor slabs on grade and above grade, and concrete-filled decks.
- Use only fire-rated listed assemblies for the type of sleeve being installed through CMU walls or gypsum walls for communications penetrations.
- Use approved manufacturer splits over existing conduits where necessary.
- Secure sleeves firmly in place using filling and patching materials (mortar) that match the surrounding construction.
- In floor penetrations, extend sleeve 1" to 3" AFF unless noted otherwise.

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- Seal voids between sleeves and building construction with joint sealants. Make allowances for and coordinate the work with installation of firestopping, conduit insulation, and waterproofing, as applicable.
- The contractor is fully responsible for the final and correct location of sleeves.
- Correct and provide sleeves that are omitted or incorrectly located in existing building construction. This is the responsibility of the communications contractor.
- Provide corridor sleeves with a diameter of 4" unless directed to change by a licensed structural engineer.
- A minimum of four (4) 4" sleeves is required into all TRs. Install additional sleeves as needed.
- Provide mechanical support for all cables outside of the sleeve to prevent slippage of the cable to the lower end of the sleeve.

## Penetrations of building surfaces

### Above grade level or non-waterproof areas (interior)

- Seal every annular space between conduits or cable and building surfaces. Pack the 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 this document for conduit and cable penetrations. Seal every space between conduit or cable and sleeve. Refer to pages 5 and 11.

### Waterproof areas (above and below grade)

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

## Grounding

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

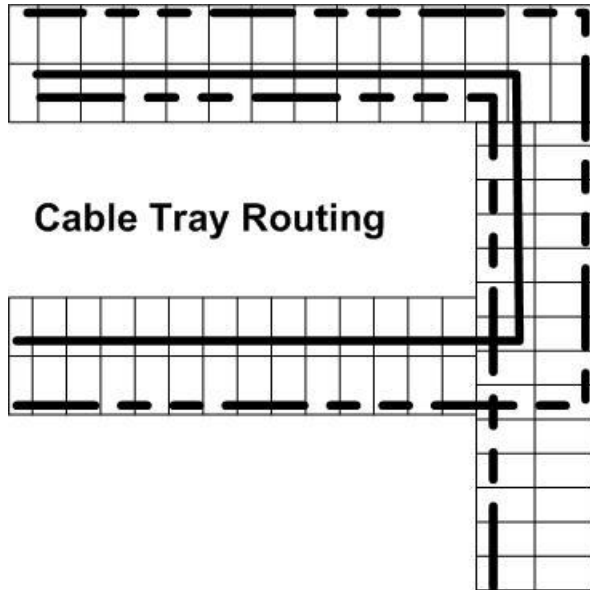
## Infrastructure pathways and spaces

### Conduits

- Install all conduit pathways prior to the communications contractor's arrival in new construction.
- The communications contractor must install all necessary conduits in existing structures unless otherwise provided by the CCSD/IT Project Manager.
- Verify that all conduits meet applicable codes and guidelines to determine material, type, and sizing.
- Mark all conduits with the words Communications Cabling.
- Attach each conduit to the building structure. Never attach conduit systems to other trade work.
- Install cables in conduit from the cable tray to the wall outlet in new construction.
- Install cable in conduit from the cable tray to the Panduit T-70 raceway system.
- Install conduit from the cable tray to the speaker locations in the classroom.
- All conduits must have a nylon pull string both before and after cable installation.
- There shall be no more than two (2) 90° bends between any pull points.
- The use of LBs is strictly prohibited.
- Install a 4" conduit from the nearest TR to the outside of the building that is the most likely location for future placement of portable classrooms. Verify that the conduit is clear of obstructions, capped, and labeled IT. Place a 24"x36"x24" handhole that has a lid labeled with Telecommunications.
- Provide handholes and pull boxes for every 200' of conduit. No more than two 90 degree bends are allowed between pull boxes. Pull boxes must not change the direction of the conduit run.
- If outside plant (OSP) cable enters the building more than 50' from the nearest TR, install an approved pull box at the building entrance. Run a rigid or IMC, threaded conduit from the pull box to the nearest TR, preferably the MTR. This allows the outdoor cable to run straight into the TR with no transition to plenum cables.

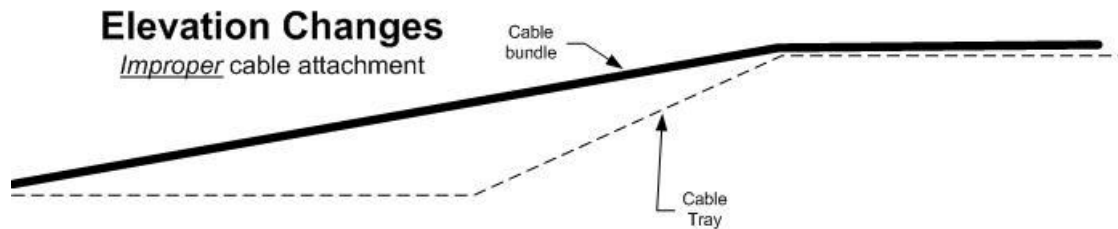
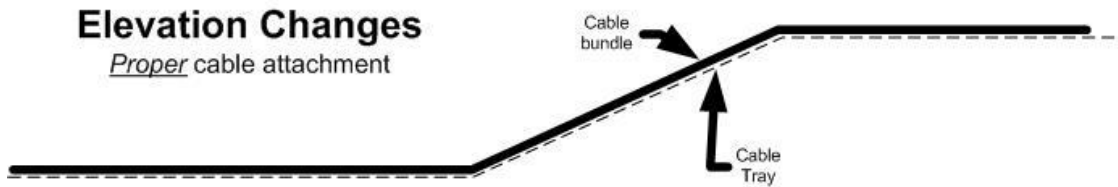
**Cable trays**

- Do not use cable trays with solid bottoms or covers unless required to meet codes.
- Cables must follow a consistent routing through the trays. Refer to the diagram below.



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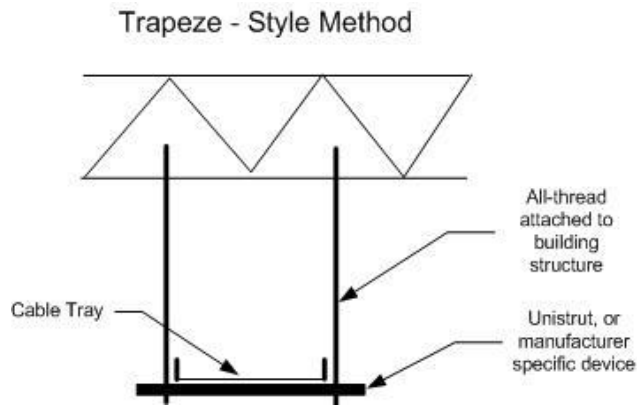
- Attach cable bundles to the tray at all elevation changes.
- Attach the bundles with a loose fastener to keep the cables on the tray through the entire run.
- Refer to the elevation diagrams below for the proper and improper attachment methods.



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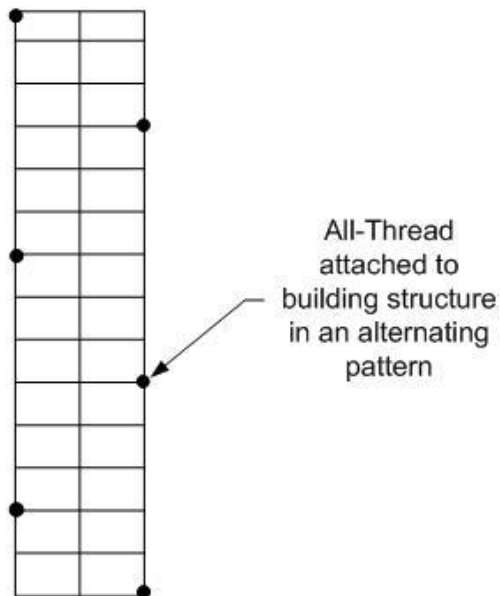
- Use flexible cable trays whenever possible.
- Designers must ensure that the installers use proper mounting methods. Install trays using either of the fastening methods below.
- Do not install trays using a support rod through the center of the tray.

### Trapeze style method of fastening cable trays



### Direct style method of fastening cable trays

#### Direct Fastening Method



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- Do not use cable trays with hooks or ribs unless installing one tray per trade. For example, cable trays with hooks or ribs can be used if there is a separate tray for each of the trades below.
  - Data
  - Facility security
  - Fire
  - PA
  - Video
  - Voice
- Install cable trays in all main corridors and any other areas that have a large cable count.
- Stop trays 6”–12” away from firewalls. Install the appropriate number of sleeves through the firewall to connect both trays. The sleeves must provide the same number of square inches as the tray.
- Sleeves must be able to accommodate: data, voice, ETV, PA, surveillance, and alarm cables. Size the tray and sleeves accordingly.
- Bundle and separate each cable trade in the trays. **Note:** Cables that are not bundled, or are poorly managed in the cable trays must be removed and replaced at the contractor’s expense.

### Other supporting systems

- J-hooks can be used in some areas of renovations and existing buildings providing they meet the specifications for Category 5E and Category 6 cable installations. Maximum distance between J-hooks is 36". Contact the CCSD/IT Project Manager to obtain written approval prior to installation of J-hooks.
- Do not use D rings or Bridle rings in the ceiling area.
- Other manufactured support structures can be used with the written permission of the CCSD/IT Project Manager. One example of this type of structure is a Snake Tray™.
- Data/power poles can be used where necessary. Include the use of these devices in each Scope of Work that incorporates their use. Fasten poles to the ceiling grid with proper hardware, and securely fasten to the floor with anchors. Electrical outlets provided with the data/power poles must meet CCSD design specifications.

### Exterior pathways

- Design each chosen pathway independently and in detail.
- All exterior pathways must be underground unless it is impractical to do so.
- The majority of portable classrooms are currently connected to the school's LAN by Outside Plant aerial cable. This includes copper and fiber optic cables. At times, wireless networking devices are installed in favor of fiber optics depending on site conditions. All aerial cables are to be self supporting (figure 8) cables with 1/4 inch messengers or individually lashed to a pre-hung messenger. The only exception to this is the self supporting aerial RG6 which carries a 5/16 inch messenger.
- On a new campus, coordinate trenching with the CCSD/IT Project Manager. It may be possible to include technology conduits with other trade conduits in the same trench.
- Tamp trenches to prior soil consistency or backfill all trenches with a mound of dirt to accommodate settling. Perform a site visit within four (4) weeks. The contractor must fill any recessed earth.
- Provide an OSHA approved barrier if mounds of dirt are left after trenching.
- It is the responsibility of the contractor to contact a service locator to mark all existing cables and conduits. The contractor assumes all responsibility for damage to underground facilities and services.

### Handholes

- Install handholes where necessary to provide pulling points and splicing access.
- The maximum distance between handholes must not exceed 200' unless authorized in writing by CCSD/IT staff. Mark all covers with a communications label.
- Locate devices out of the normal flow of foot or vehicle traffic.



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### Direct buried cable

- Provide all direct buried cables with a minimum ground cover of 36". Install a metallic tape 24" above the top of the cable.
- Label the tape with the words Telecommunications Cable, Fiber Optic Cable, or similar markings to identify what lies beneath.

### Aerial cables

- All aerial cables must be self-supporting (figure eight) cable or be attached to a messenger.
- All aerial hardware must be galvanized or stainless steel.
- All aerial cable support must be galvanized or stainless steel. **Note:** Refer to the latest edition of the BICSI's Customer Owned Outside Plant (CO-OSP) Design" manual for guidance on pole-setting depth, slack span design, and pole line guiding and anchoring.
- Contact the CCSD/IT Project Manager prior to design completion.
- All aerial hardware must be galvanized or stainless steel. **Note:** For guidance on pole-setting depth, slack span designs, and pole line guiding and anchoring, refer to the latest edition of the BICSI's Customer Owned Outside Plant (CO-OSP) Design Manual.
- Contractor must show proof of proper training and attaching hardware for each application.

### Transition points

- Transition any outdoor rated cable that enters the building to an indoor rated cable.
- Ensure that the 50' ruling is followed.
- Use fusion splices for fiber optic cables. **Note:** Do not install splice cases above the ceiling.
- Coordinate locations with the CCSD/IT Project Manager.
- Provide and install all necessary building entrance protectors when any OSP cables are installed.

## Firestopping

### General guidelines

- Firestop 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 where they penetrate new or existing building construction.
- Accomplish firestopping by using a combination of materials and devices (caulks, putties, cementitious materials) to make up a complete firestop.
- Coordinate with the electrical contractor on site to ensure compliance with other firestop systems.
- Provide documentation of the ULI system information for each type of sleeve installed.
- Verify that cabling and other penetrating elements and supporting devices have been completely installed and temporary lines and cables have been removed.
- Use products in the form of caulk, putty, strip, sheet, or devices that are specifically designed to fill holes, spaces, and voids at communications penetrations.
- Use firestopping materials that provide adhesion to substrates and maintain fire and smoke seal under normal expected movements of substrates, conduits, and cables, as well as hose streams.
- Seal all telecommunications sleeves with a re-enterable sealant whenever possible. Caulk can be used around the outer surface of the sleeve, but not inside the sleeve. Non-hardening putty is the preferred material to seal the inside of the sleeve.
- Label each sleeve with the UL system, -F" & -T" rating, the manufacturer's name, and the products used. This information can be listed in the as-built documentation if all of the sleeves are identical in design.
- Select the appropriate type or types of through penetration firestop devices or systems appropriate for each type of communications penetration and base each selection on the criteria in this document.
- Do not select firestop systems that are less than the hourly time delay ratings indicated in the contract documents for each respective fire-rated floor, wall, or other partition of building construction.
- Firestop for each type of communications penetration must conform to the requirements of the design drawing.
- Perform all necessary coordination with trades constructing floors, walls, or other partitions of building construction. Specifically, the construction of each openings size and shape and what approved device or system to use.

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- Coordinate each firestop system to match existing work. In areas accessible to the public and other finished areas, select, install, and finish firestop systems to match the quality of the adjacent surfaces of building construction being penetrated.
- Use materials that have no irritating or objectionable odors when firestopping is required in existing buildings and areas that are occupied.
- Provide damming materials, plates, wires, restricting collars, and devices necessary for proper installation of firestopping. Remove combustible installation aids after firestopping material has cured.
- Install all firestops in accordance with the manufacturer's instructions in order to maintain the specific rating assigned by the independent testing laboratory.

## Firestopping references

Use the latest version of the following documents for firestopping requirements.

- ASTM E814, "Standard Test Method for Fire Tests of Penetration Firestop Systems"
- ASTM E119, "Standard Test Methods for Fire Tests of Building Construction and Materials"
- NFPA National Electrical Code, "Spread of Fire and Products of Combustion"
- BICSI Telecommunications Distribution Methods Manual"

**Note:** Installed firestopping systems must meet the approval of Charleston County School District.

## Additional requirements for existing penetrations

- Firestop all existing raceways, cable trays, and cabling that penetrate existing building construction to the extent necessary to fill the cavities between the following:
  - Existing building construction and existing communications penetrations or existing conduit sleeve
  - Existing conduits and existing conduit sleeve
- Use assemblies consisting of individual steel hat type restricting collars filled with intumescent type materials that completely surround communications penetration for nonmetallic raceways and cabling.

## Labeling

### Labeling standards

- Meet the intent of ANSI/TIA/EIA-606-A Administration Standard for Commercial Telecommunications Infrastructure standards for labeling.
- Label each outlet with a permanent self-adhesive label with a minimum of 3/16 in. high characters.
- 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.
- Provide labels on face of data patch panels with large letters A, B, C, D, and so forth.
- Provide as-built records that are specific to the facilities terminated at each TR location. CCSD provides vinyl pouches for each rack location.
- Labels shall be machine-printed. Hand-lettered labels are not acceptable.
- Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to CCSD/IT Project Manager two (2) weeks prior to move in to allow the CCSD/IT personnel to connect and test equipment in a timely fashion.

### Telecommunication room (TR) labeling format

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.

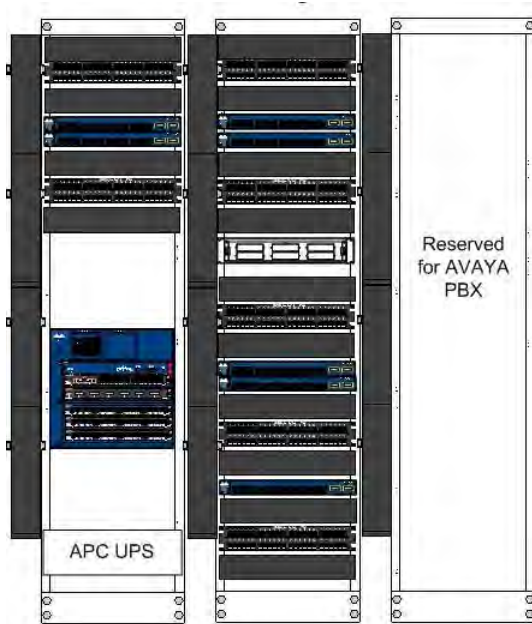
- The Main Telecommunications Room (MTR) is always considered as TR#1. The terms MTR and TR# 1 are synonymous.
- The assignment of additional TR numbers should provide a flowing sequence. Number any TRs on the same floor first and then add additional floors. TRs in separate buildings can then be added. Each building will have a designation as well. Refer to the illustrations on page 19.

## Rack/patch panel format

- Label all racks to show the TR number. Place a large label near the top of the rack, usually on the top wire manager cover.
- Configure all racks in a similar manner throughout each project. Refer to the rack layout illustrations on page 18.
- Build racks based on the Panduit NetFrame™ Rack System (part# NFR84). Use additional accessories as needed.
- Use Panduit Cable Management Troughs to connect multiple racks together. (part# CMUT19)
- Install Panduit Network Cable Managers (part# NCMH2) between each rack mount device or as shown below.
- Do not use cable ties, zip strips, or tie wraps anywhere on the rack system. Use Velcro, hook and loop, or similar products to manage cables beneath the ceiling.
- Label patch panels consecutively starting with A and continuing for each patch panel. Each TR has an A panel.
- Neatly dress all cables in the overhead cable trays, wire managers, and at the attachment point. Label all cables at the termination point on the patch panel.
- Provide each MTR with a minimum of three (3) racks. Provide each ITR with a minimum of one (1) rack. Consult the project specifications for details on the TRs for each project.

### Typical TR rack layout

Typical MTR telecommunications rack layout



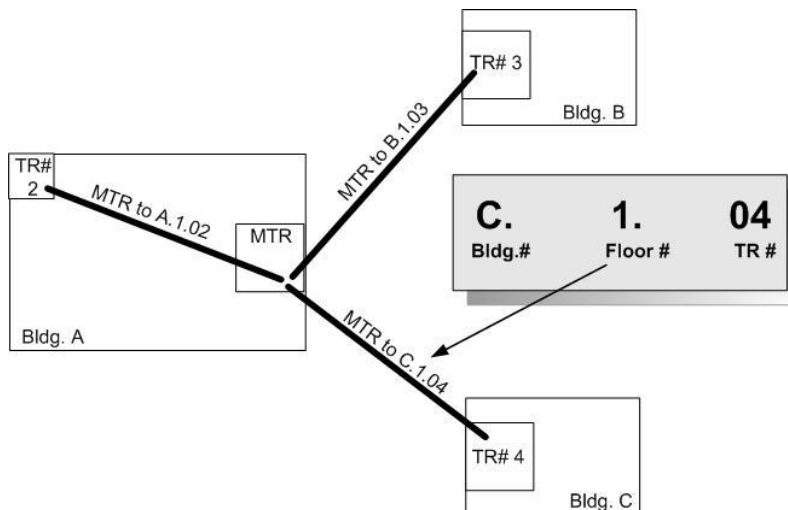
Typical ITR telecommunications rack layout



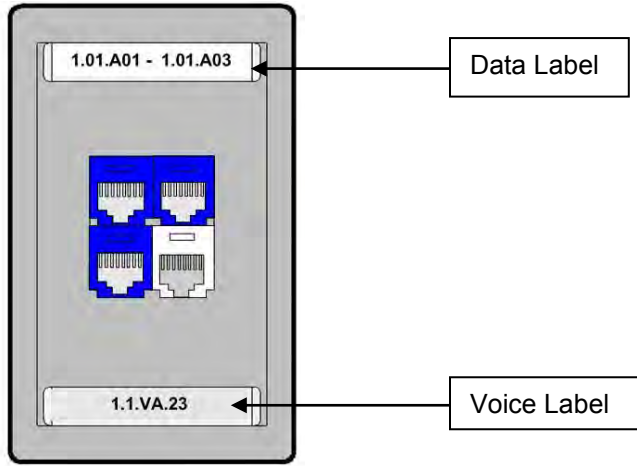
## Backbone (feeder) cable labeling formats

- If buildings have no alpha designation, such as Bldg A, then assign designations and annotate on the as-built drawings. Contact the CCSD/IT Project Manager if assistance is required.
- Clearly mark all backbone cables at each termination point showing the local TR and the far end TR. Refer to the sample backbone labeling format below.
- Clearly annotate all splices at the termination point to provide location of splice point, and type of splice. Show any transition points and Building Entrance Protector (BEP) installations on all as-built documents.
- Clearly annotate the path of each bundle at each termination point if a splice is made for the purpose of stripping out pairs.
- Do not install splices in the ceiling spaces without written permission of the CCSD/IT Project Manager.
- Fusion splice fiber optic cables unless directed otherwise by the CCSD/IT Project Manager.
- Terminate fiber optic cables in rack mount enclosures whenever possible.
- Terminate each strand of the fiber bundle unless directed otherwise by CCSD/IT Project Manager.

### Backbone labeling format

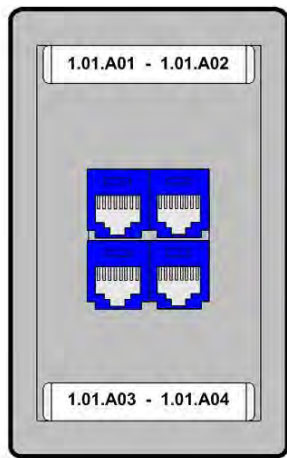


### Voice cable labeling format



**1.** Floor #  
**01.** TR#  
**VA.** V=Voice  
A= 110 Block  
**01** Port#

### Data cable labeling format



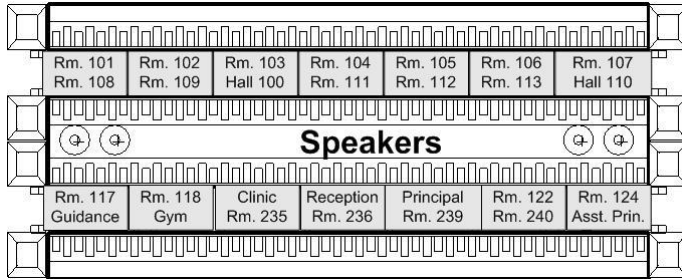
**1.** Floor #  
**01.** TR#  
**A.** Patch Panel #  
**01** Port#



## PA cabling format

- The illustrations below show the 110 block layout for PA cable termination and termination method for outdoor speaker cables using terminal blocks.
- Coordinate placement of 110 blocks with CCSD/IT Project Manager prior to installation.
- Callback buttons can only be used in special situations.

### Sample speaker format

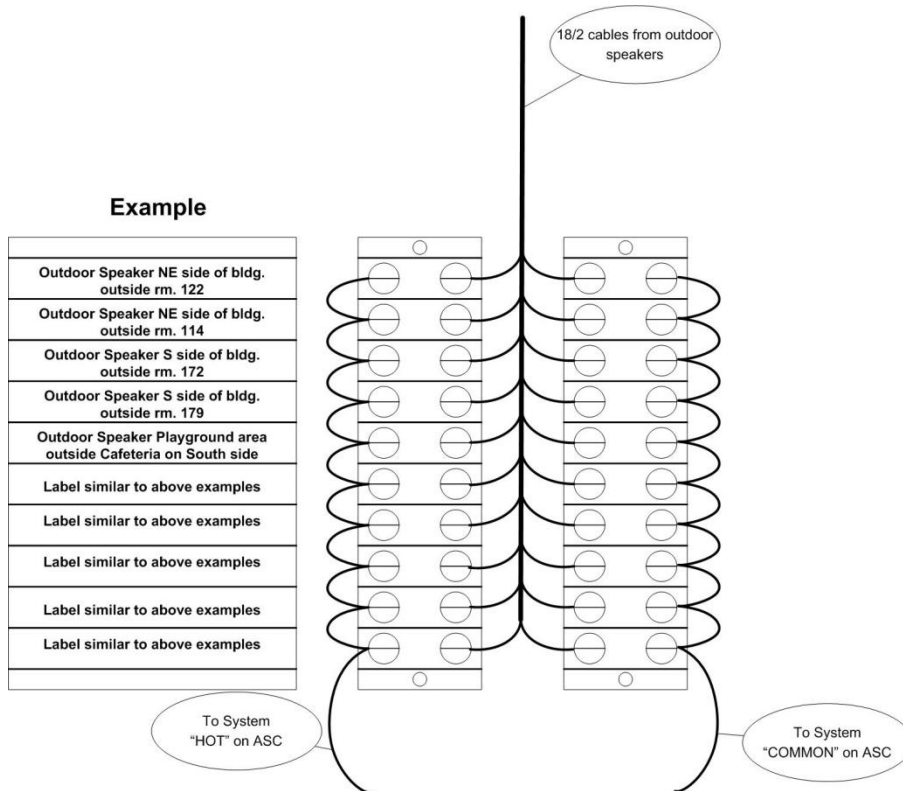


### PA terminal block



**Note:** Requires two terminal blocks.

### 110 block layout for PA cable termination and termination method for outdoor speaker cables using terminal blocks



## LAN cabling—horizontal distribution

### General information

LAN cabling consists of the following infrastructure:

- Data cabling—Workstation outlet to patch panel, necessary intra-building/inter-building connections
- Voice cabling—Device outlet to 110 blocks, necessary intra-building/inter-building connections
- Public Address (PA) cabling—Device outlet to 110 style block in each TR, speaker cables, and speaker placement
- Video distribution cabling (ETV)

Contractors must familiarize themselves with the CCSD Master Plan for design parameters in each area. Please refer to the CCSD Technical Design Specifications located at [www.ccsdschools.com](http://www.ccsdschools.com).

**Special Note:** All LAN cabling must be plenum rated unless otherwise specified.

Cable trays are provided in new construction to support multiple services. Each contractor 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 CCSD/IT Department. Any cables that use the common cable tray for support will be inspected by the CCSD/IT Project Manager for compliance.

## Horizontal distribution of data cabling

- All copper connectivity hardware shall be Panduit Mini-Com®, TX6™ PLUS components. No substitution is allowed because of the large installed base of this product.
- The use of 96 port patch panels is NOT permitted in the TRs. CCSD uses 48 port patch panels to match the configuration of the Ethernet switches (48 port switches).
- Terminate all wireless access point cables on a separate 24 port patch panel.
- All terminations must follow the EIA/TIA 568B wiring scheme using Panduit Mini-Com®, TX6™ PLUS modules. Blue is the color for data modules.
- Provide faceplates for the T-70 raceway that have a label window. Use Panduit Ultimate ID snap-on faceplates, such as, UIT70FH2IW 2 port horizontal Ivory White.
- There is currently no plan to install fiber to the desktop within the CCSD.
- At the present time, CCSD has standardized on Category 6E (550 MHz) plenum rated (CMP) cables for data applications unless otherwise specified.
- Use data cables from the same manufacturer throughout each project.
- Provide one type of cable from the following list:
  - CommScope—BLUE
  - Hitachi—BLUE
  - General Cable—BLUE
  - Mohawk—BLUE
- Substitutes must be approved prior to the bid award.
- 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) for all data cable installation.
- Use the more stringent guideline if guidelines conflict. **Note:** The BICSI training guidelines provide the preferred methods of installation.

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- Install all horizontal distribution cable in one continuous run from the TR, to the workstation outlet. Do not use splicing.
- Only CCSD can approve designs including consolidation points or zoned cabling.
- Replace all pull-strings in cable trays and conduits when installing cables.
- Provide a minimum of 10' of cable slack at each TR and a minimum of 1' of cable slack for each workstation outlet following the BICSI Telecommunications Distribution Manual. **Note:** Do not form a loop with the cable slack at either end of the run. Use a serpentine design whenever possible.

## Horizontal distribution of voice cabling

- All copper connectivity hardware shall be Panduit Mini-Com®, TX6™ PLUS components. No substitution is allowed because of the large installed base of this product
- Terminate voice cables on Panduit 110 blocks in each TR. Maintain a separate 110 block for each separate system.
- All terminations shall follow the EIA/TIA 568B wiring scheme using Panduit Mini-Com® TX6™ PLUS modules. White is the color for voice modules.
- Provide faceplates for the T-70 raceway that have a label window. Use Panduit Ultimate ID snap-on faceplates, such as, UIT70FH2xx 2 port horizontal.
- At the present time, CCSD has standardized on Category 6E (550 MHz) plenum rated (CMP) cables for voice applications unless otherwise specified. These cables support Voice over IP Digital and analog systems.
- Voice cables must come from the same manufacturer throughout each project
- Provide one type of cable from the following list.
  - CommScope—**WHITE**
  - Hitachi—**WHITE**
  - General Cable—**WHITE**
  - Mohawk—**WHITE**
- Substitutes must be approved prior to the bid award.
- 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) for all voice cable installation.
- Use the more stringent guideline if guidelines conflict. **Note:** The BICSI training guidelines are the preferred installation methods.
- Install all horizontal distribution cable in one continuous run from the TR to the workstation outlet. Do not use splicing.
- Only CCSD can approve consolidation points or zoned cabling.
- Replace all pull-strings in cable trays and conduits when installing cables.
- Provide a minimum of 10' of cable slack at each TR, and a minimum of 1' of cable slack for each workstation outlet following the BICSI Telecommunications Distribution Manual. **Note:** Do not form a loop with the cable slack at either end of the run. Use a serpentine design whenever possible.

## Horizontal distribution of PA cabling

- All copper connectivity hardware shall be Panduit Mini-Com®, TX6™ PLUS components. No substitution is allowed because of the large installed base of this product.
- Terminate PA cables on Panduit 110 blocks in each TR. Maintain a separate 110 block for each separate system, such as handsets, speakers, and more.
- Follow the EIA/TIA 568B wiring scheme using Panduit Mini-Com® TX6™ PLUS modules for all terminations. Gray is the color for PA modules.
- At the present time CCSD has standardized on Category 6 (550 MHz) cables for PA applications where handsets will be used. These cables support Voice Over IP and Paging systems. All cable must be plenum rated (CMP) unless otherwise specified.
- PA cables can be from different manufacturers depending on the type of cables to be installed. An example is Cat 5E cables for the handsets and speakers and shielded cable for backbone cables.
- Provide cable from the following list.
  - CommScope—**GRAY**
  - Hitachi—**GRAY**
  - General Cable—**GRAY**
  - Mohawk—**GRAY**
- Substitutes must be approved prior to the bid award.
- **Note:** Various West Penn multi-pair 22 AWG shielded cables may be required for PA administration handsets.
- 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) for all PA cable installation.
- Use the more stringent guideline if guidelines conflict. **Note:** The BICSI training guidelines are the preferred installation methods.
- Replace all pull-strings in cable trays and conduits when installing cables.
- **Note:** Additional information will be added to this section as the CCSD establishes standards for PA systems.

## LAN cabling—backbone distribution

### Fiber Optic Cable

- Provide all with a minimum one (1) fiber cable with twelve (12) 50 micron multimode fibers from the MTR to TRs.
- Secure fiber to wall vertically every 48” or follow manufacturer’s recommendations when fiber optic cable passes through a vertical riser closet.
- Do not install high density fiber termination cabinets. Use 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. Add additional cabinets as needed.
- Terminate all fiber strands using an SC style connector. ST connectors can be used in an existing network infrastructure that already has a large installed base of ST connectors in place.
- Do not include fiber optic patch cords unless otherwise specified.
- Use of indoor/outdoor plenum rated cables to interconnect buildings is acceptable.
- Get approval of any design that includes any type splice from CCSD/IT Project Manager prior to installation.
- Use a fusion splice method to perform all splices.

## Copper cable

- Use copper backbone cables primarily for voice and PA applications. Do not use copper cables for data applications unless specified by the CCSD/IT Project Manager.
- Use the same color designation as the horizontal distribution cables. For example, use white voice cable and gray PA cable for copper backbone cables. **Note:** OSP cables are an exception to this requirement. Label all OSP cables at the entrance and exit of each building and transition to the appropriate colored indoor cable.
- Use Category 3 or better with the appropriate jacketing for backbone cables for voice. Shielded PA cables may need to be provided.
- Perform all terminations of copper cables on an IDC, 110 style blocks. Do not use a 66 block. The only exception to this specification is the use of terminal blocks for the 18/2 cables used for outdoor speakers.
- Cross-connect all voice and PA cables from the outlet, through the ITR, and into the MTR. The LAN cabling contractor is responsible for this action.
- Ensure that there are no crossed pairs by performing a wire map and/or continuity test.
- Clearly label all blocks by block and pair.



## Copper cable testing—horizontal and backbone

- 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 when testing. Use level II field testers for testing.
- Provide a list of proposed test sets and test methods to CCSD/IT Project Manager prior to testing. This is a part of the Scope of Work for the contractor. If the contractor does not get approval for devices and methods for testing prior to installation, CCSD/IT can require the contractor to perform the tests again with the approved equipment and methods. The contractor is responsible for the costs associated with retesting.
- 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 the problem is caused by improper termination. If the termination is proper, tag bad pairs at both ends and note on as-built drawings.
- Remove and replace the entire cable if the copper backbone cables contain more than 5% bad pairs or if the outer sheath damage is the cause of bad pairs.
- Remove and replace cable if horizontal cable contains bad conductors or shield.
- Present all test results to the CCSD/IT Project Manager 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.
- Correct the deviation and repeat applicable testing if any portion of the system does not meet the specifications. The contractor is responsible for this additional testing.

## Fiber optic cable testing—horizontal and backbone

- Provide the results of attenuation tests performed by the manufacturer prior to shipping. The test results must be on the manufacturer's original form.  
**Note:** CCSD/IT highly recommends the testing of optical cable on the spool with a light source and power meter using procedures as stated in ANSI/TIA/EIA-526-14A: OFSTP-14A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant. This prevents additional costs after installation if damage occurs during shipping.
- Provide a list of proposed tests and test methods to CCSD/IT Project Manager prior to testing. This is a part of the Scope of Work for the contractor. If the contractor does not get approval for devices and methods for testing prior to installation, CCSD/IT can require the contractor to perform the tests again with the approved equipment and methods. The contractor is responsible for the costs associated with retesting.
- Perform attenuation and/or OTDR tests of every terminated fiber after installation is complete. **Note:** This is a requirement of the CCSD/IT.
- Comply with ANSI/TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard for all fiber optic installation and testing procedures.
- Present all test results to CCSD/IT Project Manager in printed and electronic format. The test results must be in the original form provided by the manufacturer's software. Printed results can be in a summary format.

- In order for the CCSD/IT Project Manager to accept and approve any fiber optic cable installation, the contractor must perform the following tests.
  - Perform end-to-end attenuation loss testing at both 850 nm and 1300 nm wavelengths for every multimode fiber installed. The results must be recorded and delivered on CD.
  - OTDR tests need to be taken only at one wavelength (850).
    - Maximum dB loss at a multimode connector shall be 0.5 dB at 850 nm as viewed by the OTDR.
    - Maximum dB loss at a splice shall be 0.3 dB at 850 nm, as viewed by the OTDR.
    - Use a minimum 200' fiber launch cable on both ends of fiber cable to the OTDR.
    - Record and deliver the results on CD.
  - Perform end-to-end attenuation loss testing at both 1310 and 1550 nm wavelengths for every single-mode fiber installed. Record and deliver the results on CD to the CCSD/IT Project Manager.
  - OTDR tests need to be taken only at one wavelength (1310 nm).
    - Use a minimum 200' fiber launch cable on both ends of fiber cable to the OTDR.
    - Record and deliver the results on CD.
- Follow the ANSI/TIA/EIA-598-A Optical Fiber Cable Color Coding guidelines.
- Provide a loss budget of proposed multi-mode fiber cable plant and single-mode fiber cable plant. Measured results shall be  $\pm 1$  dB of submitted loss budget calculations. If loss figures are outside this range, test the cable with OTDR to determine the cause of the variation. Correct improper splices and replace damaged cables at no charge to the owner.
- Correct the deviation and repeat applicable testing, at no additional cost to the owner, when any portion of system does not meet the specifications.

## Patch cables

- Provide Panduit TX6™ PLUS Patch Cords for each cable network cable that is installed.
- Use the same color designation as the other cables. For example, use white voice cable and blue data cable for patch cables.
- Include two patch cords per horizontal distribution run in all quotations. One patch cord is for use in the TR for active equipment and the other for use at the workstation.
- Limit the patch cord lengths to the shortest possible length needed to perform the patching function.
- Limit patch cord lengths to:
  - 3' for patch panels to switches
  - 10' for workstations
- Deliver 100% of the rack device patch cords and 50% of the workstation patch cords to the project site. Deliver the remaining 50% of the workstation patch cords to the CCSD/IT Project Manager. This is the responsibility of the LAN contractor.

## Acceptance

- Coordinate with CCSD/IT Project Manager to perform a site visit. This is the responsibility of the LAN cabling contractor.
- Provide CCSD/IT Project Manager with a date when all documented errors will be corrected. Refer to an example of the inspection list on page 34.
- Coordinate with CCSD/IT Project Manager to perform a second site visit. **Note:** Any errors that remain at this time are documented. CCSD/IT reserves the right at this point to employ a separate contractor to make corrections at a cost to the original contractor.
- Once all documented errors are resolved, the CCSD/IT Project Manager signs the project release form and authorizes the payment.
- Deliver all as-built drawings and test results to the CCSD/IT Project Manager prior to initial site visit/inspection.



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## Cabling project check sheet—final inspection

Project Name: \_\_\_\_\_ Vendor: \_\_\_\_\_

Vendor's Project Manager: \_\_\_\_\_

### Site Inspection

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

### 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

### 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

**Charleston County School District**

**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 Manger:

\_\_\_\_\_

Date:

\_\_\_\_\_





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