

SECTION 27 10 00  
STRUCTURED CABLING

PART 1 – GENERAL

A. SUBJECT TO CHANGE

1. These standards are subject to change. Verify that the latest are being used. Product manufacturers listed is the basis of design or equivalent unless noted otherwise.

B. PURPOSE

1. The purpose of this document is to provide design guidelines for architects, engineers, consultants, and contractors with an understanding of the minimum requirements for Telecommunications Infrastructure and other Technology systems for any building related project within the Cherry Creek School District (CCSD). If the building is existing, the requirements outlined below should be met to best of the ability of the design team and/or contractor. If the building is new construction, the requirements outlined below must be adhered to unless written approval is provided from CCSD IST prior to design completion.

C. DESIGN REQUIREMENTS

1. The design of the structured cabling and other technology systems for a new construction or renovation project shall be completed by a pre-approved CCSD Facilities and CCSD IST engineer/consultant. The engineer/consultant is typically selected by CCSD Facilities as a sub consultant to the Architect of the project, but can also be selected by CCSD IST directly if the project is technology systems specific. The engineer/consultant shall have an RCDD on staff and shall be responsible for the daily management of the project and its design. The engineer/consultant shall coordinate with the Architect and CCSD IST for a minimum of two (2) plan reviews during the design phase of the project. In addition, the engineer/consultant may be requested to include standard Contract Administration services including but not limited to Request for Information responses, Submittal Reviews, Site Observations, Final Punch walk, and review of contractor provided close out documents.
2. Because of the constant product changes and approach, need to review with CCSD staff on the particular project.
3. Refer to Division 26 for conduit, boxes, sleeves, conduit support, etc. requirements.

D. SUMMARY – SECTION INCLUDES

1. Structured Cabling

E. STRUCTURED CABLING

1. Requirements for structured cabling system
  - a. Submittal
  - b. Approved Cabling Contractors

American Datapath 2345 South Platte River Drive Denver, CO 80223 Phone: 303-922-8887 Contact: Kristin Newman Kristin@americandatapath.com	C-COMM, LLC 14 Inverness Drive East, Suite G-132 Englewood, CO 80112 Phone: 303-478-7858 Contact: Marty Cederstrom mcederstrom@c-comm.com
JNL Communications 8200 East Pacific Place, Unit 104 Denver, CO 80231 Phone: 303-587-8374 Contact: Jeff Downing Jdowning@jnlcs.com	National Network Services 6840 North Broadway Denver, CO 80221 Phone: 720-737-4737 Contact: Jeff Bowlus Jeff.bowlus@nnsi.net

Rocky Mountain Telecom & Data 13401 W 43rd Dr., Unit 12 Golden, CO 80403 Phone: 303-534-6022 Contact: Damian Difeo ddfeo@rmttd.net	Piper Communication Services 5960 North Jay Street Arvada, CO 80003 Phone: 303-456-1060 Contact: Carin Avila-Darr carin@pipercommunications.com
GigaSpan Solutions Inc 8200 South Akron Street, Suite 115 Centennial, CO 80012 Phone: 303-284-3453 Contact: Jon Getz jon.getz@gigsspan.com	IES Communications 109 Inverness Drive East, Unit G Englewood, CO 80112 Phone: 303-505-9244 Contact: Anthony Pratt anthony.pratt@iescomm.com

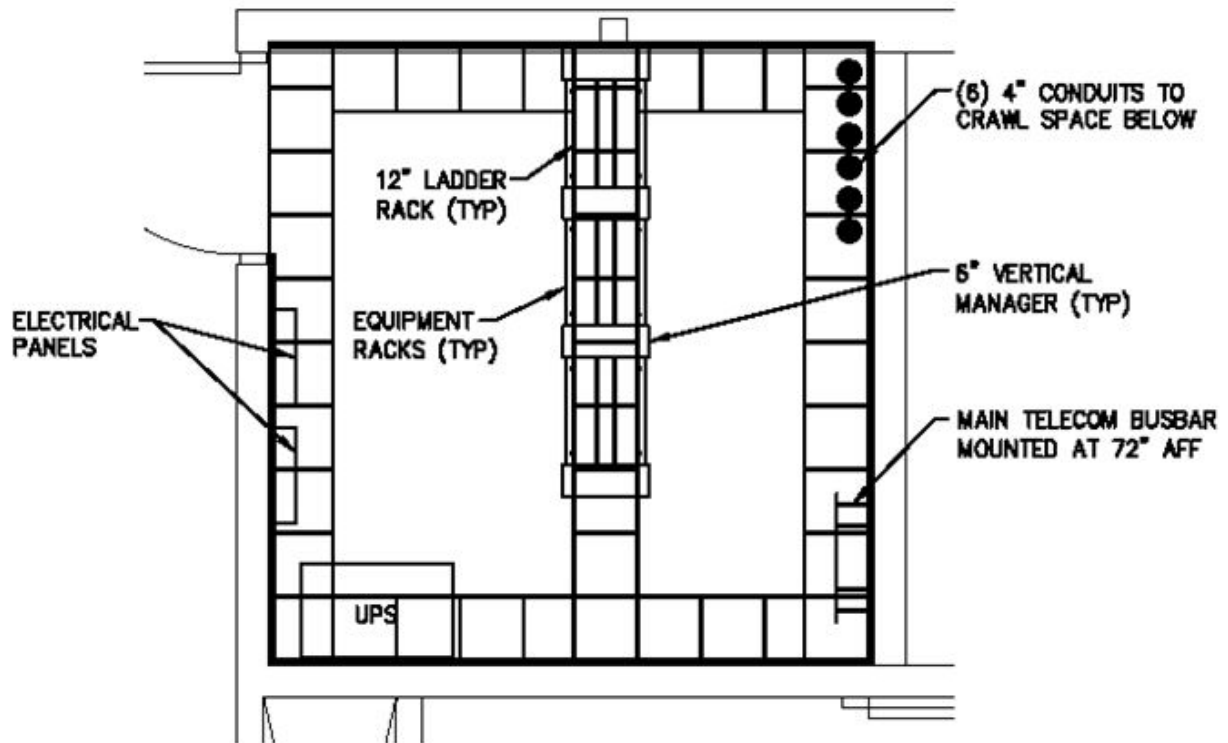
c. Telecom rooms

1. Telecom Rooms provide dedicated space for telecommunications cabling as well as other CCSD IST approved systems equipment. These rooms shall not be allowed to double as electrical or mechanical rooms nor shall they be allowed to be used as storage rooms, janitor's closets, or other non-technology related use. In addition, under no circumstance shall any Telecom Room house any equipment not serving the space including mechanical ductwork, electrical gear, transformers, piping or any plumbing or other liquid carrying apparatus etc.
2. There are three (3) basic types of telecom rooms. They are Building Entrance Facility (BEF), Main Distribution Frame (MDF), and Intermediate Distribution Frame (IDF).
  - i. The BEF is the room (only if not in the MDF) where the service provider such as CenturyLink or Comcast terminates their equipment and cabling which provides building access to the outside world. From this point, the main cross connect (MC) resides which then runs to the MDF. This room typically houses wall mounted or rack mounted equipment provided by the service provider, however the engineer/consultant shall coordinate with the service provider on what the expected equipment will be and if the service provider requires CCSD to provide any equipment racks and if so what size and quantity. The engineer/consultant will also coordinate pathway needs to enter the BEF.

- ii. The MDF (could contain the BEF equipment and MC as well) is the room that houses the main telecom equipment for the building. There is typically only one per building, however a second may exist if a dedicated server room is ever needed. The MDF is typically where all of the main equipment such as data core switches, phone systems, servers as well as other equipment reside. If there is more than one (1) MDF space in the building all additional IDF rooms act as intermediate cross connect locations (IC). The backbone cabling distribute from the MDF in a star configuration to each of the outlying IDF's. In addition, the MDF can act as the location for the horizontal cross connect (HC) in which horizontal cabling distributes out to the individual outlet workstation locations. If this room is the only one (1) in the building, then this room will act as the location for the MC and HC with no IC needed. In addition, the main access control panel is often located in this room as well as potentially building automation system (BAS) controls, and overhead paging system. Expect the IDF's to have a minimum of two equipment racks for small buildings, however the room may be required to be larger depending on how much equipment is planned for the room. The design team shall coordinate the size of the room, with a minimum of 10 feet by 10 feet floor space, during the design phase and shall be coordinated with CCSD IST prior to final construction documents being issued.
  - iii. The IDF rooms house outlying telecom equipment when additional rooms beyond the MDF are needed because the distance from outlet to IDF for the horizontal cabling exceeds 295 feet. The main intent for IDF rooms is to act is a location for HC's for the outlying portions of the building; however these rooms can also hold equipment for access control and building automation system (BAS) controls. IDF's are typically only required to have one (1) equipment rack and the size of this space shall be developed during the design phase with a minimum room size of 8 feet by 10 feet; however additional racks maybe required and should be coordinated with CCSD IST prior to final construction documents.
- 3. For all telecom spaces (BEF, MDF, and IDF's) each room should have the door swing out. In addition, each room shall have a static dissipative VCT tile or similar. Unless specifically requested by CCSD IST, telecom spaces shall be open to structure. Each telecom room shall have 3/4 inch by 4 feet by 8 feet A-C grade backboard (A side facing out) with a minimum of two coats of white fire retardant paint on all four (4) walls. Each room is expected to have a minimum of 3 feet clearance on three (3) sides of the row of equipment racks. This includes clearance from any equipment mounted on the wall dedicated for other low voltage systems. If there is more than one (1) floor, an IDF shall be located on each floor and shall be stacked unless CCSD IST provides written approval otherwise.
  - 4. The rooms shall be laid out using one (1) row of standard seven foot high, two post, relay racks with 6 inch vertical managers in-between and on the ends of the rack row. The racks shall have a deep channel. These racks shall hold owner provided server equipment, switch gear, routers, and phone system equipment. In addition, the racks shall have the termination point for the fiber backbone cable as well as patch panels to support the horizontal cabling terminated in the room. Ladder rack shall be mounted around the perimeter as well as down the center above the equipment racks allowing for proper cable management. All racks, ladder rack, and cable managers shall be manufactured by Chatsworth and are black in color.

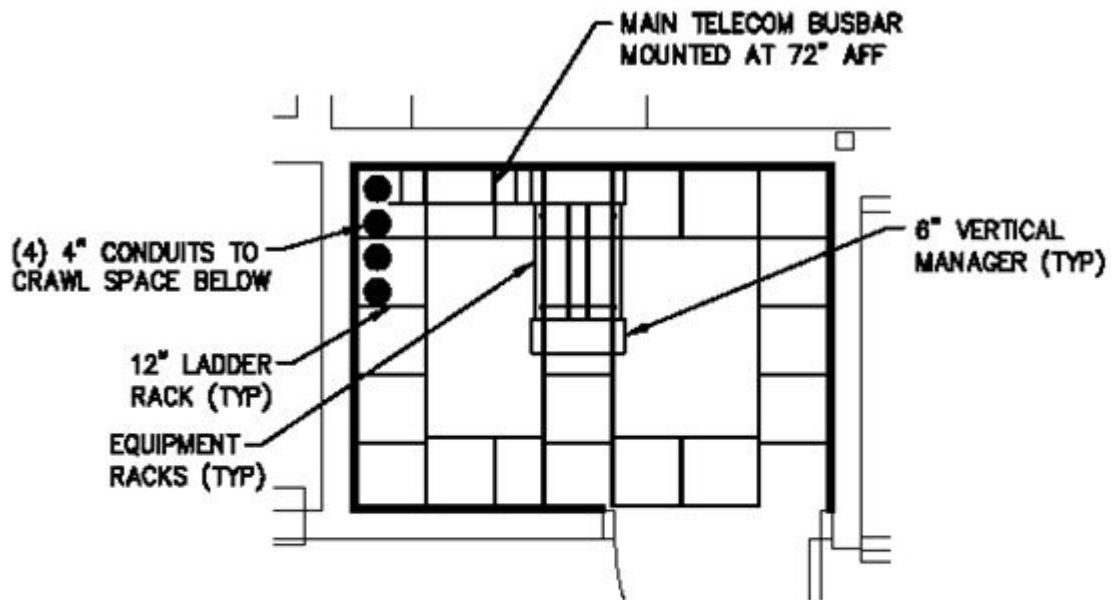
5. Verify with CCSD IST during design, but the power requirements in each room is as follows.
  - i. A 30 ampere, 120 volt receptacle installed at the base of each equipment rack
  - ii. Two (2) 20 ampere receptacles, each with a dedicated circuit, installed on the ladder rack facing the back side of each equipment rack. Each of these receptacles are required to be on emergency power if available.
  - iii. Double duplex convenience receptacles shall be installed around the perimeter of the room approximately every 6 feet on center.
6. Telecom room shall have a dedicated cooling system unit. Rooms may only require a transfer fan, however the final cooling requirements shall be based off of the expected cooling load in the room and should be confirmed with CCSD IST during the design phase of the project. Cooling requirements will meet or exceed BICSI Best Practices.
7. Lighting for the room shall consist of luminaires on the front and back of the row of equipment racks. The lighting shall provide a minimum of 30 footcandles at 1 foot above the finished floor.
8. Grounding for the BEF and MDF shall have a 20 inch by 4 inch by 1/4 inch copper main telecom ground bus bar (MTGB) using a #6 AWG ground wire bonded to building ground or the main electrical ground bar. The IDF's shall have a similar bus bar but 10 inch by 4 inch by 1/4 inch bus bar and shall be tied back to the MTGB via a minimum #6 AWG ground wire.

9. The MDF room layout as below.



PROVIDE 8'X4'X3/4" A-C GRADE FIRE TREATED PLYWOOD MOUNTED VERTICALLY FROM FLOOR LEVEL ON INTERIOR WALLS WITH "A" SIDE FACING OUT. PAINT BACKBOARD WHITE LEAVING ONE FIRE RATING STAMP VISIBLE PER PIECE OF PLYWOOD

10. The IDF rooms layout as below.



**PROVIDE 8'x4'x3/4" A-C GRADE FIRE TREATED PLYWOOD MOUNTED VERTICALLY FROM FLOOR LEVEL ON INTERIOR WALLS WITH "A" SIDE FACING OUT. PAINT BACKBOARD WHITE LEAVING ONE FIRE RATING STAMP VISIBLE PER PIECE OF PLYWOOD**

d. Pathway requirements

1. The pathways for each of the technology systems infrastructure shall be designed and installed in accordance with the latest ANSI/EIA/TIA/CCSD standards, and the National Fire Protection Association (NFPA) – all applicable standards. Each conduit shall be fitted with an appropriate plastic bushing and run to accessible ceiling space unless otherwise noted.

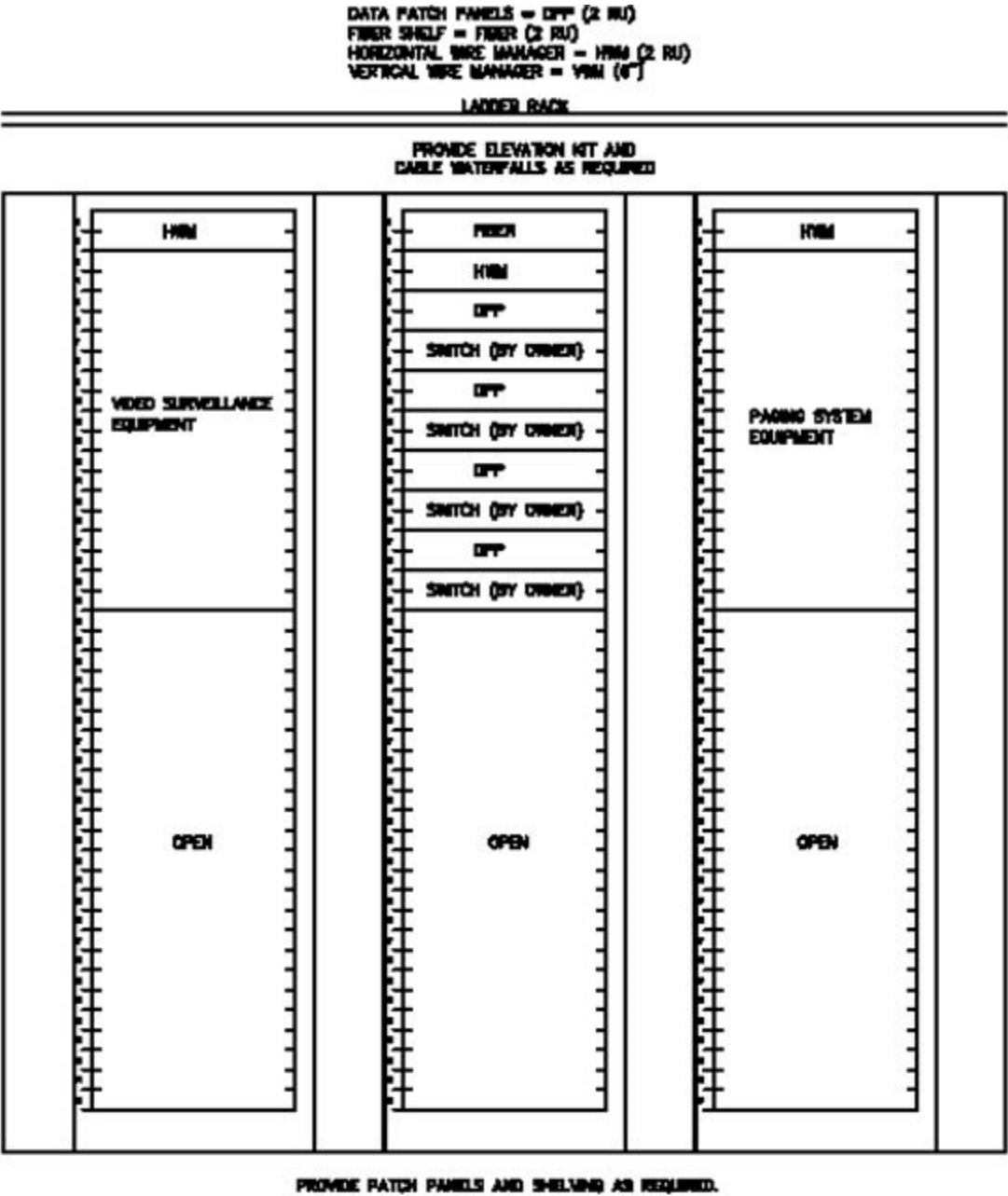
2. Pathways shall mainly consist of a combination of wire basket type cable tray, J-hooks, and EMT conduit. All outlets shall have a standard 4-11/16 inch square deep back box with single gang mud reducer and a 1 inch conduit stubbed to accessible ceiling space or to the nearest cable tray. No power poles shall be used in any CCSD space unless approved by CCSD IST as well as CCSD Facilities during the design phase of the project. Where cabling is run above the ceiling, it shall be supported by J-hooks spaced no more than 5 feet apart in route to the nearest cable tray or to the nearest telecom room. Cabling shall be supported directly by the structure, not by mechanical ductwork, piping, electrical supports. When crossing electrical wiring, the structured cabling shall cross at a perpendicular angle to the electrical wiring. All code and standard requirements for distances for telecom cabling and infrastructure from sources of EMI such as transformers, fluorescent lights, copiers, etc. shall be observed and shall follow BICSI Best Practices. Cable tray shall be installed in locations where large quantities of cables are consolidated into one (1) pathway and run back to either the telecom room or the conduit riser pathway leading back to the nearest telecom room. Cable tray shall be supported using either a trapeze mounted from the ceiling structure or using L-brackets if wall mounted. The cable tray shall not be supported by the center of the tray. Where cable tray is installed, it shall be located in main corridors where possible, however due to conflicts with low height HVAC feeder ducts, some tray may require running through other areas with accessible ceiling. Conduit concealed in finished areas (CCSD approval required for surface mounted raceways on existing concrete, masonry, or etc. surfaces, plastic raceways, Panduit type, are not unacceptable).
3. For new construction, a minimum of two (2) 4 inch conduits shall be run from the BEF to the nearest service provider pedestal or manhole. It is the design team's responsibility to coordinate the conduit routing and final termination point with the service provider during the design phase of the project. If there is more than one (1) IDF in the building, the outlying IDF's shall be tied back to the MDF using a minimum of three (3) 4 inch conduits. One (1) conduit shall be dedicated for fiber backbone and two (2) spare. All conduits shall be labeled for telecom cabling and shall not be used for any other systems without prior approval from CCSD IST. If telecom rooms are stacked on multiple floors, four (4) 4 inch conduit sleeves shall be provided between the rooms. One (1) conduit shall be dedicated for fiber backbone, one (1) for horizontal cabling running between floors (such as cabling running from poke-through devices on the same floor to the accessible ceiling space below) and two (2) spare.
4. Conduit sleeves shall be provided through rated walls for all system wiring not specified being in conduit. Conduit segments between endpoints/pull boxes shall not exceed 100 feet, nor contain more than a total of 180 degrees of bends. L-bend devices shall not be used in any circumstances for any structured cabling pathways. All fire-rated wall penetration must be properly made and sealed according to National Electric Code (NEC) and National Fire Protection Association (NFPA) using approved Underwriters Laboratories (UL) methods and materials and following BICSI Best Practices.
5. For new construction, two (2) 2 inch conduits with weatherheads shall be run from the top IDF to the roof for cabling to support a future satellite connection to support a television distribution system or a distributed antenna system (DAS).

6. The engineer/consultant is responsible for communicating in the construction documents that the following power separation requirements are maintained:
  - i. Distribution cabling shall not be alongside power lines, or share the same conduit, channel, or sleeve with electrical apparatus.
  - ii. Voice and data cables must route in the designated cable pathways within the furniture systems. These must be separated from the electrical feeds.
  - iii. Cable trays must be installed in such a manner that all installed copper communications cabling can be routed to maintain EIA/TIA and BICSI standards for keeping the proper distances away from EMI/RFI producing devices, alternating current power cables, motors, transformers, fluorescent lighting ballasts, and other EMI/RFI generating equipment. High voltage, high emissions equipment may require greater distances.
- e. Backbone cabling
  1. The backbone cabling is the cabling that connects the IDF's back to the MDF and again from the MDF to the BEF. The backbone shall consist of both fiber. The fiber backbone cabling shall consist of 12 strand armored singlemode fiber optic cable running from the MDF to each outlying IDF.
  2. All fiber optic cabling shall be terminated on rack mounted 1U or 2U enclosures mounted in the equipment racks. The enclosures shall have 12 strand SC adapter panels at both ends.
  3. CCSD IST has standardized on Commscope Net Connect products for the fiber, terminations, and enclosures.
- f. Horizontal cabling
  1. The horizontal cabling is the cabling that connects each outlet located throughout the building back to the nearest IDF. The horizontal cabling system consists of patch panels, Category 6 cabling, and RJ-45 jacks at each telecom outlet faceplate. CCSD IST has standardized on Commscope TE products for an end to end horizontal cabling infrastructure. All cabling for voice, data, video surveillance, wireless access points (WAP), and building automation systems (BAS) controls, and IP paging speakers shall have Category 6 horizontal cabling. Cabling shall be plenum rated where required by code. All cabling shall be terminated on standard RJ-45 jacks at the faceplate and on RJ-45 jacks in standard, not discrete, two rack unit (RU) 48 port modular patch panels mounted in the equipment racks in the telecom room.
    - i. Always for new construction and whenever possible in renovations, cabling for video surveillance, wireless access points, and IP speakers will need to be evenly distributed across all installed patch panels. The horizontal cabling shall be designed and installed in accordance with the latest ANSI/EIA/TIA standards, and the National Fire Protection Association (NFPA) BICSI Best Practices – all applicable standards. All horizontal cable runs shall be limited to 295 feet (90 meters) in length.
      - (1) At the patch panel; voice/data and building automation system (BAS) controls cabling shall be white in color with black jacks
      - (2) At the patch panel; video surveillance cabling shall be yellow in color with yellow jacks
      - (3) At the patch panel; paging system cabling shall be green in color with green jacks
      - (4) At the patch panel; WAP cabling shall be blue in color with blue jacks
      - (5) At the wall plate jacks should all be orange



2. CCSD has standardized on voice over internet protocol (VoIP) phones and therefore each standard data outlet shall consist of only one (1) Category 6 cable. Floor locations require a minimum of two cables and in some cases four (4) cables may be required. The final cable counts for each location are to be coordinated with the architect, furniture, and CCSD IST during design to ensure the district's needs are met. All wireless outlet locations will consist of one (1) Category 6 cable each. Video surveillance cameras and IP paging speakers each require one (1) Category 6 cable as well. See additional paging system requirements located in the overhead paging system section 27 51 13. There are other non-standard outlets that will serve specific specialty systems such as wall phones, building automation system (BAS) controls, and some audio video equipment. The cable quantities for these outlets shall be specific to those systems and locations and shall be coordinated throughout the design process. Outlets dedicated for wall phones shall be mounted at 48 inches AFF and have a stainless steel faceplate with two mounting studs to support a wall mounted phone.
3. Classrooms shall have typically centered on one (1) single gang WAP outlet allocated for every classroom. For non-classroom spaces, WAP outlets shall be spaced consistent with the latest industry standards and to provide 100 percent coverage throughout the building. Cable service loops (25 feet) shall be provided at each to accommodate adjustments in the locations during coverage testing and shall be terminated in the field on RJ-45 jacks housed in a biscuit box. Floor locations shall be coordinated with the furniture and architect during design.
4. It is expected that CCSD IST will provide all patch cords, however this should be confirmed during the design phase with CCSD IST.

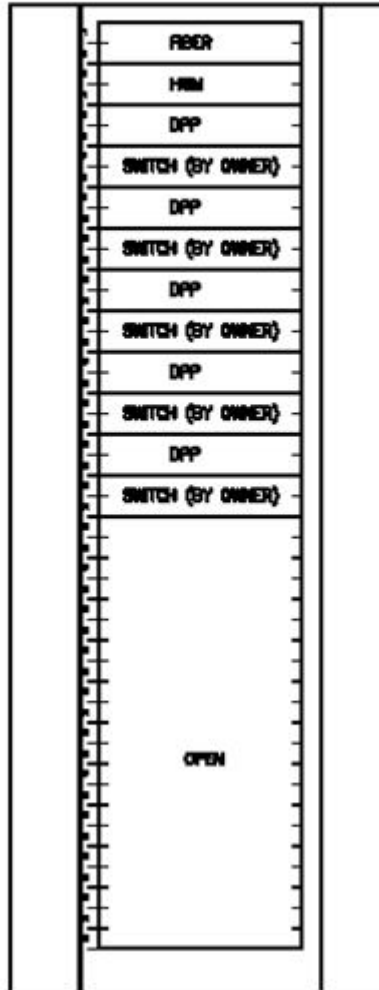
- Patch panels in the telecom rooms supporting the horizontal cabling shall be laid out using a 2U panel with 2U of empty rack space configuration in the equipment racks. The 2U open space is dedicated for CCSD provided network switchgear. All rack configurations shall be confirmed with CCSD IST prior to final construction documents being issued by the design team. Refer to below for a typical rack elevation configuration.



PAGING PATCH PANELS = PPP (2 RU)  
 SECURITY PATCH PANELS = SPP (2 RU)  
 DATA PATCH PANELS = DPP (2 RU)  
 FIBER SHELF = FIBER (2 RU)  
 HORIZONTAL WIRE MANAGER = HWM (2 RU)  
 VERTICAL WIRE MANAGER = VWM (6")

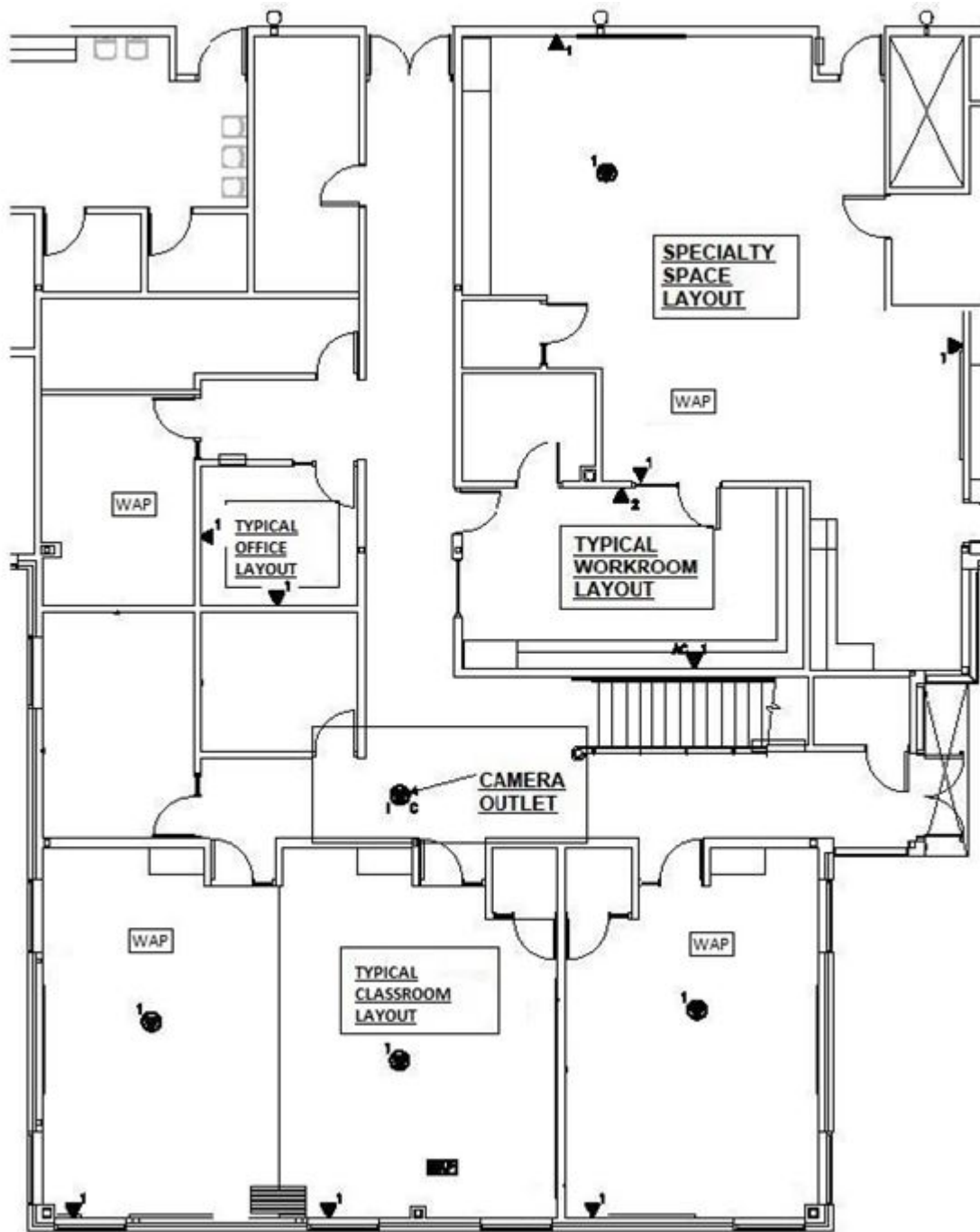
#### LADDER RACK

PROVIDE ELEVATION KIT AND  
 CABLE WATERFALLS AS REQUIRED



PROVIDE PATCH PANELS AND SHELVING AS REQUIRED.

6. Refer to typical outlet layout below.



g. Testing

1. The design team shall be responsible for ensuring that all cabling is tested by the contractor and test results are submitted in the appropriate formats. In addition, the design team shall be responsible for reviewing all test results and coordinating with the cabling contractor on any non-compliant test results. All copper cable to be tested and all test results must comply with the specifications of ANSI/EIA/TIA 568- C.1 and C.2, including TSB-155, Additional Guidelines for 4-pair Category 6 cabling for 1GBase-T Applications. Category 6 cables tested for 250 MHz operation for the ANSI/EIA/TIA Category 6 standard. Testing will include the end-to-end link.
2. Test equipment shall be suitable for certifying all ANSI/EIA/TIA 568C.2 specifications or Category 6 as applicable. Performance requirements for testers will meet the Level II-E accuracy. The contractor shall provide proof of current factory calibration of all test equipment. Tests shall be in accordance with TSB-67 Level II-E accuracy. Test and certify all station cable for all ANSI/EIA/TIA 568C.2 Additional Transmission Performance Guidelines. Provide test reports in electronic flat ASCII file format. Installations by outside contractor shall be certified and warranted by the manufacturer for operation at current ANSI/EIA/TIA 568C.1 250 MHz for a period of not less than 20 years.
3. Optical test equipment shall be suitable for measuring the attenuation and optical characteristics of the installed fiber optic plant. Provide records of recent factory calibration of all test equipment. The following fiber optic testing standards shall apply:
  - i. TIA 526-7 (OFSTP-7) Measurement of Optical Loss of Singlemode Fiber Optic Cable Plant.
  - ii. TIA 526-14-A (OFSTP-14) Measurement of Optical Loss of Multimode Fiber Optic Cable Plant.
  - iii. Pre-installation Testing: Both factory and onsite on-reel certification shall be performed on the cable prior to installation. Test records will be made available to CCSD upon request.
  - iv. Post-Installation Testing: Two optical tests shall be performed, Optical Time Domain Reflectometer (OTDR) test and attenuation (power meter) test per the following standards:
    - (1) TIA 526-7 (OFSTP-7) Measurement of Optical Loss of Singlemode Fiber Optic Cable Plant
    - (2) TIA 526-14-A (OFSTP-14) Measurement of Optical Loss of Multimode Fiber Optic Cable Plant
  - v. The OTDR test shall be used to determine the adequacy of the cable installations. The OTDR test shall be measured in both directions. A reference length of fiber, 328 feet minimum, used as the delay line shall be placed before the new connector and after the far end patch panel connectors for inspection of connector signature.
  - vi. End-to-end attenuation measurements shall be made on all fiber optic cables, in both directions, using the appropriate light source for the window in test.
4. The Contractor shall provide test reports, in electronic flat ASCII file format (Microsoft Excel compatible) to the Owner and Technology Consultant. Additionally, the Contractor shall provide one (1) licensed copy of test equipment software that provides a means for viewing both copper and fiber test results in the format matching that of the original test equipment.

- h. Fire stopping
  - 1. The design team is responsible for specifying the fire stopping requirements and the contractor is responsible for installing fire stopping where required by code and using only systems that are code compliant. Fire stop systems shall comply with the system manufacturer's written installation instructions and published drawings for products and applications indicated.
- i. Bonding and grounding
  - 1. The design team shall be responsible for specifying all bonding and grounding requirements supporting the structured cabling system. Grounding must be in accordance with the NEC, NFPA and all local codes and ANSI/EIA/TIA standards. The design shall include approved ground at all newly installed distribution frames, and/or insuring proper bonding to any existing facilities. In addition, the cabling contractor shall also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, and framework. All grounds shall consist of a minimum of a #6 AWG copper wire and shall be supplied from an approved building ground and bonded to the main electrical ground.
- j. Labeling
  - 1. The design team responsible for communicating the following cable labeling requirements in the construction documents.
  - 2. All labels shall be printed for all cables, distribution frames, and outlet locations, according to labeling scheme listed below. Labeling shall be in accordance with the recommendations found in TIA/EIA 606A, the manufacturer's recommendations/installation guides, and industry best practices. All switches, connectors, outlets, etc., shall be clearly logically, and permanently labeled during installation. Label all cables both at the receptacle and equipment rack with vinyl wire markers. Although the below labeling scheme is provided, it is a guideline and should be confirmed with CCSD IST during design and again at the beginning of installation.
    - i. Level 1 – Building level where the telecom room is located
    - ii. Level 2 – Telecom room number
    - iii. Level 3 – Patch panel by letter
    - iv. Level 4 – Port number on the patch panel
    - v. Example: A cable terminated in a telecom room located on the second floor in telecom room 202B on port number 23 of panel C would be labeled 2-202B-C-23

k. Refer to responsibility matrix below

MATRIX OF CONSTRUCTION RESPONSIBILITIES												
THE RESPONSIBILITIES LISTED HEREIN ARE PROVIDED AS A RECOMMENDATION AND DO NOT SUPERSEDE OR REPLACE ANY CONTRACTS, OR OTHERWISE DEFINED RESPONSIBILITIES, BETWEEN THE DESIGNATED PARTIES. IN ADDITION, THE INFORMATION IS MEANT TO INDICATE GENERAL RESPONSIBILITY FOR A SCOPE OF WORK AND IN NO WAY DISALLOWS THE RESPONSIBLE PARTY TO SUBCONTRACT THE SCOPE.												
RESPONSIBLE PARTY	GENERAL CONTRACTOR	ELECTRICAL CONTRACTOR	TELECOM CONTRACTOR	LOW VOLTAGE CONTRACTOR	AUDIO-VIDEO CONTRACTOR	SECURITY CONTRACTOR	OWNER	NOTES				
SCOPE OF WORK	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL		
BUDGET OF WORK	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	FIX-FURN-EQUIP				
SITE												
INCOMING SERVICE PROVIDER CABLING & COORDINATION									X	X		1
EXTERIOR CONDUIT PATHWAY / DUCTBANK			X	X								
INTERIOR INFRASTRUCTURE												
GROUNDING & BONDING			X	X	X	X						3, 4
INTERIOR CONDUIT PATHWAY			X	X								
BACKBOX / JUNCTION BOX			X	X								
FLOOR BOX / POKE THROUGH			X	X		X						5
CABLE TRAY			X	X								
J-HOOK / SLING					X	X						
SLEEVE / CONDUIT PENETRATIONS			X	X	X	X						6, 7
TELECOMMUNICATIONS												
PLYWOOD BACKBOARD	X	X										
LADDER RACK / LADDER RUNWAY / ACCESSORIES					X	X						
RACK / FRAME / CABINET (TELECOM)					X	X						
WIREMANAGER					X	X						
FIBER PATCH PANEL					X	X						
COPPER PATCH PANEL					X	X						
POWER DISTRIBUTION UNIT (PDU)					X	X						
UNINTERRUPTIBLE POWER SUPPLY (UPS)					X	X						
MISCELLANEOUS RACK COMPONENTS (DRAWER, SHELF, ETC.)					X	X						
BACKBONE CABLING SYSTEM (NETWORK, VOICE, CATV)					X	X						
HORIZONTAL CABLING SYSTEM (NETWORK, VOICE, CATV)					X	X						
FACEPLATE / JACK / SURFACE MOUNT BOX					X	X						
PATCH CABLE (INTERIOR TO TELECOMMUNICATIONS ROOM)					X	X					X	
PATCH CABLE (END DEVICE / OUTLET)					X	X		X		X		2
LABELING					X	X						
MEDIA CONVERTERS / COPPER EXTENDERS FOR NETWORK CABLING					X	X						
WIRELESS ACCESS POINT (WAP)						X					X	
BUILDING NETWORK (LAN) EQUIPMENT (SWITCH, HEADEND, ETC.)										X	X	9
PERIPHERAL EQUIPMENT (PHONE, PRINTER, PC, ETC.)										X	X	
LOW VOLTAGE (LV)												
PAGING / PUBLIC ADDRESS						X	X					
CELLULAR DISTRIBUTED ANTENNA SYSTEM (DAS)	X	X										
BUILDING NETWORK (LAN) CABLING TO LV SYSTEM(S)				X	X							
AUDIO VISUAL (AV)												
RACK / FRAME / CABINET (AV)						X	X					
AMPLIFIER / CONTROLLER / PROCESSOR / MATRIX						X	X					
MICROPHONE						X	X					
FACEPLATE / JACK						X	X					
CABLING (NON-NETWORK)						X	X					
SPEAKER						X	X					
DISPLAY & MOUNT						X	X					
DISPLAY BACKING	X	X										
PROJECTOR						X	X					
PROJECTOR SCREEN						X	X					
AUDIO VIDEO NETWORK EQUIPMENT (SWITCHES AND CABLING)						X	X					9
BUILDING NETWORK (LAN) CABLING TO AUDIO VIDEO SYSTEM(S)				X	X							9
SECURITY - ACCESS CONTROL SYSTEM (ACS)												
ACS HEADEND / CONTROLLER / PANEL							X	X				
ACS SOFTWARE, PROGRAMMING, & INTEGRATION							X	X	X	X		
CARD READER / KEYPAD AND LICENSE (AUTHENTICATION DEVICE)							X	X				
REQUEST TO EXIT (WHEN NOT INTEGRAL TO DOOR HARDWARE)							X	X				
INTERCOM & INTERCOM MASTER STATION							X	X				
DOOR POSITION SWITCH							X	X				
DOOR RELEASE BUTTON							X	X				
DOOR HARDWARE / COMPONENTS	X	X										
BUILDING NETWORK (LAN) CABLING TO ACS				X	X							9
SECURITY - VIDEO SURVEILLANCE SYSTEM (VSS)												
VSS NETWORK VIDEO RECORDER (NVR)										X	X	
VSS SOFTWARE, PROGRAMMING, & INTEGRATION										X	X	
CAMERA AND LICENSE							X	X				
BUILDING NETWORK (LAN) CABLING TO VSS				X	X							9
SECURITY - INTRUSION DETECTION SYSTEM (IDS)												
ID HEADEND / CONTROLLER / PANEL							X	X				
ID SOFTWARE, PROGRAMMING, & INTEGRATION							X	X				
MOTION SENSOR &/OR GLASS BREAK SENSORS							X	X				
LOCK-DOWN BUTTON							X	X				
PANIC / DURESS BUTTON							X	X				
AUTO-DIALER & DIAL DESTINATION COORDINATION							X	X				
BUILDING NETWORK (LAN) CABLING TO IDS				X	X							9
NOTES:												
1. CONTRACTOR SHALL COORDINATE WITH OWNER REGARDING TIMELINE OF INSTALLATION AND REQUIREMENTS FOR INSTALLATION TO ENSURE A TIMELY INSTALLATION.												
2. THE PARTY RESPONSIBLE FOR INSTALLING THE END DEVICE (PC, CAMERA, WAP, ETC.) SHALL BE RESPONSIBLE FOR INSTALLING THE END-OF-RUN PATCH CABLE. AFTER INSTALLATION, VERIFICATION OF OPERABILITY IS REQUIRED.												
3. THE ELECTRICAL CONTRACTOR SHALL i) EXTEND THE BUILDING GROUND TO EACH TELECOMMUNICATION SPACE ii) PROVIDE AND INSTALL THE BUSBAR(S), GROUNDING CABLES, AND ASSOCIATED EQUIPMENT, iii) AND ENSURE EACH TELECOMMUNICATION SPACE HAS PROPER ACCESS TO BUILDING GROUND THROUGH THE LOCAL BUSBAR AS SHOWN IN THE DRAWINGS.												
4. FOR ALL DEVICES, EQUIPMENT, PATHWAY, AND OTHER SUCH MATERIAL REQUIRED TO BE GROUNDED, THE CONTRACTOR/PARTY, WITH WHICH THE DEVICE, EQUIPMENT, PATHWAY OR OTHER SUCH MATERIAL WAS INSTALLED BY, SHALL BE RESPONSIBLE FOR ITS PROPER BONDING AND GROUNDING.												
5. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROVISION AND INSTALLATION OF ALL FLOOR BOXES AND POKE THROUGH, AS WELL AS ALL CONDUIT/PATHWAY REQUIREMENTS PERTAINING TO IT, REGARDLESS IF THERE IS POWER CABLING INCLUDED AT DEVICE. THE TELECOM CONTRACTOR SHALL COORDINATE WITH DRAWINGS AND ELECTRICAL CONTRACTOR TO ENSURE LOW VOLTAGE INFRASTRUCTURE AND CABLING REQUIREMENTS ARE MET AND SHALL PROVIDE AND INSTALL ALL CABLING AND FACEPLATE/TERMINATION EQUIPMENT PERTAINING TO DEVICE.												
6. FOR ALL PENETRATIONS SHOWN IN DRAWINGS, THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL. THE ELECTRICAL CONTRACTOR SHALL ENSURE THE EXTERIOR OF EACH PENETRATION IS FIRE-RATED TO MATCH OR EXCEED THE PENETRATED SURFACE.												
7. ALL PENETRATIONS NOT SHOWN ON DRAWINGS, BUT REQUIRED FOR CABLING INSTALLATION, SHALL BE PROVIDED AND INSTALLED BY THE CABLING INSTALLATION CONTRACTOR/TEAM. FOR FIRE-RATED PENETRATIONS, THE CABLE INSTALLATION CONTRACTOR/TEAM SHALL ENSURE THE EXTERIOR OF EACH PENETRATION IS FIRE-RATED TO MATCH OR EXCEED THE PENETRATED SURFACE. AFTER ALL CABLING IS INSTALLED, TESTED, AND ACCEPTED, THE INTERIOR OF EACH PENETRATION SHALL BE FIRE-RATED TO MATCH OR EXCEED THE PENETRATED MATERIAL.												
8. IT IS ACCEPTABLE FOR THE CONTRACTOR TO REUSE AN EXISTING DEVICE WITH OWNER APPROVAL. COORDINATE WITH OWNER PRIOR TO ANY NEW DEVICE PROCUREMENT TO RECORD ALL DEVICES THAT MAY BE REUSED. FOR ALL DEVICES SCHEDULED FOR REUSE THAT REPLACE AN ITEM SCHEDULED FOR NEW, A CREDIT SHALL BE GIVEN TO OWNER FOR ITEM REPLACEMENT.												
9. THE BUILDING NETWORK IS THE LOCAL AREA NETWORK (LAN) OF THE BUILDING AND CONNECTS DIRECTLY TO THE INCOMING SERVICE PROVIDER; IT PROVIDES GENERAL ACCESS TO THE WIDE AREA NETWORK (WAN). OTHER SYSTEMS MAY UTILIZE NETWORK EQUIPMENT TO SUPPORT THEIR SPECIFIC NEEDS. HOWEVER, THIS EQUIPMENT IS SEPARATE AND DISTINCT FROM THE BUILDING NETWORK (LAN) AND ASSOCIATED												

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## SECTION 27 41 16

### INTEGRATED AUDIO VIDEO SYSTEM

#### PART 1 – GENERAL

##### A. SUBJECT TO CHANGE

1. These standards are subject to change. Verify that the latest are being used. Product manufacturers listed is the basis of design or equivalent unless noted otherwise.

##### B. PURPOSE

1. The purpose of this document is to provide design guidelines for architects, engineers, consultants, and contractors with an understanding of the minimum requirements for Telecommunications Infrastructure and other Technology systems for any building related project within the Cherry Creek School District (CCSD). If the building is existing, the requirements outlined below should be met to best of the ability of the design team and/or contractor. If the building is new construction, the requirements outlined below must be adhered to unless written approval is provided from CCSD IST prior to design completion.

##### C. DESIGN REQUIREMENTS

1. The design of the structured cabling and other technology systems for a new construction or renovation project shall be completed by a pre-approved CCSD Facilities and CCSD IST engineer/consultant. The engineer/consultant is typically selected by CCSD Facilities as a sub consultant to the Architect of the project, but can also be selected by CCSD IST directly if the project is technology systems specific. The engineer/consultant shall have an RCDD on staff and shall be responsible for the daily management of the project and its design. The engineer/consultant shall coordinate with the Architect and CCSD IST for a minimum of two (2) plan reviews during the design phase of the project. In addition, the engineer/consultant may be requested to include standard Contract Administration services including but not limited to Request for Information responses, Submittal Reviews, Site Observations, Final Punch walk, and review of contractor provided close out documents.
2. Because of the constant product changes and approach, need to review with CCSD staff on the particular project.
3. Refer to Division 26 for conduit, boxes, sleeves, conduit support, etc. requirements.

##### D. SUMMARY – SECTION INCLUDES

1. Integrated Audio Video System

##### E. INTEGRATED AUDIO VIDEO SYSTEM

1. Requirements for integrated audio video system
  - a. Submittal
  - b. Classroom audio video shall follow current structured cabling section 27 10 00. Current standard is to install an HDMI connection to a ceiling mounted district standard projector. Unless otherwise specified, the jack shall be located in the center of the presentation wall below the whiteboard.
  - c. Non-classroom systems are left to the individual school to purchase. It shall be the responsibility of the contractor to install all the infrastructure to support the audio video systems. Infrastructure requirements shall be coordinated with CCSD IST during the design phase process.

d. Refer to responsibility matrix below

MATRIX OF CONSTRUCTION RESPONSIBILITIES												
THE RESPONSIBILITIES LISTED HEREIN ARE PROVIDED AS A RECOMMENDATION AND DO NOT SUPERSEDE OR REPLACE ANY CONTRACTS, OR OTHERWISE DEFINED RESPONSIBILITIES, BETWEEN THE DESIGNATED PARTIES. IN ADDITION, THE INFORMATION IS MEANT TO INDICATE GENERAL RESPONSIBILITY FOR A SCOPE OF WORK AND IN NO WAY DISALLOWS THE RESPONSIBLE PARTY TO SUBCONTRACT THE SCOPE.												
RESPONSIBLE PARTY	GENERAL CONTRACTOR	ELECTRICAL CONTRACTOR	TELECOM CONTRACTOR	LOW VOLTAGE CONTRACTOR	AUDIO-VIDEO CONTRACTOR	SECURITY CONTRACTOR	OWNER	NOTES				
SCOPE OF WORK	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL		
BUDGET OF WORK	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	FIX-FURN-EQUIP				
SITE												
INCOMING SERVICE PROVIDER CABLING & COORDINATION									X	X	1	
EXTERIOR CONDUIT PATHWAY / DUCTBANK			X	X								
INTERIOR INFRASTRUCTURE												
GROUNDING & BONDING			X	X	X	X					3, 4	
INTERIOR CONDUIT PATHWAY			X	X								
BACKBOX / JUNCTION BOX			X	X								
FLOOR BOX / POKE THROUGH			X	X		X					5	
CABLE TRAY			X	X								
J-HOOK / SLING					X	X						
SLEEVE / CONDUIT PENETRATIONS			X	X	X	X					6, 7	
TELECOMMUNICATIONS												
PLYWOOD BACKBOARD	X	X										
LADDER RACK / LADDER RUNWAY / ACCESSORIES					X	X						
RACK / FRAME / CABINET (TELECOM)					X	X						
WIREMANAGER					X	X						
FIBER PATCH PANEL					X	X						
COPPER PATCH PANEL					X	X						
POWER DISTRIBUTION UNIT (PDU)					X	X						
UNINTERRUPTIBLE POWER SUPPLY (UPS)					X	X						
MISCELLANEOUS RACK COMPONENTS (DRAWER, SHELF, ETC.)					X	X						
BACKBONE CABLING SYSTEM (NETWORK, VOICE, CATV)					X	X						
HORIZONTAL CABLING SYSTEM (NETWORK, VOICE, CATV)					X	X						
FACEPLATE / JACK / SURFACE MOUNT BOX					X	X						
PATCH CABLE (INTERIOR TO TELECOMMUNICATIONS ROOM)					X	X					X	
PATCH CABLE (END DEVICE / OUTLET)					X	X		X		X	2	
LABELING					X	X						
MEDIA CONVERTERS / COPPER EXTENDERS FOR NETWORK CABLING					X	X						
WIRELESS ACCESS POINT (WAP)						X				X		
BUILDING NETWORK (LAN) EQUIPMENT (SWITCH, HEADEND, ETC.)										X	X	9
PERIPHERAL EQUIPMENT (PHONE, PRINTER, PC, ETC.)										X	X	
LOW VOLTAGE (LV)												
PAGING / PUBLIC ADDRESS						X	X					
CELLULAR DISTRIBUTED ANTENNA SYSTEM (DAS)	X	X										
BUILDING NETWORK (LAN) CABLING TO LV SYSTEM(S)				X	X							
AUDIO VISUAL (AV)												
RACK / FRAME / CABINET (AV)						X	X					
AMPLIFIER / CONTROLLER / PROCESSOR / MATRIX						X	X					
MICROPHONE						X	X					
FACEPLATE / JACK						X	X					
CABLING (NON-NETWORK)						X	X					
SPEAKER						X	X					
DISPLAY & MOUNT						X	X					
DISPLAY BACKING	X	X										
PROJECTOR						X	X					
PROJECTOR SCREEN						X	X					
AUDIO VIDEO NETWORK EQUIPMENT (SWITCHES AND CABLING)						X	X					9
BUILDING NETWORK (LAN) CABLING TO AUDIO VIDEO SYSTEM(S)				X	X							9
SECURITY - ACCESS CONTROL SYSTEM (ACS)												
ACS HEADEND / CONTROLLER / PANEL							X	X				
ACS SOFTWARE, PROGRAMMING, & INTEGRATION							X	X	X	X		
CARD READER / KEYPAD AND LICENSE (AUTHENTICATION DEVICE)							X	X				
REQUEST TO EXIT (WHEN NOT INTEGRAL TO DOOR HARDWARE)							X	X				
INTERCOM & INTERCOM MASTER STATION							X	X				
DOOR POSITION SWITCH							X	X				
DOOR RELEASE BUTTON							X	X				
DOOR HARDWARE / COMPONENTS	X	X										
BUILDING NETWORK (LAN) CABLING TO ACS				X	X							9
SECURITY - VIDEO SURVEILLANCE SYSTEM (VSS)												
VSS NETWORK VIDEO RECORDER (NVR)										X	X	
VSS SOFTWARE, PROGRAMMING, & INTEGRATION										X	X	
CAMERA AND LICENSE							X	X				
BUILDING NETWORK (LAN) CABLING TO VSS				X	X							9
SECURITY - INTRUSION DETECTION SYSTEM (IDS)												
ID HEADEND / CONTROLLER / PANEL							X	X				
ID SOFTWARE, PROGRAMMING, & INTEGRATION							X	X				
MOTION SENSOR &/OR GLASS BREAK SENSORS							X	X				
LOCK-DOWN BUTTON							X	X				
PANIC / DURESS BUTTON							X	X				
AUTO-DIALER & DIAL DESTINATION COORDINATION							X	X				
BUILDING NETWORK (LAN) CABLING TO IDS				X	X							9
NOTES:												
1. CONTRACTOR SHALL COORDINATE WITH OWNER REGARDING TIMELINE OF INSTALLATION AND REQUIREMENTS FOR INSTALLATION TO ENSURE A TIMELY INSTALLATION.												
2. THE PARTY RESPONSIBLE FOR INSTALLING THE END DEVICE (PC, CAMERA, WAP, ETC.) SHALL BE RESPONSIBLE FOR INSTALLING THE END-OF-RUN PATCH CABLE. AFTER INSTALLATION, VERIFICATION OF OPERABILITY IS REQUIRED.												
3. THE ELECTRICAL CONTRACTOR SHALL i) EXTEND THE BUILDING GROUND TO EACH TELECOMMUNICATION SPACE ii) PROVIDE AND INSTALL THE BUSBAR(S), GROUNDING CABLES, AND ASSOCIATED EQUIPMENT, iii) AND ENSURE EACH TELECOMMUNICATION SPACE HAS PROPER ACCESS TO BUILDING GROUND THROUGH THE LOCAL BUSBAR AS SHOWN IN THE DRAWINGS.												
4. FOR ALL DEVICES, EQUIPMENT, PATHWAY, AND OTHER SUCH MATERIAL REQUIRED TO BE GROUNDED, THE CONTRACTOR/PARTY, WITH WHICH THE DEVICE, EQUIPMENT, PATHWAY OR OTHER SUCH MATERIAL WAS INSTALLED BY, SHALL BE RESPONSIBLE FOR ITS PROPER BONDING AND GROUNDING.												
5. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROVISION AND INSTALLATION OF ALL FLOOR BOXES AND POKE THROUGH, AS WELL AS ALL CONDUIT/PATHWAY REQUIREMENTS PERTAINING TO IT, REGARDLESS IF THERE IS POWER CABLING INCLUDED AT DEVICE. THE TELECOM CONTRACTOR SHALL COORDINATE WITH DRAWINGS AND ELECTRICAL CONTRACTOR TO ENSURE LOW VOLTAGE INFRASTRUCTURE AND CABLING REQUIREMENTS ARE MET AND SHALL PROVIDE AND INSTALL ALL CABLING AND FACEPLATE/TERMINATION EQUIPMENT PERTAINING TO DEVICE.												
6. FOR ALL PENETRATIONS SHOWN IN DRAWINGS, THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL. THE ELECTRICAL CONTRACTOR SHALL ENSURE THE EXTERIOR OF EACH PENETRATION IS FIRE-RATED TO MATCH OR EXCEED THE PENETRATED SURFACE.												
7. ALL PENETRATIONS NOT SHOWN ON DRAWINGS, BUT REQUIRED FOR CABLING INSTALLATION, SHALL BE PROVIDED AND INSTALLED BY THE CABLING INSTALLATION CONTRACTOR/TEAM. FOR FIRE-RATED PENETRATIONS, THE CABLING INSTALLATION CONTRACTOR/TEAM SHALL ENSURE THE EXTERIOR OF EACH PENETRATION IS FIRE-RATED TO MATCH OR EXCEED THE PENETRATED SURFACE. AFTER ALL CABLING IS INSTALLED, TESTED, AND ACCEPTED, THE INTERIOR OF EACH PENETRATION SHALL BE FIRE-RATED TO MATCH OR EXCEED THE PENETRATED MATERIAL.												
8. IT IS ACCEPTABLE FOR THE CONTRACTOR TO REUSE AN EXISTING DEVICE WITH OWNER APPROVAL. COORDINATE WITH OWNER PRIOR TO ANY NEW DEVICE PROCUREMENT TO RECORD ALL DEVICES THAT MAY BE REUSED. FOR ALL DEVICES SCHEDULED FOR REUSE THAT REPLACE AN ITEM SCHEDULED FOR NEW, A CREDIT SHALL BE GIVEN TO OWNER FOR ITEM REPLACEMENT.												
9. THE BUILDING NETWORK IS THE LOCAL AREA NETWORK (LAN) OF THE BUILDING AND CONNECTS DIRECTLY TO THE INCOMING SERVICE PROVIDER; IT PROVIDES GENERAL ACCESS TO THE WIDE AREA NETWORK (WAN). OTHER SYSTEMS MAY UTILIZE NETWORK EQUIPMENT TO SUPPORT THEIR SPECIFIC NEEDS. HOWEVER, THIS EQUIPMENT IS SEPARATE AND DISTINCT FROM THE BUILDING NETWORK (LAN) AND ASSOCIATED												

END OF SECTION

## SECTION 27 51 13

### OVERHEAD PAGING SYSTEM

#### PART 1 – GENERAL

##### A. SUBJECT TO CHANGE

1. These standards are subject to change. Verify that the latest are being used. Product manufacturers listed is the basis of design or equivalent unless noted otherwise.

##### B. PURPOSE

1. The purpose of this document is to provide design guidelines for architects, engineers, consultants, and contractors with an understanding of the minimum requirements for Telecommunications Infrastructure and other Technology systems for any building related project within the Cherry Creek School District (CCSD). If the building is existing, the requirements outlined below should be met to best of the ability of the design team and/or contractor. If the building is new construction, the requirements outlined below must be adhered to unless written approval is provided from CCSD IST prior to design completion.

##### C. DESIGN REQUIREMENTS

1. The design of the structured cabling and other technology systems for a new construction or renovation project shall be completed by a pre-approved CCSD Facilities and CCSD IST engineer/consultant. The engineer/consultant is typically selected by CCSD Facilities as a sub consultant to the Architect of the project, but can also be selected by CCSD IST directly if the project is technology systems specific. The engineer/consultant shall have an RCDD on staff and shall be responsible for the daily management of the project and its design. The engineer/consultant shall coordinate with the Architect and CCSD IST for a minimum of two (2) plan reviews during the design phase of the project. In addition, the engineer/consultant may be requested to include standard Contract Administration services including but not limited to Request for Information responses, Submittal Reviews, Site Observations, Final Punch walk, and review of contractor provided close out documents.
2. Because of the constant product changes and approach, need to review with CCSD staff on the particular project.
3. Refer to Division 26 for conduit, boxes, sleeves, conduit support, etc. requirements.

##### D. SUMMARY – SECTION INCLUDES

1. Overhead Paging System

##### E. OVERHEAD PAGING SYSTEM

1. Requirements for overhead paging system
  - a. Submittal
  - b. Generally: Overhead paging system shall follow current structured cabling section 27 10 00. Cherry Creek School District (CCSD) requires a Valcom IP based intercom system. A Valcom (8022) to be utilized for the District's Cisco phones to access the intercom system. A Valcom (8048) required for security integration.
  - c. Individual communication to each teaching space including a call button, IP compact speaker with text/flasher (VL520BK-F-IC) connect the space to the building administration, and Security Offices. Teaching spaces are defined as any space in which students and teachers conduct classes. These areas include all classrooms, intervention rooms, gymnasiums and commons areas where classes can be conducted.

- d. All corridors, multi-occupancy toilet rooms, faculty offices, work rooms, and common areas have analog and zoned accordingly with Valcom (8004) or equivalent devices with the exception of multi-occupancy office spaces, conference rooms and Principal's Office that will utilize a (VL520BK-F-IC). The (VL550F) 40 inch PoE boards will be utilized in large areas such as the gymnasiums and cafeterias for legible messaging. Adequate exterior coverage using one way horns shall be installed around the perimeter of the building.
- e. Exterior horns zoned by north, south, east and west coverage areas.
- f. All conference rooms and the Main Office have an IP speaker.
- g. Separate zones to provide analog speakers in gyms, cafeteria, north/south commons and library. A means to shunt fixed in place sound systems in areas such as gyms and commons areas shall be provided.
- h. An all-call desktop microphone and remote input module (V-9130) via (V-8002) will in the Main Offices.
- i. Elementary schools and Administrative buildings: one (1) administrative phone in the Main Office.
- j. Middle schools: two (2) administrative phones; one (1) in the Main Office, and one (1) in the Security Office.
- k. High schools: three (3) administrative phones; one (1) in the Main Office, one (1) in an administrative office as directed, and one (1) in the Security Office.
- l. One (1) 40 inch PoE admin sign (VL550F) to be utilized in Main Office for room call-in information.
- m. Document on building floor plans.
- i. Panic/lockdown buttons report through the overhead paging system.
- n. Minimum capabilities and components as follows:
  1. Multiple event schedules for bells or other messaging
  2. The ability to use sound files for bells or prerecorded messages
  3. Multiple options for paging zones including, but not limited to, all zones, inside/outside, assembly areas, etc.
  4. The ability to display messages via PoE message boards
  5. Server allowing for 10 percent future expansion end points SIP compliant dual enhanced network audio port for music and microphone
  6. SIP compliant dual enhanced network audio port (for analog circuits)
  7. Dual enhanced network trunk (FXO) port
  8. Networked input and relay module (VE8048A/VE8048AR) required for security integration
  9. FXS dual network station port
  10. Main Office: one (1) IP speaker with text/flasher (VL550BK-F), one (1) all call desktop microphone and remote input module, one (1) administrative phone
  11. Teaching Spaces: one (1) IP compact speaker with text/flasher (VL520BK-F), one (1) call in button (V-2972), and additional speaker in rooms larger than 800 square feet
  12. Gymnasiums: one (1) IP speaker with text/flasher (VL550BK-F), one (1) call in button (V-2972), and additional separately zoned analog speakers to achieve intelligibility
  13. Cafeterias: One (1) for Elementary schools, two (2) for Middle and High schools speaker with text/flasher (VL550BK-F IP), and additional separately zoned analog speakers to achieve intelligibility
  14. Single Occupancy Faculty Office: one (1) analog 1-way speaker (VE9022A-2 for lay-in ceilings and V1920C or V1020C for drywall ceilings)
  15. Multi-occupancy Office: one (1) IP compact speaker with text/flasher (VL520BK-F)

16. Corridors, or multi-occupancy toilet rooms, or mechanical rooms: Analog 1-way speakers (VE9022A-2 for lay-in ceilings and V1920C or V1020C for drywall ceilings) located no more than 30 feet on center in any direction
17. Single occupancy toilet rooms and storage rooms: no devices
18. Conference rooms: one (1) IP lay-in IP speaker (VE4022)
19. Security Office (Middle schools): one (1) IP compact speaker with text/flasher (VL520BK-F) and one (1) administrative phone
20. Principle Office: one (1) IP compact speaker with text/flasher (VL520BK-F)
21. Exterior: Analog 1-way flex horns (V9880) quantity to achieve full intelligibility on all playgrounds and parking lots with separate zones for north, south, east, and west areas

o. Refer to responsibility matrix below

MATRIX OF CONSTRUCTION RESPONSIBILITIES												
THE RESPONSIBILITIES LISTED HEREIN ARE PROVIDED AS A RECOMMENDATION AND DO NOT SUPERSEDE OR REPLACE ANY CONTRACTS, OR OTHERWISE DEFINED RESPONSIBILITIES, BETWEEN THE DESIGNATED PARTIES. IN ADDITION, THE INFORMATION IS MEANT TO INDICATE GENERAL RESPONSIBILITY FOR A SCOPE OF WORK AND IN NO WAY DISALLOWS THE RESPONSIBLE PARTY TO SUBCONTRACT THE SCOPE.												
RESPONSIBLE PARTY	GENERAL CONTRACTOR	ELECTRICAL CONTRACTOR	TELECOM CONTRACTOR	LOW VOLTAGE CONTRACTOR	AUDIO-VIDEO CONTRACTOR	SECURITY CONTRACTOR	OWNER	NOTES				
SCOPE OF WORK	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL		
BUDGET OF WORK	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	FIX-FURN-EQUIP				
SITE												
INCOMING SERVICE PROVIDER CABLING & COORDINATION									X	X		1
EXTERIOR CONDUIT PATHWAY / DUCTBANK			X	X								
INTERIOR INFRASTRUCTURE												
GROUNDING & BONDING			X	X	X	X						3, 4
INTERIOR CONDUIT PATHWAY			X	X								
BACKBOX / JUNCTION BOX			X	X								
FLOOR BOX / POKE THROUGH			X	X		X						5
CABLE TRAY			X	X								
J-HOOK / SLING					X	X						
SLEEVE / CONDUIT PENETRATIONS			X	X	X	X						6, 7
TELECOMMUNICATIONS												
PLYWOOD BACKBOARD	X	X										
LADDER RACK / LADDER RUNWAY / ACCESSORIES					X	X						
RACK / FRAME / CABINET (TELECOM)					X	X						
WIREMANAGER					X	X						
FIBER PATCH PANEL					X	X						
COPPER PATCH PANEL					X	X						
POWER DISTRIBUTION UNIT (PDU)					X	X						
UNINTERRUPTIBLE POWER SUPPLY (UPS)					X	X						
MISCELLANEOUS RACK COMPONENTS (DRAWER, SHELF, ETC.)					X	X						
BACKBONE CABLING SYSTEM (NETWORK, VOICE, CATV)					X	X						
HORIZONTAL CABLING SYSTEM (NETWORK, VOICE, CATV)					X	X						
FACEPLATE / JACK / SURFACE MOUNT BOX					X	X						
PATCH CABLE (INTERIOR TO TELECOMMUNICATIONS ROOM)					X	X					X	
PATCH CABLE (END DEVICE / OUTLET)					X	X		X		X	2	
LABELING					X	X						
MEDIA CONVERTERS / COPPER EXTENDERS FOR NETWORK CABLING					X	X						
WIRELESS ACCESS POINT (WAP)						X				X		
BUILDING NETWORK (LAN) EQUIPMENT (SWITCH, HEADEND, ETC.)										X	X	9
PERIPHERAL EQUIPMENT (PHONE, PRINTER, PC, ETC.)										X	X	
LOW VOLTAGE (LV)												
PAGING / PUBLIC ADDRESS						X	X					
CELLULAR DISTRIBUTED ANTENNA SYSTEM (DAS)	X	X										
BUILDING NETWORK (LAN) CABLING TO LV SYSTEM(S)				X	X							
AUDIO VISUAL (AV)												
RACK / FRAME / CABINET (AV)						X	X					
AMPLIFIER / CONTROLLER / PROCESSOR / MATRIX						X	X					
MICROPHONE						X	X					
FACEPLATE / JACK						X	X					
CABLING (NON-NETWORK)						X	X					
SPEAKER						X	X					
DISPLAY & MOUNT						X	X					
DISPLAY BACKING	X	X										
PROJECTOR						X	X					
PROJECTOR SCREEN						X	X					
AUDIO VIDEO NETWORK EQUIPMENT (SWITCHES AND CABLING)						X	X					9
BUILDING NETWORK (LAN) CABLING TO AUDIO VIDEO SYSTEM(S)				X	X							9
SECURITY - ACCESS CONTROL SYSTEM (ACS)												
ACS HEADEND / CONTROLLER / PANEL							X	X				
ACS SOFTWARE, PROGRAMMING, & INTEGRATION							X	X	X	X		
CARD READER / KEYPAD AND LICENSE (AUTHENTICATION DEVICE)							X	X				
REQUEST TO EXIT (WHEN NOT INTEGRAL TO DOOR HARDWARE)							X	X				
INTERCOM & INTERCOM MASTER STATION							X	X				
DOOR POSITION SWITCH							X	X				
DOOR RELEASE BUTTON							X	X				
DOOR HARDWARE / COMPONENTS	X	X										
BUILDING NETWORK (LAN) CABLING TO ACS				X	X							9
SECURITY - VIDEO SURVEILLANCE SYSTEM (VSS)												
VSS NETWORK VIDEO RECORDER (NVR)										X	X	
VSS SOFTWARE, PROGRAMMING, & INTEGRATION										X	X	
CAMERA AND LICENSE							X	X				
BUILDING NETWORK (LAN) CABLING TO VSS				X	X							9
SECURITY - INTRUSION DETECTION SYSTEM (IDS)												
ID HEADEND / CONTROLLER / PANEL							X	X				
ID SOFTWARE, PROGRAMMING, & INTEGRATION							X	X				
MOTION SENSOR &/OR GLASS BREAK SENSORS							X	X				
LOCK-DOWN BUTTON							X	X				
PANIC / DURESS BUTTON							X	X				
AUTO-DIALER & DIAL DESTINATION COORDINATION							X	X				
BUILDING NETWORK (LAN) CABLING TO IDS				X	X							9
NOTES:												
1. CONTRACTOR SHALL COORDINATE WITH OWNER REGARDING TIMELINE OF INSTALLATION AND REQUIREMENTS FOR INSTALLATION TO ENSURE A TIMELY INSTALLATION.												
2. THE PARTY RESPONSIBLE FOR INSTALLING THE END DEVICE (PC, CAMERA, WAP, ETC.) SHALL BE RESPONSIBLE FOR INSTALLING THE END-OF-RUN PATCH CABLE. AFTER INSTALLATION, VERIFICATION OF OPERABILITY IS REQUIRED.												
3. THE ELECTRICAL CONTRACTOR SHALL i) EXTEND THE BUILDING GROUND TO EACH TELECOMMUNICATION SPACE ii) PROVIDE AND INSTALL THE BUSBAR(S), GROUNDING CABLES, AND ASSOCIATED EQUIPMENT, iii) AND ENSURE EACH TELECOMMUNICATION SPACE HAS PROPER ACCESS TO BUILDING GROUND THROUGH THE LOCAL BUSBAR AS SHOWN IN THE DRAWINGS.												
4. FOR ALL DEVICES, EQUIPMENT, PATHWAY, AND OTHER SUCH MATERIAL REQUIRED TO BE GROUNDED, THE CONTRACTOR/PARTY, WITH WHICH THE DEVICE, EQUIPMENT, PATHWAY OR OTHER SUCH MATERIAL WAS INSTALLED BY, SHALL BE RESPONSIBLE FOR ITS PROPER BONDING AND GROUNDING.												
5. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROVISION AND INSTALLATION OF ALL FLOOR BOXES AND POKE THROUGH, AS WELL AS ALL CONDUIT/PATHWAY REQUIREMENTS PERTAINING TO IT, REGARDLESS IF THERE IS POWER CABLING INCLUDED AT DEVICE. THE TELECOM CONTRACTOR SHALL COORDINATE WITH DRAWINGS AND ELECTRICAL CONTRACTOR TO ENSURE LOW VOLTAGE INFRASTRUCTURE AND CABLING REQUIREMENTS ARE MET AND SHALL PROVIDE AND INSTALL ALL CABLING AND FACEPLATE/TERMINATION EQUIPMENT PERTAINING TO DEVICE.												
6. FOR ALL PENETRATIONS SHOWN IN DRAWINGS, THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL. THE ELECTRICAL CONTRACTOR SHALL ENSURE THE EXTERIOR OF EACH PENETRATION IS FIRE-RATED TO MATCH OR EXCEED THE PENETRATED SURFACE.												
7. ALL PENETRATIONS NOT SHOWN ON DRAWINGS, BUT REQUIRED FOR CABLING INSTALLATION, SHALL BE PROVIDED AND INSTALLED BY THE CABLING INSTALLATION CONTRACTOR/TEAM. FOR FIRE-RATED PENETRATIONS, THE CABLING INSTALLATION CONTRACTOR/TEAM SHALL ENSURE THE EXTERIOR OF EACH PENETRATION IS FIRE-RATED TO MATCH OR EXCEED THE PENETRATED SURFACE. AFTER ALL CABLING IS INSTALLED, TESTED, AND ACCEPTED, THE INTERIOR OF EACH PENETRATION SHALL BE FIRE-RATED TO MATCH OR EXCEED THE PENETRATED MATERIAL.												
8. IT IS ACCEPTABLE FOR THE CONTRACTOR TO REUSE AN EXISTING DEVICE WITH OWNER APPROVAL. COORDINATE WITH OWNER PRIOR TO ANY NEW DEVICE PROCUREMENT TO RECORD ALL DEVICES THAT MAY BE REUSED. FOR ALL DEVICES SCHEDULED FOR REUSE THAT REPLACE AN ITEM SCHEDULED FOR NEW, A CREDIT SHALL BE GIVEN TO OWNER FOR ITEM REPLACEMENT.												
9. THE BUILDING NETWORK IS THE LOCAL AREA NETWORK (LAN) OF THE BUILDING AND CONNECTS DIRECTLY TO THE INCOMING SERVICE PROVIDER; IT PROVIDES GENERAL ACCESS TO THE WIDE AREA NETWORK (WAN). OTHER SYSTEMS MAY UTILIZE NETWORK EQUIPMENT TO SUPPORT THEIR SPECIFIC NEEDS. HOWEVER, THIS EQUIPMENT IS SEPARATE AND DISTINCT FROM THE BUILDING NETWORK (LAN) AND ASSOCIATED												

END OF SECTION

## SECTION 27 51 23

### EDUCATIONAL COMMUNICATION SYSTEM

#### PART 1 – GENERAL

##### A. SUBJECT TO CHANGE

1. These standards are subject to change. Verify that the latest are being used. Product manufacturers listed is the basis of design or equivalent unless noted otherwise.

##### B. SUMMARY – SECTION INCLUDES

1. Educational Intercommunications System, Classroom Sound Enhancement System, Elementary School Gymnasium Rack Sound System, Middle School Cafetorium Rack Sound System, Middle School Gymnasium Rack Sound System, High School Gymnasium Rack Sound System, and High School Auditorium Rack Sound System

##### C. DESIGN REQUIREMENTS

1. The design of the structured cabling and other technology systems for a new construction or renovation project shall be completed by a pre-approved CCSD Facilities and CCSD IST engineer/consultant. The engineer/consultant is typically selected by CCSD Facilities as a sub consultant to the Architect of the project, but can also be selected by CCSD IST directly if the project is technology systems specific. The engineer/consultant shall have an RCDD on staff and shall be responsible for the daily management of the project and its design. The engineer/consultant shall coordinate with the Architect and CCSD IST for a minimum of two (2) plan reviews during the design phase of the project. In addition, the engineer/consultant may be requested to include standard Contract Administration services including but not limited to Request for Information responses, Submittal Reviews, Site Observations, Final Punch walk, and review of contractor provided close out documents.
2. Because of the constant product changes and approach, need to review with CCSD staff on the particular project.
3. Refer to Division 26 for conduit, boxes, sleeves, conduit support, etc. requirements.

##### D. EDUCATIONAL INTERCOMMUNICATIONS SYSTEM

1. Requirements for educational intercommunications system refer to section 27 51 13

##### E. CLASSROOM SOUND ENHANCEMENT SYSTEM

1. Requirements for classroom sound enhancement system (need to review with CCSD staff on the particular project)
  - a. Submittal
  - b. Classroom sound enhancement system shall follow current structured cabling section 27 10 00
  - c. Manufactured by Atlas Learn or Lightspeed (no equivalent)
  - d. Ceiling mounted dome sensor
  - e. Ceiling mounted speakers
  - f. Two (2) lanyard wireless full sized microphones with one (1) charging/docking station
  - g. Amplifier/receiver with two microphone, computer, TV/VCR, CD/DVD, and auxiliary inputs
  - h. Locate in all instructional spaces
  - i. Amplifier and microphone charging/docking station cabinet mounted with duplex receptacle
  - j. One speaker per 200 square feet (or fraction thereof) of instructional spaces

F. ELEMENTARY SCHOOL GYMNASIUM RACK SOUND SYSTEM

1. Requirements for elementary school gymnasium rack sound system (because of the constant product changes and approach, need to review with CCSD staff on the particular project)
  - a. Submittal
  - b. Elementary school gymnasium rack sound system shall follow current structured cabling section 27 10 00
  - c. Portable mono sound system equipment (mixer, power strip, media player, processor, amplifier, and drawer) with snake connection to permanent wiring
  - d. Portable microphones and instructor headsets
  - e. Portable monitor speakers
  - f. Permanent performance speakers
  - g. Provisions for hearing impaired components
  - h. System to be reviewed by CCSD audio specialist
  - i. Owner training to include two (2) sessions, one (1) for maintenance personnel and one (1) for school personnel
  - j. Permanent wiring in minimum 3/4 inch conduit with speaker wiring separate from input wiring
  - k. Sound equipment storage room to be a minimum of 4 feet wide and 6 feet deep accessed from gymnasium
  - l. Receptacles in gymnasium on 25 foot on center around to be used for sound system
  - m. 12U portable cabinet on casters manufactured by Gator located in sound equipment storage room accessed from gymnasium where permanent wiring terminates to snake connection box
  - n. 16 channel digital or analog mixer manufactured by Yamaha (no equivalent) mounted on top of portable cabinet
  - o. Nine (9) single 15 ampere receptacle power strip with surge protection, sequencer, and 9 foot cord manufactured by Middle Atlantic mounted in portable cabinet
  - p. CD/media player with Bluetooth/USB/SD/Auxiliary/AM-FM Tuner manufactured by Denon (no equivalent) mounted in portable cabinet
  - q. Processor with provision for sound being shunted by fire alarm and educational intercommunication
  - r. Sound system manufactured by Soundweb London model BLU-50 or Nexia (no equivalent) mounted in portable cabinet
  - s. Two (2) channel, 1300 watt at 4 ohms power amplifier manufactured by QSC model RMX 4050a mounted in portable cabinet
  - t. Two (2) space drawer without lock manufactured by Middle Atlantic mounted in portable cabinet
  - u. Two (2) pack (handheld dynamic unidirectional and belt pack) wireless microphones with headsets for belt packs manufactured by ATW (no equivalent) to be stored in cabinet drawer
  - v. Wireless Bluetooth earset for instructor with charging/receiving system manufactured by Samson AirLine (no equivalent) to be stored in instructor office with portable receiver in gymnasium cabled to outlet in instructors office
  - w. Three (3) hanging microphones without separate power supply used as portable microphones manufactured by Shure stored in cabinet drawer
  - x. Three (3) microphone boom for hanging microphones manufactured by Ultimate Support stored in sound equipment storage room
  - y. One (1) handheld cabled microphone with 25 foot cable manufactured by Shure stored in cabinet drawer
  - z. Two (2) portable monitor speakers without separate power supplies needed manufactured by Yamaha stored in sound equipment storage room



- aa. Two (2) performance speaker columns manufactured by JBL mounted on the walls of either side of the gymnasium near the stage
- bb. Snake connection box with 75 foot snake manufactured by RapcoHorizon model 12x2x2 with box mounted in the back left wall at 36 inches above finished floor of sound equipment storage room with snake coil support on left wall
- cc. Sound system connection boxes at the stage located on back side of each of the proscenium walls with the following connections; three (3) microphone input, one (1) speaker output (wired together between both sides of the proscenium), one (1) spare speaker output, and line leveler connection

#### G. MIDDLE SCHOOL CAFETORIUM RACK SOUND SYSTEM

1. Requirements for middle school cafeteria rack sound system (because of the constant product changes and approach, need to review with CCSO staff on the particular project)
  - a. Submittal
  - b. Middle school cafeteria rack sound system shall follow current structured cabling section 27 10 00
  - c. Permanent stereo sound system equipment (mixer, power strip, media player, processor, amplifier, and drawer) in sound room
  - d. Portable and permanent microphones
  - e. Portable monitor speakers
  - f. Permanent performance speakers
  - g. Provisions for hearing impaired capabilities
  - h. System to be reviewed by CCSO audio specialist
  - i. Owner training to include two (2) sessions, one (1) for maintenance personnel and one (1) for school personnel
  - j. Permanent wiring in minimum 3/4 inch conduit with speaker wiring separate from input wiring
  - k. Sound room to be a minimum of 10 feet wide and 8 feet deep accessed from and open to cafeteria
  - l. Dedicated 20 ampere, 120 volt duplex receptacle in sound room
  - m. 18U permanent cabinet manufactured by Gator located in sound room
  - n. 32 channel digital or analog mixer manufactured by Yamaha (no equivalent) mounted in sound room
  - o. Nine (9) single 15 ampere receptacle power strip with surge protection, sequencer, and 9 foot cord manufactured by Middle Atlantic mounted in cabinet
  - p. CD/media player with Bluetooth/USB/SD/Auxiliary/AM-FM Tuner manufactured by Denon (no equivalent) mounted in cabinet
  - q. Processor with provision for sound being shunted by fire alarm and educational intercommunication
  - r. Sound system manufactured by Soundweb London model BLU-50 or Nexia (no equivalent) mounted cabinet
  - s. Two (2) channel, 1300 watt at 4 ohms power amplifier manufactured by QSC model RMX 4050a mounted in cabinet
  - t. Two (2) space drawer without lock manufactured by Middle Atlantic mounted in cabinet
  - u. Two (2) pack (handheld dynamic unidirectional and belt pack) wireless microphones with headsets for belt packs manufactured by ATW (no equivalent) to be stored in cabinet drawer
  - v. Six (6) hanging microphones without separate power supply manufactured by Shure permanently mounted above stage, evenly distributed
  - w. Two (2) microphone boom for handheld microphones manufactured by Ultimate Support stored in sound room

- x. One (1) handheld cabled microphone with 25 foot cable manufactured by Shure stored in cabinet drawer
- y. Two (2) portable monitor speakers without separate power supplies needed manufactured by Yamaha stored in sound room
- z. Two (2) performance speaker columns manufactured by JBL mounted on the walls of either side of the cafetorium near the stage
- aa. Sound system connection boxes at the stage located on back side of each of the proscenium walls with the following connections; four (4) microphone input, one (1) speaker output (wired separately between sides of proscenium), one (1) spare speaker output, and line leveler connection

#### H. MIDDLE SCHOOL GYMNASIUM RACK SOUND SYSTEM

1. Requirements for middle school gymnasium rack sound system (because of the constant product changes and approach, need to review with CCSD staff on the particular project)
  - a. Submittal
  - b. Middle school gymnasium rack sound system shall follow current structured cabling section 27 10 00
  - c. Permanent mono sound system equipment (mixer, power strip, media player, processor, amplifier, and drawer)
  - d. Portable microphones
  - e. Permanent speakers
  - f. Provisions for hearing impaired components
  - g. System to be reviewed by CCSD audio specialist
  - h. Owner training to include two (2) sessions, one (1) for maintenance personnel and one (1) for school personnel
  - i. Permanent wiring in minimum 3/4 inch conduit with speaker wiring separate from input wiring
  - j. Sound equipment room to be a minimum of 4 feet wide and 4 feet deep accessed from gymnasium
  - k. Dedicated 20 ampere, 120 volt duplex receptacle in sound equipment room
  - l. 12U floor mounted cabinet manufactured by Gator located in sound equipment room
  - m. 8 channel digital or analog mixer manufactured by Alesis (no equivalent) mounted in cabinet
  - n. Nine (9) single 15 ampere receptacle power strip with surge protection, sequencer, and 9 foot cord manufactured by Middle Atlantic mounted in cabinet
  - o. CD/media player with Bluetooth/USB/SD/Auxiliary/AM-FM Tuner manufactured by Denon (no equivalent) mounted in cabinet
  - p. Processor with provision for sound being shunted by fire alarm and educational intercommunication
  - q. Sound system manufactured by Soundweb London model BLU-50 or Nexia (no equivalent) mounted in cabinet
  - r. Two (2) channel, 1300 watt at 4 ohms power amplifier manufactured by QSC model RMX 4050a mounted in cabinet
  - s. Two (2) space drawer without lock manufactured by Middle Atlantic mounted in cabinet
  - t. Two (2) pack (handheld dynamic unidirectional and belt pack) wireless microphones with headsets for belt packs manufactured by ATW (no equivalent) to be stored in drawer
  - u. Wireless Bluetooth earset for instructor with charging/receiving system manufactured by Samson AirLine (no equivalent) to be stored in instructor's office with portable receiver in gymnasium cabled to outlet in instructor's office
  - v. One (1) handheld cabled microphone with 25 foot cable manufactured by Shure stored in cabinet drawer

- w. Three (3) permanent loud speakers manufactured by Electro-Voice mounted on the walls near ceiling opposite the bleachers equally spaced
- x. Sound system connection box at center of bleacher with the following connections; two (2) microphone input, one (1) speaker output, one (1) spare speaker output, one (auxiliary input) and line leveler connection

#### I. HIGH SCHOOL GYMNASIUM RACK SOUND SYSTEM

1. Requirements for high school gymnasium rack sound system (because of the constant product changes and approach, need to review with CCSD staff on the particular project))
  - a. Submittal
  - b. High school gymnasium rack sound system shall follow current structured cabling section 27 10 00
  - c. Permanent mono sound system equipment (mixer, power strip, media player, processor, amplifiers, and drawer)
  - d. Portable microphones
  - e. Permanent speakers
  - f. Provisions for hearing impaired components
  - g. System to be reviewed by CCSD audio specialist
  - h. Owner training to include two (2) sessions, one (1) for maintenance personnel and one (1) for school personnel
  - i. Permanent wiring in minimum 3/4 inch conduit with speaker wiring separate from input wiring
  - j. Sound equipment room to be a minimum of 4 feet wide and 4 feet deep accessed from gymnasium
  - k. Dedicated 20 ampere, 120 volt duplex receptacle in sound equipment room
  - l. 18U floor mounted cabinet manufactured by Gator located in sound equipment room
  - m. 8 channel digital or analog mixer manufactured by Alesis (no equivalent) mounted in cabinet
  - n. Nine (9) single 15 ampere receptacle power strip with surge protection, sequencer, and 9 foot cord manufactured by Middle Atlantic mounted in cabinet
  - o. CD/media player with Bluetooth/USB/SD/Auxiliary/AM-FM Tuner manufactured by Denon (no equivalent) mounted in cabinet
  - p. Processor with provision for sound being shunted by fire alarm and educational intercommunication
  - q. Sound system manufactured by Soundweb London model BLU-50 or Nexia (no equivalent) mounted in cabinet
  - r. Two (2), two (2) channel, 1300 watt at 4 ohms power amplifier manufactured by QSC model RMX 4050a mounted in cabinet
  - s. Two (2) space drawer without lock manufactured by Middle Atlantic mounted in cabinet
  - t. Two (2) pack (handheld dynamic unidirectional and belt pack) wireless microphones with headsets for belt packs manufactured by ATW (no equivalent) to be stored in drawer
  - u. Wireless Bluetooth earset for instructor with charging/receiving system manufactured by Samson AirLine (no equivalent) to be stored in instructors office with portable receiver in gymnasium cabled to outlet in instructors office
  - v. One (1) handheld cabled microphone with 25 foot cable manufactured by Shure stored in cabinet drawer
  - w. 9 dB or better antenna for CD/media player with Bluetooth/USB/SD/Auxiliary/AM-FM Tuner remote control mounted on ceiling with wire guard
  - x. Six (6) permanent 15 inch variable intensity loud speakers manufactured by Electro-Voice mounted on ceiling three (3) locations along the center of the gymnasium equally spaced parallel with the bleachers

- y. Sound system connection box at center of both bleachers with the following connections; two (2) microphone input, one (1) speaker output, one (1) spare speaker output, one (auxiliary input) and line leveler connection

J. HIGH SCHOOL AUDITORIUM RACK SOUND SYSTEM

1. Requirements for high school auditorium rack sound system (because of the constant product changes and approach, need to review with CCSD staff on the particular project)
  - a. Submittal
  - b. High school auditorium rack sound system shall follow current structured cabling section 27 10 00
  - c. Permanent stereo sound system equipment (mixer, power strip, media player, processor, amplifier, and drawer) in sound room
  - d. Portable and permanent microphones
  - e. Portable monitor speakers
  - f. Permanent performance speakers
  - g. Provisions for hearing impaired capabilities
  - h. System to be reviewed by CCSD audio specialist
  - i. Owner training to include two (2) sessions, one (1) for maintenance personnel and one (1) for school personnel
  - j. Permanent wiring in minimum 3/4 inch conduit with speaker wiring separate from input wiring
  - k. Sound room to be a minimum of 15 feet wide and 8 feet deep accessed from and open to auditorium
  - l. Dedicated 20 ampere, 120 volt duplex receptacle in sound room
  - m. 24U permanent cabinet manufactured by Gator located in sound room
  - n. 64 channel digital or analog mixer manufactured by Yamaha (no equivalent) mounted in sound room
  - o. Two (2), nine (9) single 15 ampere receptacle power strip with surge protection, sequencer, and 9 foot cord manufactured by Middle Atlantic mounted in cabinet
  - p. CD/media player with Bluetooth/USB/SD/Auxiliary/AM-FM Tuner manufactured by Denon (no equivalent) mounted in portable cabinet
  - q. Processor with provision for sound being shunted by fire alarm and educational intercommunication
  - r. Sound system manufactured by Soundweb London model BLU-50 or Nexia (no equivalent) mounted in cabinet
  - s. Four (4), two (2) channel, 1300 watt at 4 ohms power amplifier manufactured by QSC model RMX 4050a mounted in cabinet
  - t. Two (2), two (2) space drawer without lock manufactured by Middle Atlantic mounted in cabinet
  - u. Four (4) pack (handheld dynamic unidirectional and belt pack) wireless microphones with headsets for belt packs manufactured by ATW (no equivalent) to be stored in cabinet drawer
  - v. Six (6) hanging microphones without separate power supply manufactured by Shure permanently mounted above stage, evenly distributed
  - w. Four (4) microphone boom for handheld microphones manufactured by Ultimate Support stored in sound room
  - x. Two (2) handheld cabled microphone with 25 foot cable manufactured by Shure stored in cabinet drawer
  - y. Four (4) portable monitor speakers without separate power supplies needed manufactured by Yamaha stored in sound room
  - z. Two (2) performance speakers line array type manufactured by JBL mounted on the walls of either side of the auditorium near the stage

- aa. Sound system connection boxes at the stage located on back side of each of the proscenium walls with the following connections; eight (8) microphone input, two (2) speaker output (wired separately between sides of proscenium and in each of the boxes), two (2) spare speaker output, and line leveler connection

END OF SECTION

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## SECTION 27 53 19

### DISTRIBUTED ANTENNA SYSTEM

#### PART 1 – GENERAL

##### A. SUBJECT TO CHANGE

1. These standards are subject to change. Verify that the latest are being used. Product manufacturers listed is the basis of design or equivalent unless noted otherwise.

##### B. PURPOSE

1. The purpose of this document is to provide design guidelines for architects, engineers, consultants, and contractors with an understanding of the minimum requirements for Telecommunications Infrastructure and other Technology systems for any building related project within the Cherry Creek School District (CCSD). If the building is existing, the requirements outlined below should be met to best of the ability of the design team and/or contractor. If the building is new construction, the requirements outlined below must be adhered to unless written approval is provided from CCSD IST prior to design completion.

##### C. DESIGN REQUIREMENTS

1. The design of the structured cabling and other technology systems for a new construction or renovation project shall be completed by a pre-approved CCSD Facilities and CCSD IST engineer/consultant. The engineer/consultant is typically selected by CCSD Facilities as a sub consultant to the Architect of the project, but can also be selected by CCSD IST directly if the project is technology systems specific. The engineer/consultant shall have an RCDD on staff and shall be responsible for the daily management of the project and its design. The engineer/consultant shall coordinate with the Architect and CCSD IST for a minimum of two (2) plan reviews during the design phase of the project. In addition, the engineer/consultant may be requested to include standard Contract Administration services including but not limited to Request for Information responses, Submittal Reviews, Site Observations, Final Punch walk, and review of contractor provided close out documents.
2. Because of the constant product changes and approach, need to review with CCSD staff on the particular project.
3. Refer to Division 26 for conduit, boxes, sleeves, conduit support, etc. requirements.

##### D. SUMMARY – SECTION INCLUDES

1. Distributed Antenna System

##### E. DISTRIBUTED ANTENNA SYSTEM

1. Requirements for distributed antenna system
  - a. Submittal
  - b. Distributed antenna system shall follow current structured cabling section 27 10 00. Some CCSD facilities require a distributed antenna or bi-directional amplification (BDA) system to support first responder radio signals. Historically, the building is surveyed by the local authority having jurisdiction (AHJ) and determined if a distributed antenna or bi-directional amplification system is required. During this time, CCSD Facilities or the construction team will communicate to the design team that a system is required. If required, then CCSD may require the design team to provide a performance specification for this system.
  - c. Fire detection and alarm system to monitor the system

d. Refer to responsibility matrix below

MATRIX OF CONSTRUCTION RESPONSIBILITIES												
THE RESPONSIBILITIES LISTED HEREIN ARE PROVIDED AS A RECOMMENDATION AND DO NOT SUPERSEDE OR REPLACE ANY CONTRACTS, OR OTHERWISE DEFINED RESPONSIBILITIES, BETWEEN THE DESIGNATED PARTIES. IN ADDITION, THE INFORMATION IS MEANT TO INDICATE GENERAL RESPONSIBILITY FOR A SCOPE OF WORK AND IN NO WAY DISALLOWS THE RESPONSIBLE PARTY TO SUBCONTRACT THE SCOPE.												
RESPONSIBLE PARTY	GENERAL CONTRACTOR	ELECTRICAL CONTRACTOR	TELECOM CONTRACTOR	LOW VOLTAGE CONTRACTOR	AUDIO-VIDEO CONTRACTOR	SECURITY CONTRACTOR	OWNER	NOTES				
SCOPE OF WORK	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL	FURNISH	INSTALL		
BUDGET OF WORK	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	FIX-FURN-EQUIP				
SITE												
INCOMING SERVICE PROVIDER CABLING & COORDINATION									X	X		1
EXTERIOR CONDUIT PATHWAY / DUCTBANK			X	X								
INTERIOR INFRASTRUCTURE												
GROUNDING & BONDING			X	X	X	X						3, 4
INTERIOR CONDUIT PATHWAY			X	X								
BACKBOX / JUNCTION BOX			X	X								
FLOOR BOX / POKE THROUGH			X	X		X						5
CABLE TRAY			X	X								
J-HOOK / SLING					X	X						
SLEEVE / CONDUIT PENETRATIONS			X	X	X	X						6, 7
TELECOMMUNICATIONS												
PLYWOOD BACKBOARD	X	X										
LADDER RACK / LADDER RUNWAY / ACCESSORIES					X	X						
RACK / FRAME / CABINET (TELECOM)					X	X						
WIREMANAGER					X	X						
FIBER PATCH PANEL					X	X						
COPPER PATCH PANEL					X	X						
POWER DISTRIBUTION UNIT (PDU)					X	X						
UNINTERRUPTIBLE POWER SUPPLY (UPS)					X	X						
MISCELLANEOUS RACK COMPONENTS (DRAWER, SHELF, ETC.)					X	X						
BACKBONE CABLING SYSTEM (NETWORK, VOICE, CATV)					X	X						
HORIZONTAL CABLING SYSTEM (NETWORK, VOICE, CATV)					X	X						
FACEPLATE / JACK / SURFACE MOUNT BOX					X	X						
PATCH CABLE (INTERIOR TO TELECOMMUNICATIONS ROOM)					X	X					X	
PATCH CABLE (END DEVICE / OUTLET)					X	X		X		X		2
LABELING					X	X						
MEDIA CONVERTERS / COPPER EXTENDERS FOR NETWORK CABLING					X	X						
WIRELESS ACCESS POINT (WAP)						X					X	
BUILDING NETWORK (LAN) EQUIPMENT (SWITCH, HEADEND, ETC.)										X	X	9
PERIPHERAL EQUIPMENT (PHONE, PRINTER, PC, ETC.)										X	X	
LOW VOLTAGE (LV)												
PAGING / PUBLIC ADDRESS						X	X					
CELLULAR DISTRIBUTED ANTENNA SYSTEM (DAS)	X	X										
BUILDING NETWORK (LAN) CABLING TO LV SYSTEM(S)				X	X							
AUDIO VISUAL (AV)												
RACK / FRAME / CABINET (AV)						X	X					
AMPLIFIER / CONTROLLER / PROCESSOR / MATRIX						X	X					
MICROPHONE						X	X					
FACEPLATE / JACK						X	X					
CABLING (NON-NETWORK)						X	X					
SPEAKER						X	X					
DISPLAY & MOUNT						X	X					
DISPLAY BACKING	X	X										
PROJECTOR						X	X					
PROJECTOR SCREEN						X	X					
AUDIO VIDEO NETWORK EQUIPMENT (SWITCHES AND CABLING)						X	X					9
BUILDING NETWORK (LAN) CABLING TO AUDIO VIDEO SYSTEM(S)			X	X								9
SECURITY - ACCESS CONTROL SYSTEM (ACS)												
ACS HEADEND / CONTROLLER / PANEL							X	X				
ACS SOFTWARE, PROGRAMMING, & INTEGRATION							X	X	X	X		
CARD READER / KEYPAD AND LICENSE (AUTHENTICATION DEVICE)							X	X				
REQUEST TO EXIT (WHEN NOT INTEGRAL TO DOOR HARDWARE)							X	X				
INTERCOM & INTERCOM MASTER STATION							X	X				
DOOR POSITION SWITCH							X	X				
DOOR RELEASE BUTTON							X	X				
DOOR HARDWARE / COMPONENTS	X	X										
BUILDING NETWORK (LAN) CABLING TO ACS			X	X								9
SECURITY - VIDEO SURVEILLANCE SYSTEM (VSS)												
VSS NETWORK VIDEO RECORDER (NVR)									X	X		
VSS SOFTWARE, PROGRAMMING, & INTEGRATION									X	X		
CAMERA AND LICENSE							X	X				
BUILDING NETWORK (LAN) CABLING TO VSS			X	X								9
SECURITY - INTRUSION DETECTION SYSTEM (IDS)												
ID HEADEND / CONTROLLER / PANEL							X	X				
ID SOFTWARE, PROGRAMMING, & INTEGRATION							X	X				
MOTION SENSOR &/OR GLASS BREAK SENSORS							X	X				
LOCK-DOWN BUTTON							X	X				
PANIC / DURESS BUTTON							X	X				
AUTO-DIALER & DIAL DESTINATION COORDINATION							X	X				
BUILDING NETWORK (LAN) CABLING TO IDS			X	X								9
NOTES:												
1. CONTRACTOR SHALL COORDINATE WITH OWNER REGARDING TIMELINE OF INSTALLATION AND REQUIREMENTS FOR INSTALLATION TO ENSURE A TIMELY INSTALLATION.												
2. THE PARTY RESPONSIBLE FOR INSTALLING THE END DEVICE (PC, CAMERA, WAP, ETC.) SHALL BE RESPONSIBLE FOR INSTALLING THE END-OF-RUN PATCH CABLE. AFTER INSTALLATION, VERIFICATION OF OPERABILITY IS REQUIRED.												
3. THE ELECTRICAL CONTRACTOR SHALL i) EXTEND THE BUILDING GROUND TO EACH TELECOMMUNICATION SPACE ii) PROVIDE AND INSTALL THE BUSBAR(S), GROUNDING CABLES, AND ASSOCIATED EQUIPMENT, iii) AND ENSURE EACH TELECOMMUNICATION SPACE HAS PROPER ACCESS TO BUILDING GROUND THROUGH THE LOCAL BUSBAR AS SHOWN IN THE DRAWINGS.												
4. FOR ALL DEVICES, EQUIPMENT, PATHWAY, AND OTHER SUCH MATERIAL REQUIRED TO BE GROUNDED, THE CONTRACTOR/PARTY, WITH WHICH THE DEVICE, EQUIPMENT, PATHWAY OR OTHER SUCH MATERIAL WAS INSTALLED BY, SHALL BE RESPONSIBLE FOR ITS PROPER BONDING AND GROUNDING.												
5. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROVISION AND INSTALLATION OF ALL FLOOR BOXES AND POKE THROUGH, AS WELL AS ALL CONDUIT/PATHWAY REQUIREMENTS PERTAINING TO IT, REGARDLESS IF THERE IS POWER CABLING INCLUDED AT DEVICE. THE TELECOM CONTRACTOR SHALL COORDINATE WITH DRAWINGS AND ELECTRICAL CONTRACTOR TO ENSURE LOW VOLTAGE INFRASTRUCTURE AND CABLING REQUIREMENTS ARE MET AND SHALL PROVIDE AND INSTALL ALL CABLING AND FACEPLATE/TERMINATION EQUIPMENT PERTAINING TO DEVICE.												
6. FOR ALL PENETRATIONS SHOWN IN DRAWINGS, THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL. THE ELECTRICAL CONTRACTOR SHALL ENSURE THE EXTERIOR OF EACH PENETRATION IS FIRE-RATED TO MATCH OR EXCEED THE PENETRATED SURFACE.												
7. ALL PENETRATIONS NOT SHOWN ON DRAWINGS, BUT REQUIRED FOR CABLING INSTALLATION, SHALL BE PROVIDED AND INSTALLED BY THE CABLING INSTALLATION CONTRACTOR/TEAM. FOR FIRE-RATED PENETRATIONS, THE CABLE INSTALLATION CONTRACTOR/TEAM SHALL ENSURE THE EXTERIOR OF EACH PENETRATION IS FIRE-RATED TO MATCH OR EXCEED THE PENETRATED SURFACE. AFTER ALL CABLING IS INSTALLED, TESTED, AND ACCEPTED, THE INTERIOR OF EACH PENETRATION SHALL BE FIRE-RATED TO MATCH OR EXCEED THE PENETRATED MATERIAL.												
8. IT IS ACCEPTABLE FOR THE CONTRACTOR TO REUSE AN EXISTING DEVICE WITH OWNER APPROVAL. COORDINATE WITH OWNER PRIOR TO ANY NEW DEVICE PROCUREMENT TO RECORD ALL DEVICES THAT MAY BE REUSED. FOR ALL DEVICES SCHEDULED FOR REUSE THAT REPLACE AN ITEM SCHEDULED FOR NEW, A CREDIT SHALL BE GIVEN TO OWNER FOR ITEM REPLACEMENT.												
9. THE BUILDING NETWORK IS THE LOCAL AREA NETWORK (LAN) OF THE BUILDING AND CONNECTS DIRECTLY TO THE INCOMING SERVICE PROVIDER; IT PROVIDES GENERAL ACCESS TO THE WIDE AREA NETWORK (WAN). OTHER SYSTEMS MAY UTILIZE NETWORK EQUIPMENT TO SUPPORT THEIR SPECIFIC NEEDS. HOWEVER, THIS EQUIPMENT IS SEPARATE AND DISTINCT FROM THE BUILDING NETWORK (LAN) AND ASSOCIATED												

END OF SECTION