

Telecommunications Construction Standards



Document Control

Revision History

Version	Date	Change Description
1.0	01/08/2014	Initial Version
7.0	02/16/2023	Updated Appendix A equipment list. Changed document format. Added several additional sections to the document to capture additional requirements.

1. Introduction

Carson City School District (CCSD) has a multitude of voice, data, audio visual, and security requirements that rely on infrastructure that is of quality design, reliable, secure, and flexible, to meet the current and future demands of its students, educators, and support staff. This document is designed to inform planners, architects, engineers, and contractors of CCSD's minimum requirements. These requirements must be met for all CCSD Facilities.

1.1. Planning and Design

During the planning and implementation stages of any new construction or renovation, planners, architects, engineers, and contractors will come into contact with one or several representatives from CCSD's Department of Innovation and Technology (DoIT). DoIT is interested in delivering high quality services to its users by establishing high quality standards for its ICT infrastructure.

Renovation projects are quite different in nature from new construction and require very early consultation with a DoIT representative. This early consultation will ensure all existing and future Information and Communications Technology (ICT) requirements are addressed. For ease of coordination, please contact the Director of Innovation and Technology below. In turn, the director will coordinate a team of engineers, technicians, and support personnel to meet the scope of the project. **It is extremely important that the Director of Innovation and Technology be contacted during the early planning stages to ensure all aspects of ICT requirements are met.**

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The Director of Innovation Technology or his/her designee must approve in advance all telecommunications work as well as verify upon completion of the work that all standards have been met.

This document outlines minimum standards. Whenever and wherever OSHA and/or federal, state, and/or local laws or regulations and/or design require higher or specific standards be followed, than is included in this document, then these laws and/or regulations and/or design shall be followed. In such cases, CCSD DoIT shall be notified and provided the specific law, regulation, or code that requires the deviation from CCSD DoIT standards.

All work shall be executed by persons certified/skilled in the work to which they are assigned.

All materials, parts, and equipment shall be new (unless specified otherwise) and produced by manufacturers of recognized reputation. CCSD DoIT reserves the right to specify any and all materials, parts, and equipment used in the project. **For a list of specified materials, parts, and equipment, please refer to Appendix A.** CCSD DoIT reserves the right to, without notice, change or replace any items on this list. Please be sure to obtain the most recent revision of this document prior to beginning the project.

Items not listed in Appendix A that are needed to complete a project need to be submitted to CCSD DoIT for approval prior to use.

CCSD DoIT bases its requirements on ANSI/EIA/TIA standards such as:

- ANSI/EIA/TIA 568 - Commercial Building Telecommunications Cabling Standard.
- ANSI/EIA/TIA 569 - Commercial Building Standards for Telecommunications Pathways and Spaces.
- ANSI/EIA/TIA 606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
- ANSI/EIA/TIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications.
- BICSI Telecommunications Distribution Methods Manual (TDMM).
- NFPA 70 National Electric Code (NEC).

2. Building Communications Service Entrance

2.1. Routing of underground conduit

All inter-building communications cabling shall be installed in an underground duct bank, encased in concrete.

2.1.1. Number of conduits required

CCSD DoIT will assist in developing the best size and number of conduits, to anticipate ultimate requirements for service and emergency needs. Construction drawings shall provide a minimum of two 4" conduits extending from a vault (typically located 5' 0" outside the building) and terminating in the building's Telecommunications Entrance Room (TER) as described later in this document.

2.1.2. Conduit

Where the entrance conduits penetrate the foundation, footings, or outside walls of a building, rigid metallic conduit shall be used. Plaster fiber ducts or aluminum conduit are not acceptable. These conduits shall have a minimum of 2' 0" ground cover at the point of exit. A downward slope must be maintained to the vault to prevent water from draining into the building.

2.1.3. Bends

Bends in conduit runs must not exceed 180° between vaults or other access points. The total number of bends in a conduit section run must not exceed two 90° bends or equivalent of sweeps and radius bends. All bends must be long, sweeping bends, with a radius not less than ten times the conduit's diameter. For example, a 4" conduit would have a minimum sweep of 40".

2.1.4. Pull strings

Equip each conduit with at least two nylon lines, each with a minimum test rating of 200 pounds.

3. Main Distribution Frame (MDF) Room

The Main Distribution Frame (MDF) room serves as the demarcation point for the building. It is the central point from which voice, data, and video run to each Intermediate Distribution Frame (IDF) room. The MDF contains ICT equipment and can double as the IDF room for the area of the building around it. Connecting conduit or raceway systems are required to ensure that cables are protected from damage and that the greatest distance from any telecommunications outlet (TO) to the nearest IDF does not exceed 294 cable feet.

All MDF and IDF rooms shall have a cable support system.

3.1. Location

3.1.1. General

The MDF room for each building is typically located on the ground floor and must be located on a bearing wall, which reduces the possibility of relocating the room if the building is expanded or altered. Do not locate the MDF room in any place that may be subject to water infiltration due to flooding, steam infiltration, humidity from nearby water or steam, heat, or any other corrosive atmospheric or environmental conditions. Do not allow utilities except those serving the room to run above or in this room (for example, HVAC ducts, electrical service planes, plumbing lines [water, sewage, or steam]). The MDF must not be located inside of office spaces, classrooms, locker rooms, storage rooms, mechanical rooms, auditoriums, or other spaces being used for purposes other than telecommunications. The MDF may not contain or be used for storage, electrical, mechanical, HVAC, fire alarm panels or custodial services. Equipment not related to the MDF such as piping, duct work, building column and distribution of building power must not be located in or pass through the MDF.

3.1.2. Relation to IDF

Locate the MDF room, if possible, in a location as to provide a riser for all other IDF rooms in the building.

3.1.3. Electromagnetic interference

Do not locate the MDF room near equipment that can cause electromagnetic interference (EMI). Keep electrical feeders and branch circuits of noisy equipment away from sensitive equipment and its associated circuits. Likely sources of EMI are heavy-duty electromechanical equipment (for example, transformers, door openers, and elevator systems).

3.2. Size

The MDF room must be a minimum of 100 sq. ft. (minimum width 10', length 10'), which provides at least a 36" clearance on each side of a loaded 19" equipment rack, on which power outlets are normally mounted. If more than one 19" equipment rack is required, additional MDF square footage will also be required.

3.3. Risers

Vertical cable risers make for ease of design, construction, and maintenance. Provide a riser with a minimum of two 4" conduits or sleeves to each communications room. Conduit max fill percentage is 40% for new construction and 60% for adds/removes after initial installation. The total number of conduits or sleeves depends on the number of outlets required in the building. Architects and engineers shall include a single line riser diagram of all conduits as part of the construction documents and drawings. A DoIT representative shall review the conduit sizes and details of this drawing.

3.3.1. Entrance to the MDF room

Locate the riser entrance in a corner of the MDF room. Conduit or sleeves must extend far enough below the ceiling to permit installation of a bushing and cap. In the IDF room above, in a stacked configuration, the conduit should extend a minimum of 3" above the finished floor.

Conduits entering the MDF room shall penetrate the room walls at no less than 8' 0" above the finished floor and extend one to two inches into the room with bushings. The telecommunications contractor will provide and install overhead ladder racks to support the horizontal wire.

3.3.2. Riser cable

The telecommunication contractor is responsible for determining the length of and pulling all voice, data, and video communications cabling. This shall include:

- All intra-building backbone cable for voice, data, and video communications between the MDF room and each IDF room.
- All horizontal cable for voice, data, and video communications between the IDF room and each telecommunications outlet (TO).

The telecommunications contractor shall label all cable pulls in MDF and IDF locations with the end-termination room number.

A DoIT representative will determine placement and route of cable drops in each MDF and IDF location. Each cable run shall include a minimum of 6 feet of slack in MDF and IDF rooms and 2 feet of slack at the telecommunications outlet.

3.3.3. Firestopping

Firestopping is to be placed on the outside of all conduits and sleeves installed into cored holes. The telecommunications contractor is responsible for firestopping the inside of all risers when penetrating floor slabs or fire-rated walls. Unused conduits and sleeves shall be capped.

3.4. Electrical Requirements

Communications systems have strict requirements for electric power. To ensure reliable service, adhere to the following guidelines.

3.4.1. Lighting

LED light fixture(s) are required. Fixture(s) shall be located to provide adequate lighting with an illumination of no less than 50 foot candles at 3' 0" above the finished floor. An illuminated (LED, white in color) manual wall switch should be located near the door. Timers and motion sensors are not permitted. Lighting must be on a separate circuit than outlets intended to support equipment.

3.4.2. Power requirements

When emergency power is available:

Provide one dedicated quad NEMA 5-20R 20A/120V to normal power, one dedicated quad NEMA 5-20R 20A/120V to emergency standby power and one dedicated L5-30P outlet to emergency power.

When only standard power is available:

Provide one dedicated quad NEMA5-20R 20A/120V to normal power and one dedicated L5-30P outlet to normal power.

Electrical plans shall be reviewed by a DoIT representative to help ensure electrical requirements will be met.

3.4.3. Grounding

Supply a power ground or building ground connection utilizing a minimum #6 green copper conductor as close as possible to the service entry conduits.

3.5. Structure requirements

3.5.1. Door

Minimum door size shall be 3' 0" wide, 7' 0" high, and be constructed of metal (no center post and no seal) with 180° hinges, lockable, and open outward. Doors and frames shall be designed and piped for door alarms or future electric locksets and access control system readers. Locks must be keyed to the Department of Innovation and Technology.

3.5.2. Floor coverings

To keep dust and static electricity to a minimum in the room, use floor finishes of sealed cement. Carpeting is not permitted.

3.5.3. Walls

The walls of the room must extend from the finished floor to the regular ceiling and be rated fire resistant. They must support loading of 200 pounds; this load can occur every two feet at 5' 6" above the finished floor.

3.5.4. Wall covering

All walls shall be lined with rigidly installed wall-to-wall framing of 4' x 8', 3/4-inch trade size AC grade (or better), void free plywood. Plywood panels shall be installed vertical 6" above a finished floor. All surfaces (including the unexposed side) of the plywood shall be painted with a white latex nonconductive fire-retardant overcoat. Anchors for plywood panels shall be sufficient to support all background equipment apparatus.

3.5.5. Ceiling

Ceilings must be at least 10'-0" high to provide adequate space over the equipment frames for cables and suspended racks. False ceilings are not permitted in the room. Sprinkler heads must be provided with cages to prevent accidental operations. Drainage troughs must be provided under the sprinkler pipes to prevent leakage onto the equipment. They must be as high as possible to avoid accidental operation from cable pulling activities.

3.5.6. Environment

The room must be designed to maintain a temperature between 65° and 75°F. A thermostat located within the room and 5' 0" above the finished floor shall control the cooling system. The room shall be positive with respect to corridor or area adjoining these rooms. Auxiliary air conditioning units may be required in rooms with high volumes of voice, data, and video electronics. A typical device with a port density of 48 generates approximately 5,000 BTU's.

3.5.7. Fire protection

Fire alarm infrastructure and operation requirements are separate and in addition to DoIT standards.

3.5.8. Card readers

Provide a card reader for entry into the room. Card and electronic entry reading infrastructure and operation requirements are separate and in addition to DoIT standards.

4. Intermediate Distribution Frame (IDF) Room

IDF rooms house intra-building backbone cables and serve as a distribution point for horizontal cabling. The physical size of a building determines the need for communications rooms. The length of the horizontal standard cabling for voice, data and video is limited to 294 “cable feet” from the IDF to the communications outlet. The IDF must not be located inside of office spaces, classrooms, locker rooms, storage rooms, mechanical rooms, auditoriums, or other spaces being used for purposes other than telecommunications. The IDF may not contain or be used for storage, electrical, mechanical, HVAC, fire alarm panels or custodial spaces. Equipment not related to the IDF such as piping, duct work, building column, and distribution of building power must not be located in or pass through the IDF.

4.1. Location

IDF rooms shall be interconnected with a riser system using sleeves or conduits. The room shall be located off a corridor, or accessible from a hallway or other public space, as not to require passing through an office, locker room, mechanical room, maintenance room, custodial room, or classroom to access the IDF. Restrooms and all other water, sewage, and steam sources shall not be located on any side of or above IDF rooms.

4.2. Size

IDF rooms are sized to provide the linear wall footage necessary for routing cable, mounting termination blocks, mounting electronics and other equipment. Size should be a minimum of 63 sq. ft. (9' by 7'), which provides at least a 36" clearance on each side of a loaded 19" equipment rack mounted on the horizontal center point of the 9' wall.

4.3. Other specifications

All other specifications for IDF rooms are identical to those listed in sections 3.4 Electrical requirements and 3.5 Structure requirements except the following.

4.3.1. Environment

As determined by DoIT, a separate cooling system may not be necessary. If the space is serviced by an existing climate control system that can maintain a temperature between 65° and 75°F.

4.3.2. Electrical

Provide one dedicated quad NEMA5-20R 20A/120V to normal power

5. Intra-Building Distribution System (Internal Building)

In all buildings, horizontal and vertical communications distribution systems are an absolute necessity in meeting and in keeping pace with the building occupants' voice, data, and video communications needs. The distribution systems are designated to house the cables and wiring necessary to connect communications equipment with the control and cross-connecting switching equipment located in the MDF room and in each IDF room. As the needs of CCSD grow, the communications service requirements increase accordingly. Although the initial telecommunications outlets are identified based on furniture layouts and the intended purpose of the space, needs often change over time. The design and capacity of a communications distribution system should have built-in flexibility to anticipate this movement and should be planned for in the initial building design. Therefore, it is prudent to design a building in such a way as to ensure that an adequate and functional intra-building distribution system is provided for telecommunications.

5.1. Horizontal cabling system

5.1.1. Cable tray

Minimum standards require that the cable tray be 12" wide and 4" deep basket tray. The tray shall either be suspended from the ceiling by supporting rods or wall mounted as recommended by the manufacturer. No rod threads should be exposed in the cable tray, to avoid damaging the cable during installation. The cable tray shall have a minimum clearance of 12" on top and 6" on the sides and bottom from all obstructions (for example, sprinkler pipe, HVAC ducts, lights). Stub conduits one to two inches from the cable tray. See section 5.1.3 Conduit systems for standard installation requirements.

5.1.2. J-hooks

J-hooks are not recommended, and the designer must receive approval for use in CCSD Buildings. If approved, the minimum standards require that J-hooks are not more than 5' apart and are installed above the finished ceiling. J-hooks shall be accessible with a minimum clearance of 6" above, below, and on all sides.

5.1.3. Conduit system

Conduit systems are designed to protect the communications cabling. The following are installation standards for each type of conduit. The CCSD project manager must approve the type of conduit through consultation with CCSD DoIT. The conduit system shall be designed to allow no more than 25 pounds of pulling pressure on cable when installed.

5.1.3.1. Rigid metallic conduit

- Conduit shall be industry-standard, heavy wall steel conduit, and shall have a galvanized finish throughout.
- Conduit shall not be less than 1" trade size.
- Make all cuts square.
- Ream out all burrs from end after threading and before mounting in place.

- Utilize factory-manufactured elbows where change in direction is required. No more than two long radius 90° bends or the equivalent are permitted between junction boxes, pull boxes, cabinets, or cable access points. Pull boxes may not be substituted for 90° bends.
- Utilize threaded couplings and make all joints tight. Running threads, split couplings, and threadless couplings are not acceptable.
- Install metallic bushings at all terminations, both free standing and within boxes, enclosures, and cabinets.
- During installation, cap all runs left unfinished or unattended. Cap all terminations of finished runs until wire and cable are pulled in. Manufactured fittings shall be used for this purpose.
- All conduit runs between communications outlets and new IDF rooms shall be on the same floor. When existing IDF rooms are not on the same level, conduit shall be installed as individual home runs, unless a DoIT representative has granted prior approval of some other method.

5.1.3.2. Electrical Metallic Tubing (EMT)

- Conduit shall be cold rolled steel tubing with zinc coating on the outside and protected on the inside with zinc enamel or equivalent corrosion-resistant coating.
- Conduit may be installed in dry construction in furred spaces, in partitions other than concrete, solid plaster or exposed work. EMT shall not be installed where it will be subject to severe physical damage or severe corrosive influence, where trade size is larger than 2", or where tubing, elbows, couplings, and fittings would be in concrete or in direct contact with the earth.
- Couplings shall be in the compression type with all joints made tight.
- Follow installation practices as specified in section 5.1.3.1 Rigid metallic conduit.

5.1.3.3. PVC conduit

- PVC conduit is not acceptable in new construction except in poured concrete slabs.
- Protection against physical damage must be provided before and during the process of pouring.
- During installation, all runs left unfinished or unattended must be capped. Manufactured fittings shall be used for this purpose.
- PVC conduit may be installed above ceilings on renovation projects where existing conditions would prohibit the use of electrical metallic tubing. This applies only to non-air plenum spaces.

5.1.4. Outlet boxes

Except as noted, all boxes shall be manufactured from galvanized industry standard gauge sheet steel.

5.1.4.1. Wall outlet box

Wall-mounted telephone outlets with no data requirements shall be a minimum of 4-11/16" square, mounted to accommodate a single gang plaster ring for a single gang faceplate. The outlet shall be located no higher than 44", measured from the top of the outlet box, above the finished floor. Reference the ADA standards for more details.

Wall-mounted telecommunications outlets with data requirements shall be a minimum of 4-11/16" square, mounted to accommodate a single gang plaster ring for a single gang faceplate. Standard mounting height shall be 20", measured from the top of the outlet box, above finished floor. Reference the ADA standards for more details.

5.1.4.2. Floor outlet box

Rooms that require floor outlets shall be designed by the architect and discussed with a DoIT representative to ensure future flexibility for communications wiring. "Trapped conduit" and tombstones are not acceptable.

5.1.4.3. Junction and pull boxes

Internal diameter dimensions of boxes and the maximum number of cables that may be placed in them are dependent upon the actual requirements for any given building. Consult with a DoIT representative for specific details. A metal pull box should be specified if:

- The length is over 98'
- There are more than two 90° bends
- There is a reverse bend in the run

Pull boxes shall be placed in an exposed manner and location. These shall be readily accessible and not in the false ceiling space, unless immediately above an access panel.

5.2. Vertical system

New multi-level buildings should be designed with IDF rooms placed one above the other in a vertical fashion (stacked configuration) to facilitate vertical distribution systems. Vertical cable risers make for ease of design, construction, and maintenance. Provide a riser with a minimum of two 4" conduits or sleeves to each IDF room. The total number of conduits or sleeves depends on the number of floors in the building and on the number of outlets required in the building.

The engineer shall include a single line riser diagram of all conduits as part of the construction documents and drawings. A DoIT representative shall approve the conduit sizes and details of this drawing.

6. Premise Wiring (Horizontal and Vertical Cabling) – Voice, Data, IP Devices)

6.1. Horizontal cabling

The horizontal wiring standard is mandatory for all CCSD renovations and new buildings. The standard is structured to meet the majority of telephony and data communications protocols presently used in CCSD buildings. The purpose of this standard is to follow industry standards as they evolve and place CCSD on a standard wiring scheme to increase flexibility for moves and changes within CCSD.

The telecommunications contractor is responsible for pulling all voice, data, and video intrabuilding backbone and horizontal cable as specified in this document. The telecommunications contractor is responsible for estimating cable footage and pulling cable from the MDF room to each IDF room, and throughout the building to each communications outlet.

Apply no more than **25 pounds** of pulling pressure on cable when installed.

It is important to note that for every communications outlet location, a dual electrical outlet should be co-located. This ensures that adequate power is available for the end user's phone and data equipment.

6.1.1. Outlet cabling

6.1.1.1. Standard telecommunications outlet

The standard wiring for CCSD buildings is two Category 6 (CAT 6) cables pulled to each telecommunications outlet box.

ADA requirements may dictate different wall phone heights in special construction circumstances such as wheelchair alcoves, columns, and obstructions.

6.1.2. Cable specifications

See Appendix A for cable specifications. Runs shall be continuous with no intermediate terminations.

6.2. Vertical cabling

The vertical wiring standard includes pulling copper and fiber cables from the MDF room to each IDF room in the building. All fiber cable shall be pulled in innerduct. Quantities of each type of cable depend on the building's occupants and their requirements for voice, data, and video. **Consultation with DoIT is required so the quantities of cable and raceway systems can be determined.**

7. Copper Digital Cable (Data, VoIP, IP Devices)

CCSD has standardized on specific cable manufacturers and types, which are listed in Appendix A. Projects that require copper cable (vertical, horizontal or patch) shall be required to use this standard. All premise cabling installations must be performed by a certified/skilled cable installer, certified by Berk-Tek. To ensure that the items being used, and the work being done, will meet CCSD DoIT requirements, coordination with CCSD DoIT is required.

7.1. Copper digital cable requirements

- Only approved copper cables, patch panels, hardware, and equipment listed in Appendix A shall be used.
- Cabling installations must comply with TIA/EIA-568 standards.
- Cabling must be CAT6 UTP certified, grey in color, and not exceed 294 cable feet in length.
- Minimum of 6 ft. service loop at all MDF and IDF cable termination points for all horizontal and vertical premise cabling.
- Modular connectors, patch panels, and all other connection points must be CAT6 rated.
- Modular CAT6 jacks must be grey in color.
- Cables must not be booted.
- Patch panels must be utilized for all MDF and IDF cable terminations.
- 24 port “QuickPort” patch panels are required. If a higher port density is called for, multiple 24 port QuickPort patch panels may be used, but they must be spaced 1U apart to allow for networking equipment to be inserted between panels.
- Panels with a port density other than 24 ports are prohibited.
- All premise cabling ends must be labeled in accordance with CCSD labeling standards.
- All cabling termination points (patch panels, outlets, and modular connectors) must be labeled in accordance with CCSD labeling standards.
- All premise wiring must be tested after installation to verify that it is working and in compliance with CAT6 ANSI/TIA/EIA 568 standards.
- T568B pin assignments must be used.
- Patch cables must not exceed 3 feet between the patch panel and network equipment and 20 feet between the telecommunications outlet (TO) and the endpoint device.
- Cable management panels, wire ties, hook and loop, wall anchors, and other applicable cable management methods must be used where applicable to contain excess cabling.
- Installations must include a 15-year manufacturer warranty on all associated cables and components.

8. Copper Analog Cable (Voice)

CCSD has standardized on specific cable manufacturers and types, which are listed in Appendix A. Projects that require copper analog cable (voice) shall be required to use this standard. All premise cabling installations must be performed by a certified/skilled cable installer, certified by Berk-Tek. To ensure that the items being used, and the work being done, will meet CCSD DoIT requirements, coordination with CCSD DoIT is required.

8.1. Copper analog cable requirements

- Only approved copper cables, patch panels, hardware, and equipment listed in Appendix A shall be used.
- Cabling installations must comply with ANSI/TIA standards.
- Cabling must be CAT6 UTP certified, grey in color, and not exceed 294 cable feet in length.
- Minimum of 6 ft. service loop at all MDF and IDF cable termination points for all horizontal and vertical premise cabling.
- Modular connectors, patch panels, and all other connection points must be CAT6 rated.
- Analog Modular jacks must be white in color.
- Cables must not be booted.
- Patch panels must be utilized for all MDF and IDF cable terminations.
- 24 port “QuickPort” patch panels are required. If a higher port density is called for, multiple 24 port QuickPort patch panels may be used, but they must be spaced 1U apart to allow for networking equipment to be inserted between panels.
- Panels with a port density other than 24 ports are prohibited.
- All premise cabling installations must be performed by a certified/skilled cable installer, certified by Berk-Tek.
- All premise cabling ends must be labeled in accordance with CCSD labeling standards.
- All cabling termination points (patch panels, outlets, and cable ends) must be labeled in accordance with CCSD labeling standards.
- All premise wiring must be tested after installation to verify that it meets specifications.
- Patch cables must not exceed 3 feet between the patch panel and network equipment and 20 feet between the telecommunications outlet (TO) and the endpoint device.
- Cable management panels, wire ties, hook and loop, wall anchors, and other applicable cable management methods must be used where applicable to contain excess cabling.
- Installations must include a 15-year manufacturer warranty on all associated cables and components.

9. Fiber Cabling

CCSD has standardized on specific cable manufacturers and types, which are listed in Appendix A. Projects that require copper cable (vertical, horizontal or patch) shall be required to use this standard. All premise cabling installations must be performed by a certified/skilled cable installer, certified by Berk-Tek. To ensure that the items being used, and the work being done, will meet CCSD DoIT requirements, coordination with CCSD DoIT is required.

9.1. Fiber cabling requirements

- Only approved fiber cables, patch panels, hardware, and equipment listed in Appendix A shall be used.
- Cable must be 50/125 multimode, Aqua in color, and not exceed 1,279 cable feet, unless otherwise specified.
- Must comply with OM4 standard.
- Connectors, patch panels, and all other fiber connection/termination points must be OM4 50/125 multimode fiber rated.
- Minimum of 6 ft. service loop at all MDF and IDF cable terminations.
- Rack mounted fiber distribution boxes must be used at both ends of the fiber cable run.
- Connectors shall be LC, or LC-Duplex, but may vary depending on the project and shall be coordinated with CCSD DoIT.
- Fiber patch cable length will vary by project and shall be coordinated with CCSD DoIT.
- All premise cabling ends must be labeled in accordance with CCSD labeling standards.
- All fiber distribution boxes, and distribution panels, must be labeled in accordance with CCSD labeling standards.
- Cable management panels, wire ties, hook and loop, wall anchors, and other applicable cable management methods must be used where applicable to contain excess cabling.
- The installation of all fiber optic cabling and related terminations and equipment shall be by a trained technician and certified by Berk-Tek. The installer shall be responsible for furnishing all specialized tools required for proper installation.
- Installations must include a 15-year manufacturer warranty on all associated cables and components.

10. Equipment Rack

CCSD has standardized on specific equipment racks, which are listed in Appendix A. Projects that require an equipment rack due to expansion or the absence of an existing rack, shall be required to use this standard. To ensure that the equipment rack and installation will meet CCSD DoIT requirements, coordination with CCSD DoIT is required.

10.1. Equipment rack requirements

- Only approved equipment racks listed in Appendix A shall be used.
- Rack type and size will depend on scope of project and shall be coordinated with CCSD DoIT.
- Depending on the scope of the project, an equipment rack exhaust fan may be required. Coordinate with CCSD DoIT.
- Power and data cables must be routed through separate openings in the rack.
- A rack mount surge protector specified in Appendix A must be used if one is not already installed in the equipment rack or if the surge protector installed will no longer meet CCSD DoIT requirements.
- Nothing shall be installed in the equipment rack that would limit its usable depth, such as Type-66 Telco Splice Blocks, power outlets, fiber distribution boxes, etc.
- In most cases, a “25-pair” cable and associated Type-66 Telco Splice Block is required to be installed and shall be run back to the main phone room and terminated. Since each project is unique, this shall be coordinated with CCSD DoIT.

11. Wireless Infrastructure Design

Wireless network infrastructure shall be provided in all new buildings, renovated spaces, remodeled spaces, and construction projects. Wireless systems must be designed according to plan documents in the schematic design phase. Wi-Fi 802.11 ac/ax/be coverage across all occupied areas of the building with a minimum signal strength of -67dBm is required. Estimates for AP coverage to be supplied with construction documents and known building materials. The wireless system design shall require 1" trade size conduit from the raceway system to each wireless node location using a 4 11/16" square box with a sing gang plaster ring.

12. Cellular Infrastructure Design

Cellular- CDMA/GSM and associated voice/data standards are to be made available to building occupants in all occupied areas of the building. Cellular signal strength should be at least -92dbmv. It shall be assumed that building skins will not be permeable to RF signals, therefore project budgets must include the appropriate cellular equipment and services necessary to deliver adequate cellular signal to building occupants.

13. Parking Gates

Parking gates are not the direct responsibility of CCSD DoIT, however, CCSD DoIT will work with applicable contractors and departments to ensure that all equipment and infrastructure meet CCSD DoIT standards. In the event of a conflict between parties, CCSD DoIT requirements shall prevail.

14. Security Cameras, Access Control

Security cameras and access control are not the direct responsibility of CCSD DoIT, however, CCSD DoIT will work with applicable contractors and departments to ensure that all equipment and infrastructure meet CCSD DoIT standards. In the event of a conflict between parties, CCSD DoIT requirements shall prevail.

15. Demolition

All abandoned telecommunications cables and infrastructure within a project's boundaries shall be completely removed back to the originating MDF or IDF termination point. Telecommunications outlets shown on demolition drawings to be removed shall be removed completely, including outlet, and wiring to the originating MDF or IDF termination point, and all supporting equipment and hardware. All termination labels, including patch panels, cable ends, and telecommunication outlets, shall be revised to reflect all changes.

16.Documentation

16.1. Documentation requirements

16.1.1. Contractor shall submit to CCSD DoIT a complete documentation package **prior to commencement of the project**. The package shall include:

- Project prints that show all network drop locations, fiber, copper, and general cable routing path.
- Any item of work not clearly included, specified, or shown, and any errors or conflict between project drawings, specifications, codes, and field conditions, shall be clarified by a written request to CCSD DoIT.
- A list of materials, equipment, and hardware being used, including manufacturer, part number, and distributor (name, address, and phone number), except when using approved items listed in Appendix A.
- Cut sheets of all proposed materials, equipment, and hardware are required, except when using approved items listed in Appendix A.
- Qualifications summary – must detail the experience, training, and certification(s) of all personnel who will be working on the project.

Should the contractor commence work prior to CCSD DoIT approval of submittals, any additional costs associated with CCSD DoIT changes shall be borne by the contractor.

16.1.2. Contractor shall provide to CCSD DoIT a complete network documentation package upon completion of the project. The package shall include:

- As built drawings that must show all network drop locations, fiber, copper, and cable routing path.
- A list of serial numbers, IP addresses, DNS names, and manuals, if applicable.
- A digital copy of fiber and copper cable test results for each fiber and copper cable run to verify compliance with applicable ANSI/TIA/EIA, or ISO/IEC standards.

17. Labeling

17.1. Labeling requirements

Identification/Labeling Identifier Table:

Identifier	Description of Identifies
Bld## (Bld01-Bld99)	Building Number
cs (01-99)	Communications space
R## (R01-R99)	Communications Rack
pp (A-Z)	Patch Panel
P## (01-24)	Patch Panel Port
uid	Unique ID Number
rn	Room Number

Identification/Labeling Example Table:

Description	Identifier	Example
Horizontal Link ID	[cs][R##]-[pp][P##]	01R01-B24
Vertical Link ID	[cs][R##]-[pp][P##]	01R01-B24
Intra-Building Back Bone Link ID	[cs]/[cs]-[uid]	01/07-01
Inter-Building Back Bone Link ID	[Bld##-cs]-[uid]/[Bld##-cs]-[uid]	Bld03-01-01/Bld01-07-03
Telecommunications Outlet	[cs][R##]-[pp][P#]	01R01-B24
Patch Panel	[rn]	142

- All labels shall be machine-printed, crisp, clear, non-smearing and extremely legible.
- Label color shall be black lettering on white background.
- Labels shall be durable for the life of the system (15-year manufacturer system warranty); Labels which can be easily removed shall not be utilized.
- Labels should be sized according to cable diameter, faceplate, and readability.
- Labels shall be thermal transfer type and utilize self-adhesive labels.
- Handheld labelers such as; Brady - IDXPRT, Dymo - Rhino, Hellermann Tyton - Spirit 2100, Panduit - LS8E or LS9 are examples of acceptable labelers.
- Install labels in such a way as to be physically and visually accessible.
- Labels must be installed within 6 inches of cable ends, in the case of telecommunication outlets and patch panels, directly above the telecommunications outlet (on the faceplate) or in the designated labeling area on the faceplate.
- Remove any temporary or superseded labels and ensure no permanent labels were damaged during construction.

18. Conduct and Cleaning:

CCSD is a public school district. This means that employees and students occupy our buildings. As a result, behavior, language, conduct, and workspaces must be appropriate for such an environment.

18.1. Conduct

18.1.1. Conduct shall be appropriate for a public school environment. CCSD reserves the right, at its sole discretion, to remove and/or replace contractors and contractor employees in the event of inappropriate conduct.

18.2. Cleaning requirements

- At the completion of the work required and prior to acceptance by CCSD DoIT, thoroughly clean all exposed equipment, fittings, fixtures, and accessories.
- Old copper cables, fiber cables, and equipment that is no longer in service must be completely removed.
- All ceiling tiles shall be reinstalled, and materials placed in the designated storage area(s).
- During work, all computers, bookshelves, desks, televisions, etc. shall be covered with drop cloths to protect from dust and debris. Covering equipment that is connected to a power source is prohibited. Doing so would trap heat and increase the risk of a fire.
- At the completion of work each day, in areas accessible to CCSD employees, students, families, or the public, the contractor shall remove debris, trash, hazards, etc., from the space and return the space to a safe and usable state.

APPENDIX A

SPECIFIED EQUIPMENT LIST

Part Number	Manufacturer	Color	Quantity	Description
CAT6 COPPER CABLE				
11096490	Berk-Tek	Dark Grey	1000 Ft.	LANmark 1000 Enhanced CAT6 Riser Cable - Box
11091087	Berk-Tek	Dark Grey	1000 Ft.	LANmark 1000 Enhanced CAT6 Plenum Cable - Box
10032678	Berk-Tek	Dark Grey	1000 Ft.	LANmark 1000 Enhanced CAT6 Patch Cable - Reel
WALL PLATE				
42080-[?]WS	Leviton	White	1	QuickPort - Single-Gang, With ID Window, Up To 4 Ports
42080-[?]WP	Leviton	White	1	QuickPort - Dual-Gang, With ID Window, Up To 4 Ports
WALL JACK				
61110-RG6	Leviton	Grey	1	eXtreme 6+ QuickPort Connector CAT6
61110-RW6	Leviton	White	1	eXtreme 6+ QuickPort Connector CAT6
61110-BG6	Leviton	Grey	25	eXtreme 6+ QuickPort Connector CAT6
61110-BW6	Leviton	White	25	eXtreme 6+ QuickPort Connector CAT6
PATCH PANEL - FLAT				
49255-H24	Leviton	Black	1	1RU 24 Port QuickPort Flat Panel (Empty)
69270-U24	Leviton	Black	1	1RU 24 Port QuickPort Flat Panel (Full)
WALL-MOUNT ENCLOSED RACK				
11996-724	CPI	Black	1	Cube-iT Plus Cabinet System, (Physical Dimensions - 24"h x 24"w x 30"d), (Usable Dimensions Height 12U, Width 19, EIA-310-D)
11996-736	CPI	Black	1	Cube-iT Plus Cabinet System, (Physical Dimensions - 36"h x 24"w x 30"d), (Usable Dimensions Height 19U, Width 19, EIA-310-D)
25190-000	CPI	Black	2	Cable Port Brush Kit for CUBE-iT Wall-Mount Cabinet
40975-001	CPI	Black	2	Cube-iT Cabinet System Fan Kit, 120CFM, 115VAC, 50/60Hz, 5-15P power cord
4 POST ENCLOSED RACK AND VENTILATION				
AR3100	APC	Black	1	APC NETSHELTER SX 42U 600MM X 1070MM
SURE PROTECTOR				
NET9RMBLK	APC	Black	1	1RU Black Rack-mount SurgeArrest 9 Outlet 120V 1700 Joules
RACK-MOUNT FIBER DISTRIBUTION HOUSING				
5R1UM-S03	Leviton	Black	1	1RU, empty, with sliding tray, accepts 3 adapter plates
5F100-2QL	Leviton	Aqua	1	Plate (aqua), 50 µm LOMM (OM 3 & 4) Duplex, 12-fiber, zirconia ceramic sleeve
OM4 FIBER OPTIC CABLE				
PDR006FB3010/F5-I/O	Berk-Tek	Aqua	6 F	OM4 50/125 Multimode Tight-Buffered Cable, Indoor Riser
PDP006FB3010/F5-I/O	Berk-Tek	Aqua	6 F	OM4 50/125 Multimode Tight-Buffered Cable, Indoor Plenum
PDRK006FB3010/F5-I/O	Berk-Tek	Aqua	6 F	OM4 50/125 Multimode Tight-Buffered Cable, Indoor/Outdoor Riser Armored
PDPK006FB3010/F5-I/O	Berk-Tek	Aqua	6 F	OM4 50/125 Multimode Tight-Buffered Cable, Indoor/Outdoor Plenum Armored