BEAVERTON SCHOOL DISTRICT

BSD Technical Standard
Division 27: Communications & Technology

1. PURPOSE

This Technical Standard is a narrative describing Beaverton School District's (BSD's) basis of design for telecommunication infrastructure standards. The information contained herein shall be used by the Project Design Team. This document addresses telecommunications infrastructure standards including telecommunications, data distribution and wiring; video projectors; CATV / IPTV distribution and wiring; audio paging; and clock systems. This Technical Standard shall be used as part of the BSD's General Design Standards (comprised of the BSD Educational Specifications and the BSD Technical Standards).

2. GENERAL

2.1. STANDARDS

2.1.1. All telecommunication distribution designs shall be based on and shall comply with the current following industry standards:

2.1.1.1. ANSI/TIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant OFSTP-7

2.1.1.2. ANSI/TIA-526-14-B-1998 Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant OFSTP-14A

2.1.1.3. ANSI/TIA-568-C.0 Generic Telecommunications Cabling for Customer Premises

2.1.1.4. ANSI/TIA-568-C.1 Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements

2.1.1.5. ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling

2.1.1.6. ANSI/TIA-568-C.3 Commercial Building Telecommunications Cabling Standard, Part 3: Fiber Optic Cabling Components Standards

2.1.1.7. ANSI/TIA -569-B: Commercial Building Standard for Telecommunications Pathways and Spaces

2.1.1.8. ANSI/TIA-598 Color Coding of Fiber Optic Cables

2.1.1.9. ANSI/TIA-606-A The Administration Standard for the Telecommunications Infrastructure of Commercial Building

2.1.1.10. ANSI/TIA-607-B Commercial Building Grounding and Bonding Requirements for Telecommunications

2.1.1.11. ANSI/TIA-758 Customer Owned Outside Plant Telecommunications Cabling Standard

2.1.1.12. NFPA-70 National Electric Code (NEC)

2.1.2. All above referenced documents are to be latest version, including addendum, in publication at time work is requested.

2.1.3. In addition to the above telecommunications standards, all design documents shall comply with codes and requirements of the local Authority Having Jurisdiction (AHJ).

2.2. DESIGN REQUIREMENTS

2.2.1. The telecommunication distribution system design shall provide a Structured Cabling System that is capable of supporting current and future voice, video, and data applications over a common cabling plant.

2.2.2. The system shall support IEEE 802.3 Ethernet applications including 1000Base-T and 1000Base.

2.2.3. Classrooms will have a minimum of one duplex data drop locations located at the teacher station. One duplex data drop location in the ceiling or wall at the LCD projector or TV location and one duplex data drop to support WAP.

2.2.4. These requirements encompass all materials, design, engineering, installation, supervision, and training services for the Structured Cabling System.

2.2.5. The following are examples of the Structured Cabling Systems that can be bid for new construction and whole building renovations where all building structured cabling wiring is replaced.

2.2.6. Every effort should be given to upgrade to CAT 6 cabling and connections, CAT 6A for WiFi locations.

2.2.7. The choice of a Structured Cabling Systems is limited to the following Vendors: Uniprise, Systimax, Leviton and Panduit.

2.3. TOPOLOGY

2.3.1. The data distribution system shall be a hierarchical star topology consisting of backbone cables connecting the Main Data Frame (MDF) Distribution Equipment Room to Intermediate Data Frame (IDF) Distribution Rooms.

2.3.2. Horizontal cables shall be installed from each Data Outlet to the MDF or IDF serving that area of the building.

2.4. ALARM/SECURITY/ELEVATOR VOICE LINES

2.4.1. Voice backbone cabling from the MDF to each IDF shall be 100Ω, 6-pair, unshielded twisted pair (UTP) cables. Elevators shall have their own dedicated lines, no sharing.

2.5. DATA

2.5.1. Data backbone cables for new building construction shall be at minimum 12-strand Single Mode OS2. Fiber optic backbone cables shall terminate on duplex LC connectors, installed in rack mounted fiber optic patch panels with front access for easy access to fiber patch cables.

2.5.2. Drop down door preferred over slide out trays. Backbone cables shall bear ratings suitable to their installed environment.

2.5.3. In remodel and extensions to existing buildings plan on upgrading all fiber to Single Mode OS2.

2.5.4. A typical Data Outlet shall be a flush mount faceplate containing two RJ45 outlets (jacks). Each RJ45 jack shall be a CAT 6, 8-pin modular jack wired in a T568B pinout.

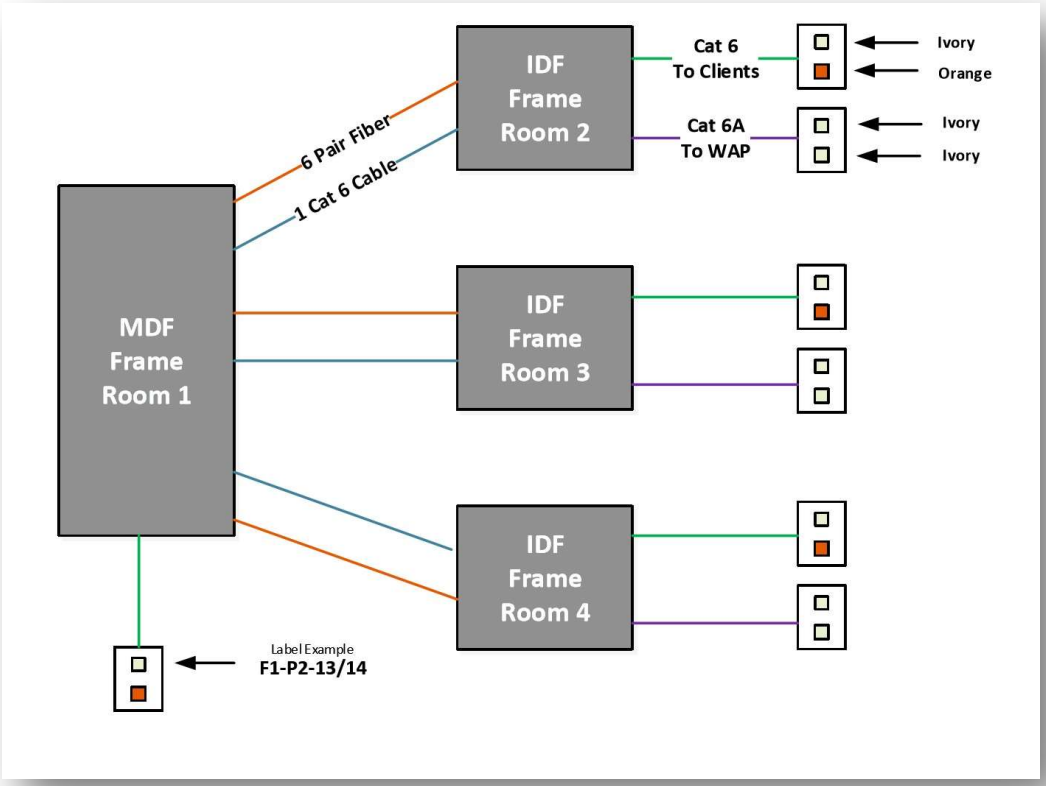
2.5.5. CAT 6A wiring and connections should be used for WiFi locations.

2.5.6. The horizontal cables shall be 4-pair, CAT 6 UTP cables. The length of each horizontal cable shall not exceed 90 meters (295 feet) regardless of medium.

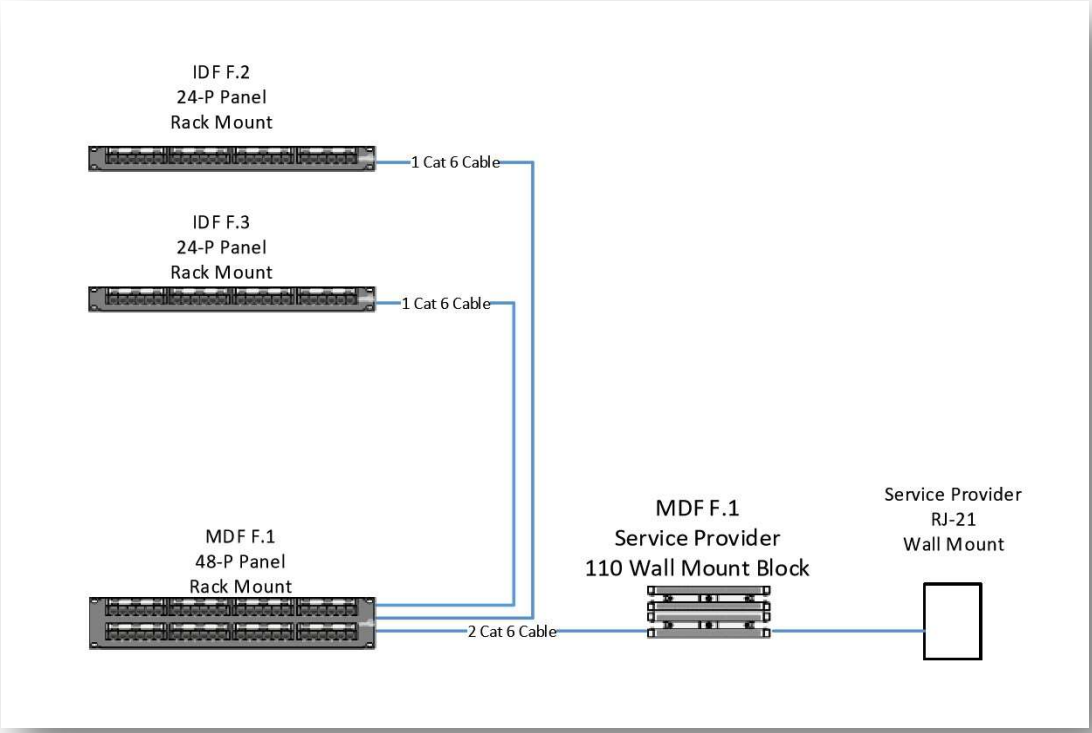
2.5.7. One end of a horizontal cable shall terminate at the Data Outlet. The other end of a horizontal cable shall terminate on a rack mounted modular patch panel located in the nearest Data Distribution Room.

2.5.8. Copper-based patch panels shall be 48 port quick port panel, example Leviton 4S255-D48. Horizontal cables shall bear ratings that are suitable to their installed environment.

General Network Topology



Copper Riser Diagram



2.6. DATA CONNECTIONS

2.6.1. Data connections shall be an interconnection from the patch panel to an Ethernet switch using modular patch cables equal to the medium installed for horizontal (station) cable.

2.6.2. An Ethernet switch in an MDF/IDF shall be connected to the intra-building data backbone cabling using a Single Mode OS2 fiber optic patch cable.

2.6.3. Fiber connections should also be use between portables and from the primary portable back to the building MDF/IDF. In the MDF, the data backbone cables shall connect to the network hardware using appropriate length fiber optic patch cables.

2.6.4. Active Electronics and fiber/copper patch cables will be furnished and installed by the District. One exception to this is when contractors are installing District provided wireless access points, in this case the contractor will install WAP and CAT 6A patch cable.

2.7. VOICE OVER IP (VOIP)

2.7.1. VoIP connections will be provided using the data outlets described above.

2.7.2. A PoE Ethernet switch in an IDF shall be connected to the intra-fiber optic patch cable connecting the Ethernet switch to the rack mounted fiber optic cabinet; the PoE switch will be installed by the District.

2.7.3. Active Electronics and fiber/copper patch cables will be furnished and installed by the District.

2.8. WIRELESS ACCESS POINT (WAP)

2.8.1. The District has standardized on an Aruba1 enterprise wireless solution. Data jack will consist of a dual CAT 6A-plenum cable to each WAP. WAP will be interconnected at each MDF/IDF to a District provided/installed PoE switch.

2.8.2. Flush mount in ceiling using standard flush mount face plate.

2.8.3. WAP connections shall be an interconnection from the patch panel to a powered Ethernet switch (PoE) using CAT 6A modular patch cables.

2.8.4. The PoE Ethernet switch in a Frame Room shall be connected to the intra-building data backbone cabling using a Single Mode OS2 fiber optic patch cable connecting the Ethernet switch to the rack mounted fiber optic cabinet.

2.8.5. The WAP traffic will typically be routed to the main MDF.

2.8.6. Active Electronics will be furnished and installed by the District.

2.9. SUBMITTALS

2.9.1. Prior to the start of work, the Telecommunications Contractor shall:

2.9.2. Submit copies of the certification of the company and names of staff that will be performing the installation and terminations.

2.9.3. Receive approval from the BSD Representative on all substitutions of material.

2.10. APPROVED CONTRACTOR

2.10.1. The following material vendors are approved by the District for data wiring installation: Uniprise, Systimax, Leviton and Panduit

2.10.2. The approved Contractor shall, at a minimum, possess the following qualifications:

2.10.2.1. Possess those licenses/permits required to perform telecommunications installations in the State of Oregon.

2.10.2.2. Be an approved Certified Installer at a Plus tier and be qualified to install and provide the product's warranty. The copper installation and termination crew must be certified by the manufacturer.

2.10.2.3. Submit references of the type of installation provided in this specification.

2.10.2.4. Personnel trained and certified in fiber optic cabling, splicing, termination, and testing techniques. Personnel must have experience using a light meter and OTDR.

2.10.2.5. Personnel trained in the installation of CAT 6 and CAT 6a rated pathways and support for housing horizontal, backbone, and campus cabling.

2.10.2.6. Personnel fluent in the use of Computer Aided Design (CAD) and possess and operate CAD software using DWG or DXF format or Microsoft VISIO.

[1] See List of Brand Name Products as approved via School Board Resolution 14-409 in accordance with ORS 279C.345.

2.10.2.7. On data/telecommunications Projects with a contract value of $100,000.00 or more, the Contractor shall have a BICSI certified RCDD on staff or access to one under contract for Project design certification and management.

2.11. POST-INSTALLATION AND TEST SYSTEM DOCUMENTATION

2.11.1. Upon completion of the installation, the Telecommunications Contractor shall provide three full documentation sets to the BSD Representative for approval.

2.11.2. The BSD Representative may request that a 50% random field re-test be conducted on fiber and a 10% random field re-test be conducted on other cable systems, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above.

2.11.3. If findings contradict the documentation submitted by the Telecommunications Contractor, additional testing can be requested to the extent determined necessary by the BSD Representative, including a 100% re-test. This re-test shall be at no additional cost to the District.

2.12. TEST RESULTS

2.12.1. Test results shall be clearly marked as “Project Test Documentation” with the Project name and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version, and last calibration date will also be provided at the end of the document.

2.12.2. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is required on all test equipment used for this installation.

2.12.3. The test document shall detail the test method used and the specific settings of the equipment during the test, as well as the software version being used in the field test equipment.

2.12.4. The field test equipment shall meet the requirements of ANSI/TIA-568-C series, including applicable TSB’s and amendments. The appropriate Level 3 tester shall be used to verify CAT 5e, CAT 6 and CAT 6a cabling systems.

2.12.5. Test results generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The Telecommunications Contractor must furnish this information in electronic form.

2.12.6. When repairs and re-tests are performed, the problem found, and corrective action taken shall be noted. Both the failed and passed test data shall be documented.

2.13. AS-BUILT DRAWINGS

2.13.1. The As-Built Drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number (**BSD data drop labeling scheme)** as defined in this standard.

2.13.2. For renovation work in existing buildings, the BSD Representative will provide floor plans in paper and electronic (current AutoCAD version) formats on which As-Built construction information can be added.

2.13.3. **As-Built documentation and test results must be received 20 working days prior to Substantial Completion to allow staff occupancy of the facility.**

2.14. WARRANTY

2.14.1. Documentation declaring Manufacturer's Warranty on Structured Cabling System shall be provided to the District within 30 days of finished installation.

3. DATA DISTRIBUTION ROOMS

3.1. GENERAL

3.1.1. For emergency generator specifications see Division 26.

3.1.2. Each District facility shall have an MDF Distribution Equipment Room. In addition, the MDF shall also serve as the connection point to the District's Wide Area Network (WAN) and the service entrance facility for Telco service providers.

3.1.3. The MDF be sized adequately to accommodate each of these systems. The minimum MDF sizes in new construction projects are:

ELEMENTARY SCHOOLS	150 SQUARE FEET
MIDDLE SCHOOLS	180 SQUARE FEET
HIGH SCHOOLS	200 SQUARE FEET

3.1.4. In remodel projects, the MDF shall be sized as closely to these space requirements as possible given the constraints of the existing conditions.

3.1.5. Whenever possible, the MDF shall be centrally located within a building to minimize horizontal cable lengths and the number of IDFs required. In school buildings, the MDF shall be on the first floor and in close proximity to the main office.

3.1.6. The IDF shall be dedicated to the telecommunications function and related support facilities. The MDF and IDF will not be shared with electrical installations other than those for data communications.

3.1.7. Equipment not related to the support of the data communications room (e.g., piping, ductwork, pneumatic tubing) shall not be installed in, pass through, or enter the MDF or IDF.

3.1.8. Security and other systems should have their own frame or rack. In remodel situations where this is not possible the MDF or IDFs must be in locking enclosures.

3.1.9. Due to noise, MDF and IDFs should not be placed in learning or office environments and moved during remodels where possible.

3.1.10. The MDF and IDFs should be accessible via access control key card. For emergency generator specifications see Division 26.

3.2. DATA COMMUNICATION RACKS

3.2.1. The MDF shall contain three or more 19"x7'-0" freestanding data communications equipment racks for mounting patch panels, cable management, and networking equipment such as routers and switches.

3.2.2. Racks shall be Chatsworth 55053-X03, or equivalent.

3.2.3. Racks shall be arranged side by side, in a row, to facilitate routing of cabling between patch panels and the networking equipment.

3.2.4. The quantity of racks shall be determined by quantity and type of patch panels and networking equipment required.

3.2.5. The racks shall be ganged with 6” wide, double-sided, vertical management hardware placed between the racks and 3” vertical wire management at the outside ends of the row of racks. Swing out covers on all cable management hardware.

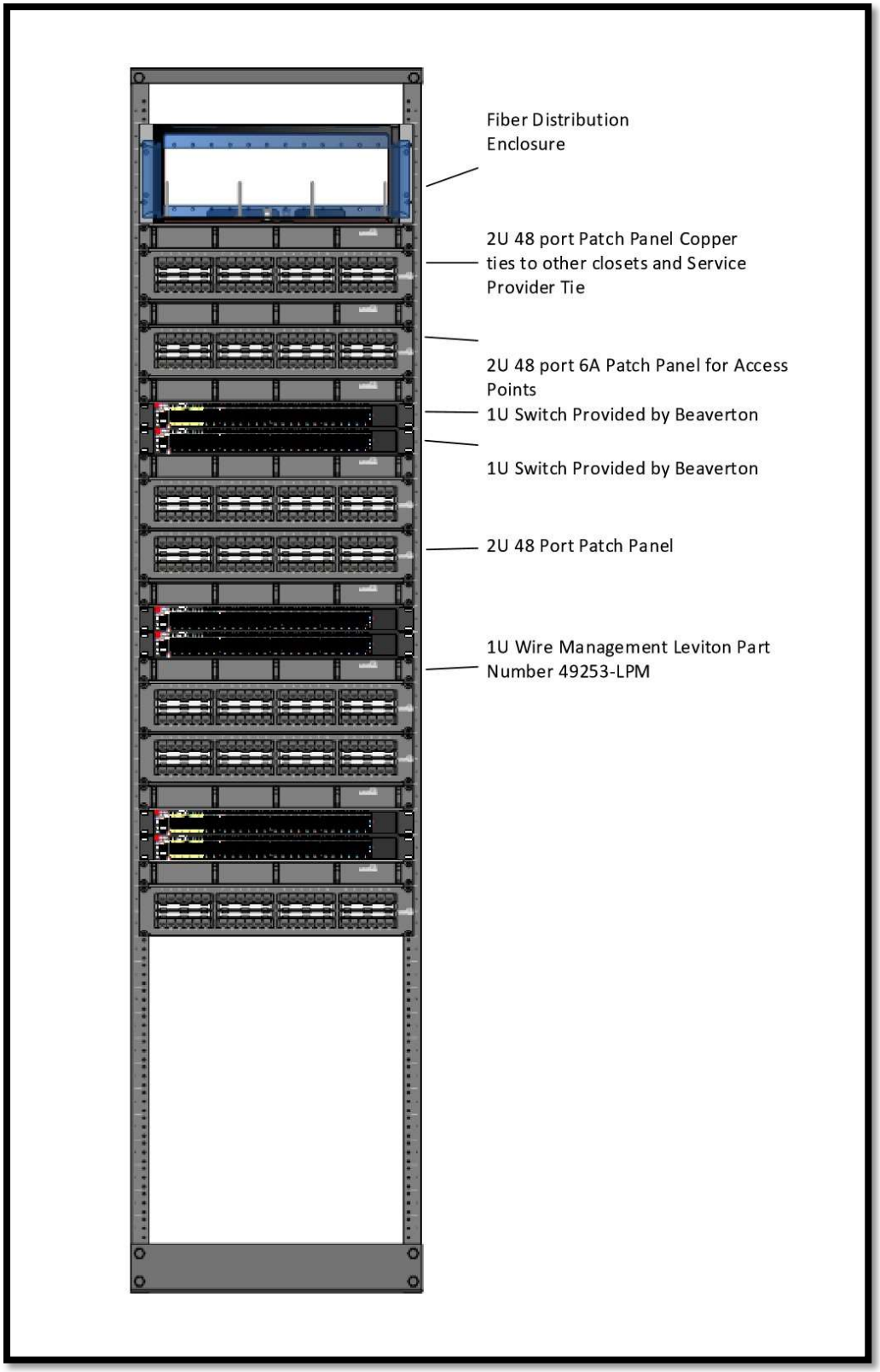
3.2.6. Security Systems should have their own frame or rack. Locking enclosures must be used in environments where the space is shared with other areas other than data communications.

3.2.7. **Racks shall be placed in a manner that will allow a minimum of 3’-0” of clearance from the front and 5’-0” clearance from rear mounting surfaces and 3’-0” clearance on one side.**

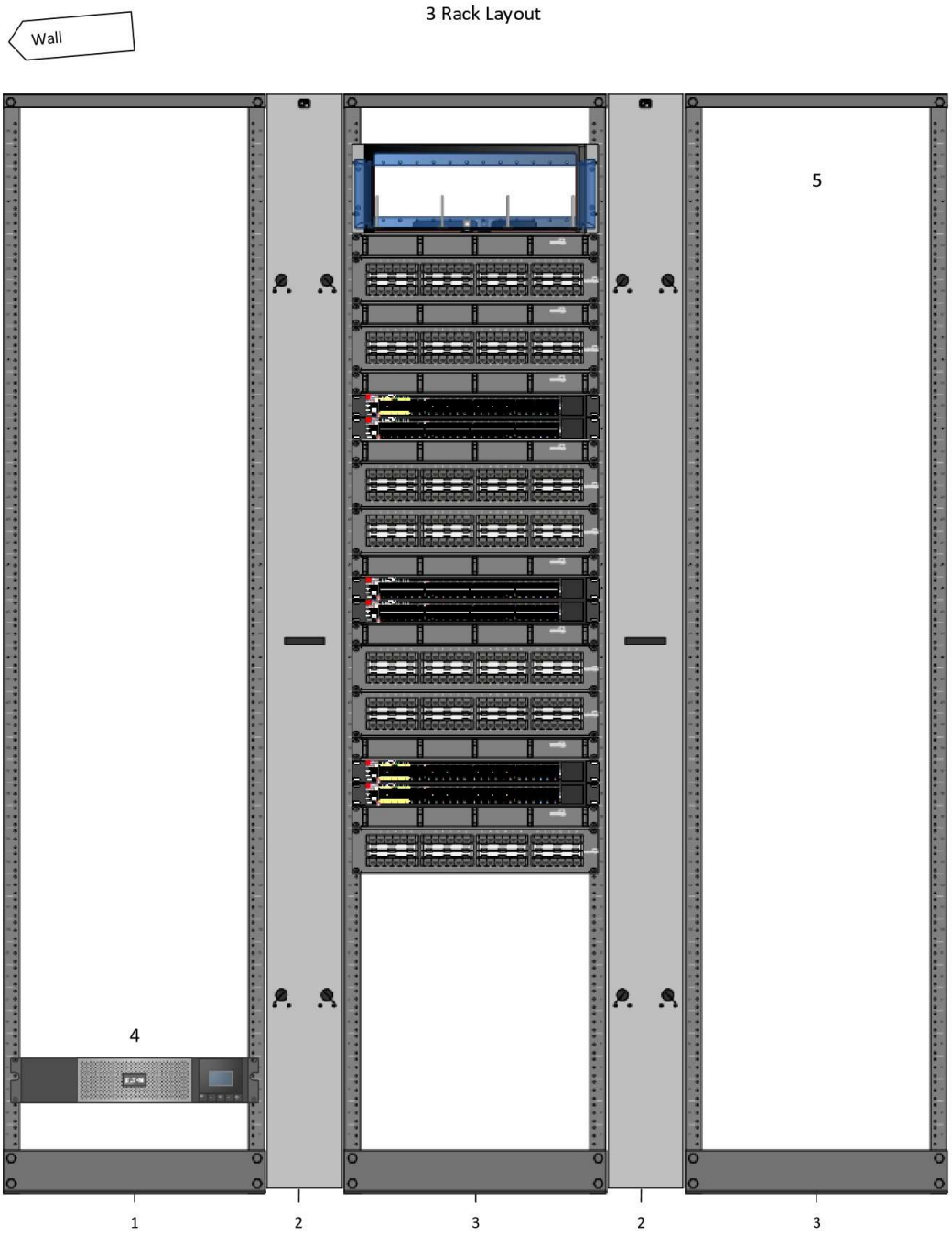
3.2.8. If one mounting rail of the rack is placed against a wall, the mounting rail shall be no closer than 3” to the wall.

3.2.9. No swing-out racks will be permitted.

MDF / Frame Room #1 Rack #1 Layout

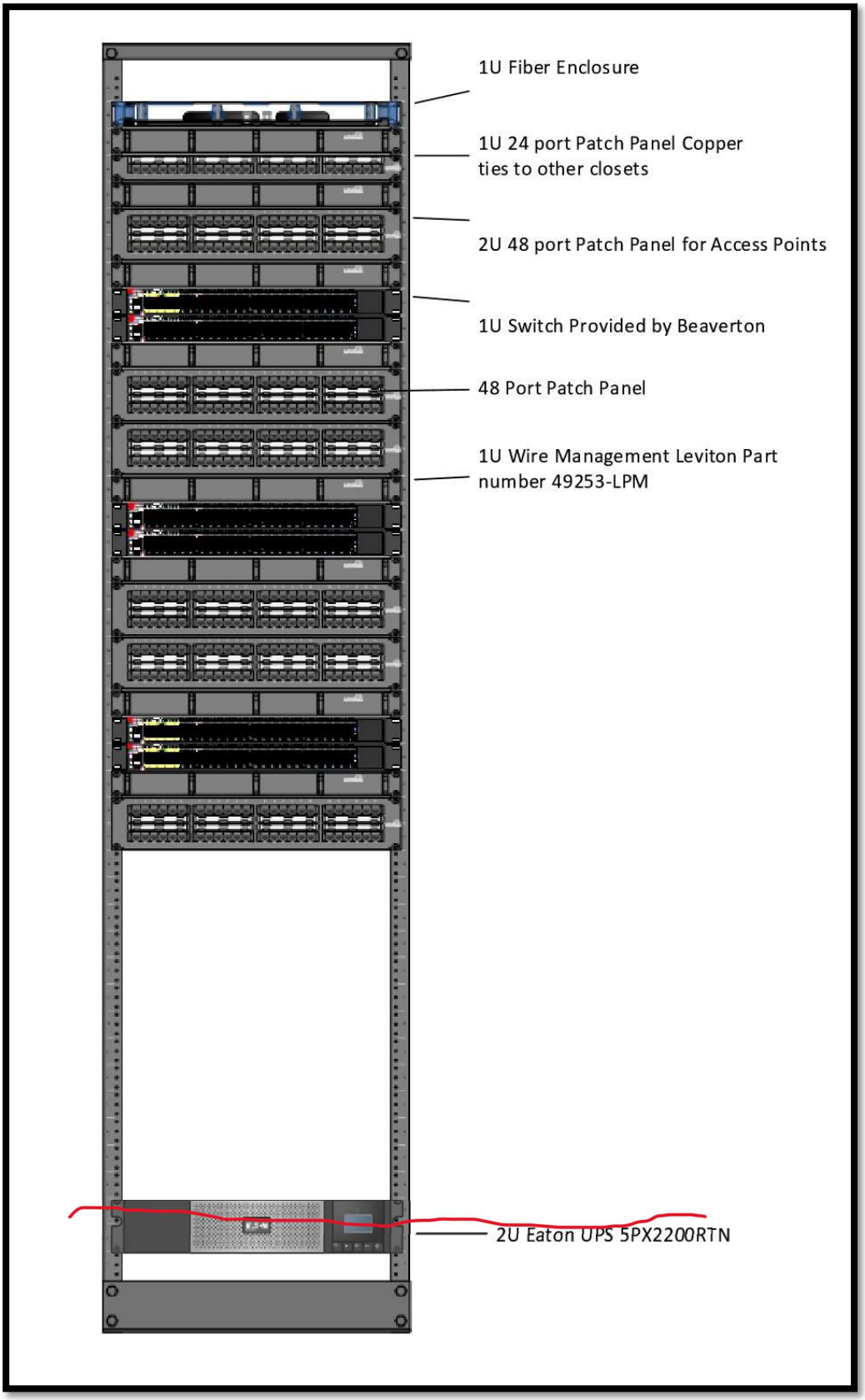


MDF / Frame Room #1 / 3 Rack Placement

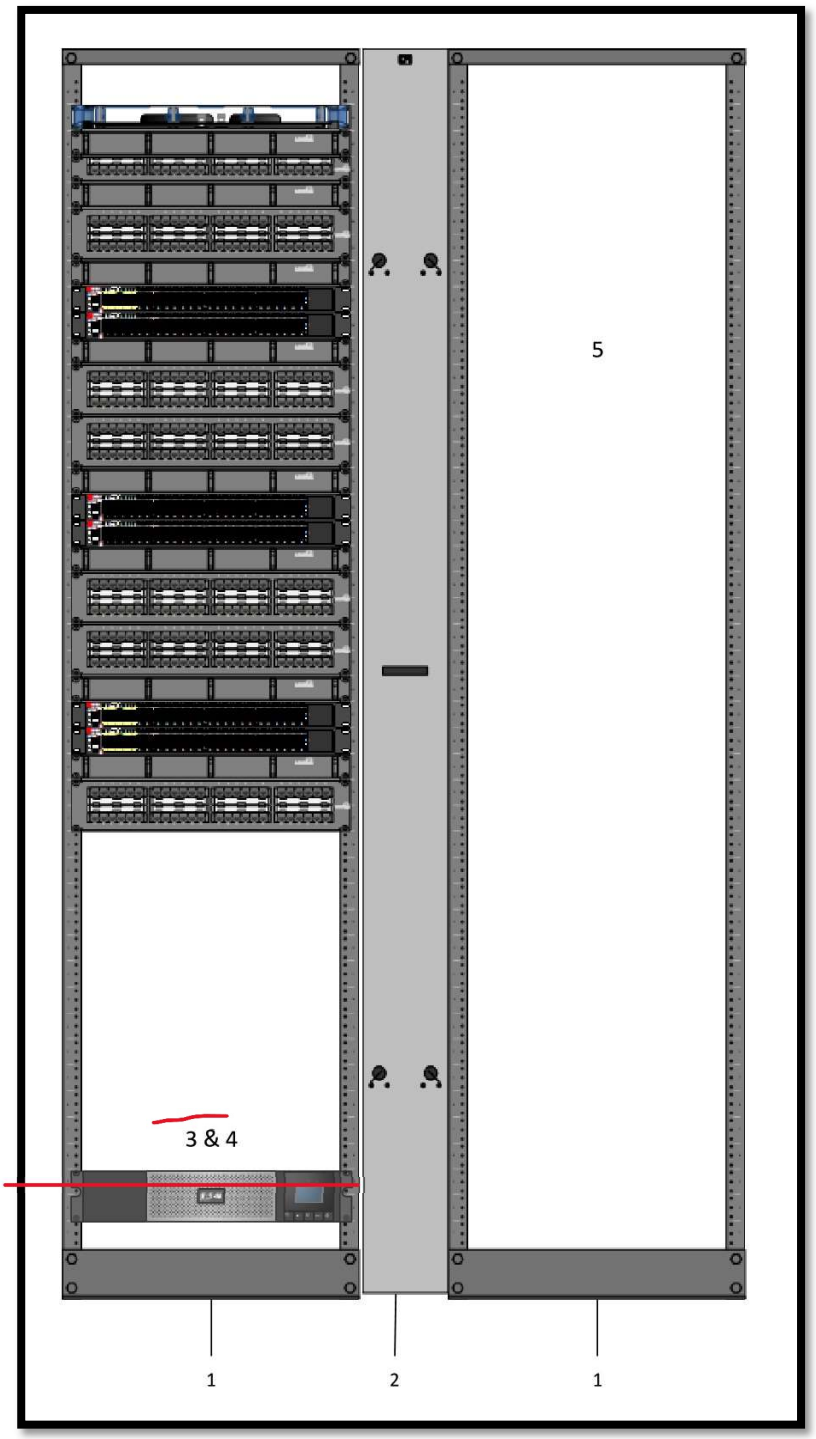


1. 4 Post Rack. Basis of design Tripp Lite Part Number SR4POST
2. Vertical Wire management. Basis of design Chatsworth Part number 30095-B03
3. 2 Post Rack. Basis of design Tripp Lite Part Number SR2POST
4. UPS- Basis of design Eaton Power Ware UPS, part number 5PX2200RTN (must have network card)
5. Contractor and other gear would go in this rack. For example- paging, security, WAN connection provider, phone system

IDF / Frame Room # Rack 1 Layout



IDF / Frame Room Multiple Rack Layout



1.	2 Post Rack. Basis of design Tripp Lite Part Number SR2POST
2.	Vertical Wire management. Basis of design Chatsworth Part number 30095-B03
3.	No UPS in IDF rooms
4.	No UPS in IDF rooms
5.	Contractor and other gear would go in this rack. For example- paging, security, etc.

3.3. POWER DISTRIBUTION

3.3.1. Provide a 100A 120/208V 3ø 4W - 24 circuit branch circuit panel located in the MDF room to feed equipment and racks. Panel shall be fed from the emergency panel to operate when the emergency generator, if provided, operates. Specifications will call out power distribution as required on a Project basis.

3.3.2. Provide a minimum of two dedicated, 120V, 20A duplex electrical circuits for each data communication rack. Provide one vertical power strip for each freestanding rack. The power strip shall have a minimum of 20 outlets on two circuits, rated at 20As, and be mounted to the rear rail of the rack. Acceptable product is Chatsworth 12851-706, or approved equivalent.

3.3.3. Duplex convenience outlets shall be placed at 6’-0” intervals around the perimeter of the room at 18” above the finished floor.

3.3.4. Building Equipment Rooms shall also contain two dedicated 20A circuits with dedicated ground for use by service providers.

3.3.5. Uninterrupted Power Supplies (UPS) shall be provided in MDF ONLY meeting the VoIP phone system specifications to provide power to all switches, networking equipment and VoIP system hardware in order for phone system to remain operational in a power outage.

3.3.6. Basis for design are Eaton UPS with Network Card:

3.3.6.1. 2U for frame room/racks Part Number: 5PX2200RTN

3.3.6.2. In IDF: Two-Post Mounting Rail Kit- 103007018-5591

3.4. PLYWOOD BACKBOARD

3.4.1. A minimum of two walls within the MDF shall be covered with 3/4" inch plywood backboards.

3.4.2. Plywood shall be A/B grade and finished with two coats of white fire-retardant paint.

3.4.3. The backboard shall be 4’-0” x 8’-0” sheets, mounted vertically, and with the bottom of the plywood mounted 6" above the finished floor.

3.5. WALL PENETRATIONS

3.5.1. All horizontal penetrations into the MDF shall be a “re-enterable” product that provides code compliant fire barrier protection. Provide separate pathway for each system.

3.6. CONDUITS

3.6.1. Conduits that enter an MDF under slab shall extend 3” to 6” above the finished floor.

3.6.2. Conduits that enter the MDF from overhead shall be routed to cable tray.

3.6.3. Conduits shall be bonded to the Telecommunications Main Grounding Busbar (TMGB).

3.7. LADDER TRAY

3.7.1. Ladder tray shall be sized to accommodate the quantity of cables required and shall comply with the current NEC and ANSI/TIA fill ratios.

3.7.2. Ladder tray shall be a minimum of 12” wide and include a cable drop out accessory where cables exit tray.

3.7.3. Ladder tray shall be extended to and firmly affixed upon the data communication racks and secured to the top of the racks using mounting plates and J-bolts in accordance with manufacturer’s instructions.

3.8. PORTABLE SERVICE

3.8.1. At each new school one additional 4” schedule 40 PVC conduit and two 2” schedule 40 PVC conduit will be provided between the MDF or IDF, whichever is closest, to a location where a future portable classroom(s) may be placed.

3.9. GROUNDING

3.9.1. ANSI Standard. See BSD Division 26: Electrical Technical Standards for details.

3.9.2. In new construction, or substantial remodel, it is the responsibility of the A/E to specify a Telecommunications Bonding Backbone (TBB) that complies with referenced standards.

3.9.3. All racks, ladder tray, and conduit shall be grounded with stranded #6 AWG copper conductor to the TMGB.

3.10. SPRINKLER HEADS

3.10.1. Wet fire sprinkler systems shall have high heat (200°) rated heads if required in the space.

3.11. MDF WORK SPACE

3.11.1. Work space shall have a Data Outlet configured with a minimum of four RJ45 jacks.

3.12. LIGHTING

3.12.1. Lighting shall be a minimum of 50 foot-candles, (538 lumens) measured 3’-0” above the finished floor.

3.12.2. Placement of lighting shall be coordinated to avoid obstacles such as cable trays that obstruct light.

3.13. DOORS

3.13.1. Doors shall open out from Data/Equipment Rooms and shall be a minimum of 36" wide and 80" high, fitted with Schlage IC core C keyway storeroom locks.

3.13.2. Doors shall be located in hallways or other common areas.

3.13.3. Refer to BSD Division 8: Doors, Windows & Openings, for additional information.

3.14. CLEARANCE

3.14.1. Minimum clearance height within an Equipment Room shall be 8’-6”.

3.14.2. False ceilings (e.g., t-bar ceilings, ceiling grids) shall not be installed in Equipment Rooms.

3.15. FINISHES

3.15.1. The floor, walls, and ceilings shall be sealed to reduce dust.

3.15.2. Provide flooring materials with anti-static properties.

3.15.3. Carpet is **not** acceptable for Equipment Rooms.

3.16. ENVIRONMENTAL CONTROL

3.16.1. Stand-alone environmental control systems shall be provided to the MDF and IDF on a 24 hours per day, 365 days per year basis to monitor and maintain acceptable temperature and humidity levels.

3.16.2. Rooms must be maintained at a constant temperature not to exceed 80°.

3.17. INTERMEDIATE DATA FRAME (IDF) DISTRIBUTION ROOM

3.17.1. General

3.17.1.1. In cases where horizontal cabling lengths exceed 90 meters, an Intermediate Data Frame (IDF) Distribution Room is required.

3.17.1.2. The IDF shall provide cross connect and interconnect facilities between horizontal cabling serving a portion of the facility and the backbone cabling to the MDF.

3.17.1.3. The IDF shall be a dedicated space and should not be in a learning or office environment.

3.17.1.4. The minimum size of an IDF shall be 8’-0” x 6’-0” to allow for the placement of one full-size telecommunication rack.

3.17.1.5. If additional racks are required in an IDF to provide mounting space for the required hardware and equipment, then the IDF shall be sized to accommodate the racks necessary and provide 3’-0” of clearance in front of, behind, and on one end of the racks.

3.17.1.6. A minimum of two walls shall be covered with 3/4" inch plywood backboard, conforming to specifications described above.

3.17.2. Data Communication Racks

3.17.2.1. An IDF shall contain a 7’-0” x 19” freestanding, aluminum telecommunications equipment rack for mounting patch panels, cable management, and networking equipment.

3.17.2.2. Chatsworth 55053-X03, or equivalent.

3.17.2.3. Three feet of clearance shall be maintained from the front and rear mounting surfaces and on one side of the rack.

3.17.3. Wall Mount Racks/Enclosures

3.17.3.1. In retrofits, where a small number of cables terminate in the IDF, the District may consider one of the wall- or floor-mounted enclosure options described below.

3.17.3.2. A floor-mounted enclosure may also be used when the capacity of a full-size rack is required but the IDF is located in a non-dedicated space such as a storage room, office or classroom.

3.17.3.3. Cabinet/rack must be capable of fitting standard size 48 port switch with power, fiber patch panel, 48 port patch panel and 1U UPS.

3.17.3.4. All IDF enclosures shall have lockable doors to prevent unauthorized access.

3.18. DATA FRAME PATCH CABLE COLOR SCHEME

3.18.1. See Technical Standards Appendix A for Category Cabling (5e, 6, 6a)

DATA	GREY
VOIP	GREY
WI-FI / ACCESS POINTS	WHITE
IP-BASED MANAGEMENT SYSTEMS	
HVAC	BLACK
LIGHTING - GENERAL	BLUE

LIGHTING - SPECIALTY (I.E. STAGE)	ORANGE
PAGING	PINK
OTHER MECHANICAL SYSTEMS	PURPLE
AV SYSTEMS	ORANGE
SECURITY IP SYSTEMS / CAMERAS	PINK
FIRE ALARM SYSTEMS	RED
OTHER SYSTEMS	VERIFY COLOR WITH BSD REP

3.19. DATA COMMUNICATIONS ENCLOSURE (PORTABLE CLASSROOMS)

3.19.1. A wall-mounted data enclosure will be used in all portable structures. A data enclosure will have approximate exterior dimensions of 24”H x 24”W x 18”D.

3.19.2. The data enclosure will have a minimum of 3 feet clearance in front to allow the door to swing fully open.

3.19.3. Chatsworth 11901724, or approved equivalent.

3.19.4. A dedicated 120V, 20A duplex power receptacle will be mounted inside the data enclosure.

3.19.5. All systems that are not directly located in the network racks and need network connection must terminate and be labeled on the patch panels.

4. STRUCTURED CABLING, DATA OUTLETS

4.1. STRUCTURED CABLING

4.1.1. Installation of raceways/pathways for telecommunication distribution systems shall be in accordance with applicable portions of ANSI/TIA-569-B.

4.1.2. Horizontal cabling shall be routed from each Data Outlet to a frame room using a combination of boxes, conduit, open cabling supports, and cable tray.

4.1.3. In new construction, cabling pathways shall be concealed in walls, casework, concrete slabs, and above ceilings whenever possible.

4.1.4. In renovations to existing spaces, the horizontal and backbone cabling may be routed in surface raceway when no other cost-effective options exist.

4.2. OPEN CABLING

4.2.1. Open cabling supports shall be installed parallel, or at right angles, to the building structure and shall be permanently anchored to building structure or substrates using beam clamps, drop wire, or threaded rod hanger brackets.

4.2.2. Open cabling supports shall be J-hook type cable supports with an open-top and wide base designed for supporting telecommunications cabling. J-hook supports should be sized in accordance with manufacturer’s recommendations for quantity of cables supported.

4.2.3. Fiber optic backbone cabling shall be installed with inner duct when routed using open cabling methods.

4.3. CONDUITS

4.3.1. Conduit pathway shall be provided for horizontal and backbone cabling routed in inaccessible spaces including walls, floors, and ceilings.

4.3.2. Cables installed in under slab conduits shall be manufactured with jackets rated for damp or wet applications and employ proper moisture blocking techniques in construction.

4.3.3. Conduits to Data Outlets shall be a minimum of 1” diameter. Conduit pathways and sleeves shall be EMT conduit.

4.3.4. All conduits shall have appropriate bushings installed on the ends prior to cabling being pulled. In case EMT conduit cannot be used, 1¼ flexible metallic conduit may be used.

4.3.5. Nylon pull strings shall be used in all conduit sleeves and pathways.

4.3.6. Runs shall be less than 90 meters (295 ft) in length and contain no more than two 90° bends.

4.3.7. Conduit shall be sized so the initial cable requirements do not exceed 50% fill ratio.

4.3.8. All conduits shall be supported independently of the ceiling support system.

4.3.9. Conduit sleeves that protrude through a floor shall terminate 3" to 6" above the surface of the floor.

4.3.10. Backbone cabling shall be routed in separate conduits from horizontal cabling.

4.4. CABLE TRAY

4.4.1. Large bundles of horizontal and backbone cabling installed outside of a frame room shall be routed within a cable tray located in accessible ceilings above corridors and other spaces.

4.4.2. Cable tray for distribution of cabling shall be a wire basket cable management system.

4.4.3. A divider strip may be installed in the cable tray to provide separation between each of the telecommunication systems in the Project. The cable tray and partitions created by the divider strips shall be sized to maintain a 40% fill ratio for each of the cabling systems.

4.4.4. Maximum depth of cabling shall be 6”.

4.4.5. Cable tray shall have minimum dimensions of 12”W x 4”D.

4.4.6. Cable tray shall be properly grounded in accordance with NEC and ANSI/TIA-607-B requirements.

4.4.7. Cable tray shall be supported with support systems approved by the manufacturer.

4.5. FIRE STOPPING

4.5.1. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate fire stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure).

4.5.2. Label all firewall penetrations as indicated on the As-Built Drawings. Any penetrations left unused shall be sealed.

4.5.3. Fire stop systems shall be UL listed and shall be acceptable to the local fire and building authorities having jurisdiction over this work.

4.6. SURFACE MOUNTED RACEWAY (SMR)

4.6.1. SMR refers to a system used for routing network cabling to outlets on existing solid walls or walls with fire-blocking. SMRs may be omitted where access into existing walls is available.

4.6.2. SMR shall be Panduit TG-70, or approved equivalent.

4.6.3. Horizontal SMR in lab environment shall be installed below the work surface height of computer tables.

4.6.4. SMR shall be UL listed and approved for the intended applications by the local authorities having jurisdiction.

4.6.5. SMR shall be sized to accommodate initial cable requirements plus a 50% expansion without exceeding the current NEC fill ratio requirements.

4.6.6. SMR shall be provided with all fittings including mounting clips and straps, couplings, flat, bend limiting internal and external elbows, cover clips, bushings, device boxes, and other incidental and miscellaneous hardware required.

4.6.7. Fittings/bends shall be sized to accommodate CAT 6 and fiber optic bend radii as specified in ANSI/TIA/568-C series.

4.6.8. SMR finish shall match, as close as possible, the finish of the wall it is to be mounted on.

4.6.9. SMR shall not be installed through walls.

4.6.10. SMR shall be securely supported in accordance with manufacturer's installation instructions.

4.6.11. The path of the raceway shall be selected to minimize impact on existing molding, tack boards, and other architectural elements.

4.6.12. Vertical runs of raceway from the ceiling to outlets shall be installed on walls near corners wherever possible. Raceway may be installed horizontally at the same height as the outlets or near to the ceiling.

4.6.13. Entrance end fittings will be supplied at the ends of raceway runs to transition to conduit sleeves through walls, ceilings, or floors.

4.7. DATA OUTLETS

4.7.1. Standard Data Outlets

4.7.1.1. The Standard Data Outlet shall be housed in a recessed $2^{5/8}$" deep x 4" square outlet box flush to the wall with single gang mud ring.

4.7.1.2. A 1" conduit and pull string shall be installed from the outlet box to an accessible ceiling space.

4.7.1.3. Appropriately rated bushings shall be installed on the end of the conduit stubbing into the accessible ceiling space.

4.7.2. Labeling

4.7.2.1. All Data Outlets shall be labeled in accordance with **BSD labeling standard** for data drops. The labels shall be non-removable, typed or machine-engraved.

4.7.2.2. The label shall identify the Data Distribution Room, patch panel, and port number on the patch panel to which the horizontal cable terminates.

4.7.2.3. Data Outlet labels shall be installed into the recess label field on the faceplate. For ceiling heights 15' or less, the label must be of large enough font to be read from the ground.

4.7.2.4. The current District labeling scheme is: **Frame room number – Panel in Frame – Port on Panel**

4.7.2.5. In new construction, MDF will be “Frame room 1”. IDF 2 will be “Frame room 2 and will continue sequentially for any additional IDFs.

4.7.2.6. Panels will start with “Panel 1” at the top on the Rack. If additional panels are needed in other racks, they will continue with sequential numbers.

4.7.2.7. Port label will indicate port number position on that panel (i.e., F1-P2-26).

4.7.2.8. No deviation from the district labeling scheme will be allowed.

4.7.3. Wireless Access Points (WAP)

4.7.3.1. The system must be designed in conjunction with the District Aruba Wireless Design Consultant.

4.7.3.2. Two CAT 6A cables will be installed from the serving MDF or IDF to each WAP location. Provide two CAT 6a data drops in the location determined by the design.

4.7.3.3. A 10’-0” service loop shall be coiled in the ceiling space above the WAP without exceeding the manufacturer’s bend radius.

4.7.3.4. WAPs should never be planned or mounted more than 15’ above ground level.

4.7.3.5. WAPs in a Gym or other areas that damage could be easily sustained will be mounted on a vertical surface within a NEMA polycarbonate enclosure measuring 14” x 12” x 6” with a clear door and locking latch.

4.7.4. Floor Box Outlet

4.7.4.1. Use of floor boxes requires BSD Representative approval to be included in the design. Boxes shall be a water-proof, multi-service metal style floor box providing separation allowing electrical power, and data outlets to share a common box.

4.7.4.2. The floor box shall be a recessed floor box flush with the finished floor.

4.7.4.3. The floor box shall have a metal lid with a hinged hatch to allow power and telecommunication cords to be fed out of the floor box to devices with lid being closed.

4.7.4.4. The floor box shall provide capacity for a duplex power receptacle and four data outlets.

4.7.4.5. The floor box will provide the capability for telecommunication cords to be fed from the box with the lid closed to protect the jacks.

4.7.4.6. Data jacks must sit vertical within the box to protect from dust and debris.

4.7.5. Data-Power Pole Outlet

4.7.5.1. Use of data-power poles requires BSD Representative approval.

4.7.6. Classrooms

4.7.6.1. Data outlets in classrooms shall be located to provide connectivity supporting instruction. The following are minimum specifications. Actual room distribution is determined by project design.

4.7.6.2. The number of jacks for student computers is recommended to be three wall locations with the standard data outlet having two CAT 6 RJ45 jacks – one white and one orange.

4.7.6.3. A typical school classroom shall have a minimum of one standard data outlet on three of the walls.

4.7.6.4. WAP outlet locations should be determined by consulting with the District Aruba Wireless Design Consultant.

4.7.7. Offices and Administrative Spaces

4.7.7.1. A typical office shall have two Data Outlets at each desk location. In larger offices that can support two workstations, provide three Data Outlets on interior walls.

4.7.7.2. In the main office, provide Data Outlets at each of the workstation locations. There shall be additional Data Outlets in the main office to support network printers, fax machines, phones, and copiers.

4.7.7.3. Office work rooms shall have a minimum of three Data Outlets. Office spaces shall have a minimum of one WAP outlet in the ceiling.

4.7.8. Under Counter, Desk, Table or Inside Cabinet

4.7.8.1. A grommet must be provided inside the counter, desk or cabinet. This could apply to 4.7.1 and 4.7.4- 7 above.

TABLE 27-1 SPECIAL PURPOSE SPACE DATA OUTLETS (DOs)

Space Description	Location	Remarks
Computer Labs	▪ 1 DO at instructor's station and 1 DO at back of room ▪ 1 video outlet at instructor's station ▪ Coordinate with BSD Representative for quantity of student DOs	Use floor boxes and wall raceways to meet specified number of student stations. All to be located in Schematic Design through BSD Representative input.
Science Labs	▪ 1DO at instructor's demo table ▪ 1DO in lab storage room ▪ Coordinate with BSD Representative for quantity of student DOs	Use wall boxes. All to be located in Schematic Design through BSD Representative input.
Library/Media Rooms	▪ Circulation desk: 3 DOs with 2 jacks each for a total of 6 jacks ▪ In student research area for Elementary School: 6 DOs distributed throughout ▪ In student research area for Middle School: 12 DOs distributed throughout ▪ In student research area for High School: 16 DOs distributed throughout ▪ 1 video outlet ▪ Library office: minimum 2 DOs ▪ Number of WAPs determined by District wireless consultant	Use wall boxes and/or floor boxes depending on direction from BSD Representative in Schematic Design. Locate in accordance with BSD Representative input.
Shops and Vocational Labs	▪ 1 DO at instructor's station and 1 each on the other 3 walls of the room	Use wall boxes. All to be located in Schematic Design through BSD Representative input.

Gymnasium	▪ 1 DO on each of the gymnasium (2 total) ▪ 1 DO near scoring table with wireguard cover ▪ 2 DOs for each coach's office ▪ 1 video outlet	Use wall boxes. All to be located in Schematic Design through BSD Representative input.
Auditorium/Theater	▪ 1 DO with duplex jacks on stage ▪ 1 DO in assembly area ▪ 1 DO in sound booth ▪ 1 video outlet with location to be determined	Use wall boxes and floor boxes. All to be located in Schematic Design through BSD Representative input.
Cafeteria and Multi-Purpose Rooms	▪ 1 fourplex DOs (4 jacks) for Point of Sale (POS) at cash register location for Elementary Schools ▪ 2 duplex DOs (POS) at cash register location for Middle Schools ▪ 3 duplex DOs (POS) at cash register location for High Schools ▪ 2 duplex DOs in the kitchen office ▪ Wall-mounted DOs with 4 jacks 1 video outlet with location to be determined	Use wall or floor boxes as guided by BSD Representative. All to be located in Schematic Design through BSD Representative input.
Elevators	▪ 1 CAT 6 service cable from nearest MDF/IDF with 15ft coiled extra length at end; not terminated at elevator end (elevator installer will connect)	Will terminate in elevator support junction box. Other end will be terminated on telecom patch panel mounted in frame room network rack.
Art Rooms	▪ 1 DO at instructor's station ▪ 3 DOs for students ▪ 1 video outlet	All to be located in Schematic Design through BSD Representative input.
Music Rooms	▪ 1 DO at instructor's station ▪ 2 DOs for students ▪ 1 video outlet	All to be located in Schematic Design through BSD Representative input.
Custodial Offices	▪ 1 DO	To be located in Schematic Design through BSD Representative input.
Mechanical/Electrical Rooms	▪ 1 DO for phone	Coordinate with BSD Representative for lighting control and fire alarm cabling design.
Conference Rooms	▪ 2 DOs ▪ 1 video outlet	All to be located in Schematic Design through BSD Representative input.
Portable Classrooms	▪ 2 DOs; one red colored jack and one white colored jack on each	All to be located in Schematic Design through BSD Representative input.
Health Room	▪ 1 DO	

4.7.9. Portable Classrooms

4.7.9.1. Data/VoIP – Primary portables will have a 6-strand 50/125µM OM4 fiber cable terminated in the data enclosure on a rack mounted FDU.

4.7.9.2. Secondary portable will also have a 6-strand 50/125µM OM4 fiber cable terminated in the data enclosure on a rack mounted FDU, this will connect and be terminated on the rack mounted FDU in the primary data enclosure, label for identification.

4.7.9.3. Portables located greater than 200 feet from main building or first portable on site will be described as a master portable. These feeds will originate in closest data frame within the school.

4.7.9.4. Voice (non-VoIP) – Primary portable will have a 6-pair CAT 6 outdoor cable terminated to the closest data frame within the school.

5. VIDEO

5.1. VIDEO PROJECTION/TV SYSTEMS

5.1.1. Classroom and instructional areas (gym, commons, auditorium), or areas designated by the BSD Representative, shall have projection capabilities and supporting infrastructure.

5.1.2. Systems shall include an amplifier providing audio to speakers.

5.1.3. Each projection location shall have a quad 110V power outlet, Data Outlet, 8m audio and HDMI. Design and location of drops to be reviewed by the BSD Representative.

5.1.4. All video connections should support 4K video resolution. Verify TV model and specifications with BSD.

5.1.5. Consult BSD concerning need for digital signage.

5.2. VIDEO

5.2.1. Video in buildings will be delivered most commonly via the Internet using video content hosts. The educational trend is toward communication to broader audiences and delivery of student and school generated video warrants this.

5.2.2. High Schools system may contain building wide video distribution system over the network for classrooms, conference rooms and digital signage in common areas.

6. CLOCK SYSTEMS

6.1. GENERAL

6.1.1. Provide GPS transmitter clock system (72MHz local transmitter with external antenna Primex #14000-E[1]) located with best signal distribution to minimize the need for additional repeaters. Provide dedicated electrical circuits to feed transmitters.

6.1.2. Provide one 12” GPS satellite battery operated clock in each classroom and one 9” or 12” GPS satellite battery operated clock in each office space.

6.1.3. Clocks in Gym or Cafeteria areas should be 16” or larger and, in gym or multi use areas, be covered with a protective cage.

[1] See List of Brand Name Products as approved via School Board Resolution 14-409 in accordance with ORS 279C.345.

6.1.4. Utilize building communication system for class bell change function by providing a relay for connection and connecting to the PA system for time synchronization. Primex only.

6.1.5. The approved Contractor must be a Certified Installer and be qualified to install and program the transmitter to operate with any required tone generator or external switching device connected to the paging equipment or other system and provide the product's warranty.

7. PAGING SYSTEM

7.1. GENERAL

7.1.1. Furnish and install a complete and operable paging system. System shall include, but not be limited to the following:

7.2. EXISTING SYSTEM UPGRADE

7.2.1. Upgrade existing system with IP based campus controller, IP based zone controllers, amplifiers, upgraded console, and accessories as necessary to support new analog speakers in each classroom and any other occupied room, covered play area, front door, plus 20% spare capacity.

7.3. NEW SYSTEM

7.3.1. Provide a new paging system including IP based campus controller connected to district enterprise paging server, IP based zone controllers, amplifiers, console, and accessories as necessary to support speakers shown on drawings for one-way paging with hands-free talkback function, plus 20% spare capacity.

7.4. SYSTEM CAPABILITIES

7.4.1. System shall be able to provide the following:

7.4.1.1. At least eight separate, individually programmable time schedules

7.4.1.2. Individual events of each schedule shall be capable of sounding nine distinct user defined tones

7.4.1.3. Allow schedules to run individually or simultaneously

7.4.1.4. Two priority levels of all-call capability

7.4.1.5. Provide integral internal program clock for time-tone distribution and other time related functions

7.4.1.6. Allow for the program clock to be synchronized from the external master clock system utilized for the school

7.4.1.7. Interface to the telephone system for general and emergency paging from any telephone instrument

7.4.1.8. Provide a paging console in the main office to operate the system

7.5. INSTALLATION

7.5.1. All paging equipment shall be mounted in a manner that allows easy access for maintenance without using ladders.

7.5.2. Rack mount units shall maintain a clearance between the equipment above and below at least 3" to allow for cable routing while testing and maintenance.

7.5.3. Desk mount units, when installed in the MDF room, shall have a wall mount shelf firmly affixed to the wall and capable of supporting at least 300 lbs.

7.5.4. The shelf shall not be less than 3’-0” and not higher than 5’-0” measured from the floor.

7.5.5. The shelf surface area shall be at least 24” x 24”.

7.5.6. Cables attached to the paging and audio equipment shall be of a length as to allow for rotating the cabinets a full 180° for maintenance.

7.5.7. A minimum distance of 36” shall be maintained from the front of the shelf to any other equipment.

7.5.8. Paging console to be located in the main office. All other paging equipment shall not be installed in office space or teacher workrooms without approval of the BSD Representative.

7.5.9. All analog speakers shall be individually connected (home run) and terminate on a 66 split block (see **Figure 1. Paging Punchdown Block** for details) at the same location as the telephone switch.

7.5.10. Bridging clips will be used to connect paging equipment to individual speaker lines. No other connection method will be approved.

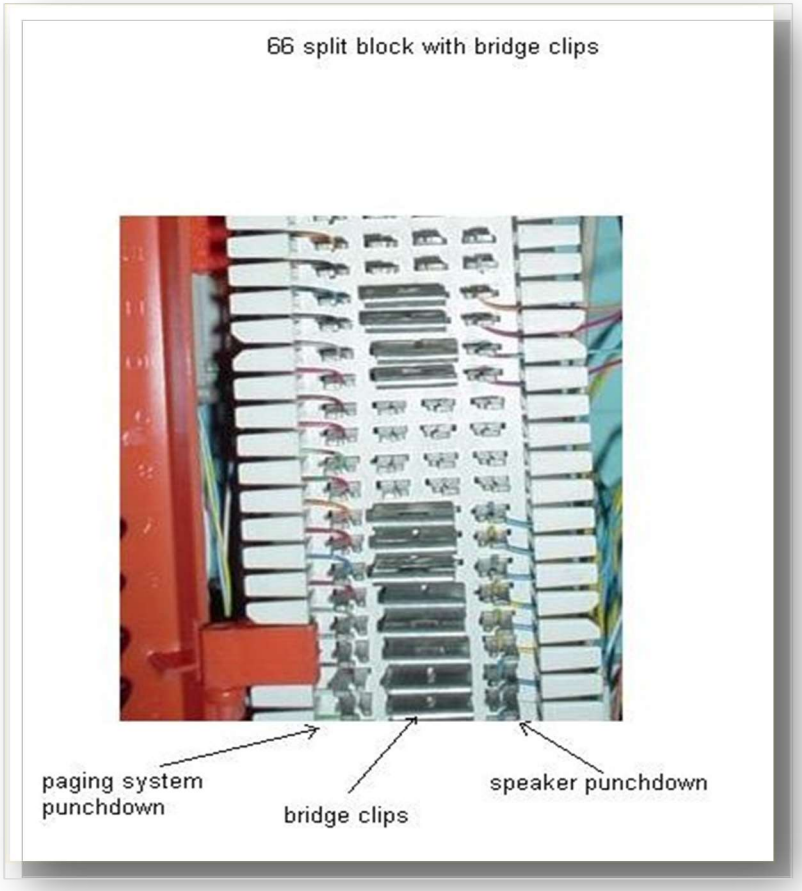


Figure 1: Paging Punchdown Block

7.6. SUBMITTALS

7.6.1. Provide data sheets on equipment being provided, wiring diagrams showing typical field wiring connections, and system field wiring diagrams showing proposed zoning and routing of speaker cabling. Provide paging zone maps and documentation of station addresses and punchdown block

layout. Provide As-Built Drawings showing any changes to the submitted documentation during construction.

7.7. QUALIFICATIONS

7.7.1. Minimum five years documented experience in the Portland Metro area and with service facilities within 100 miles of Project. Staff includes at least one factory-trained technician certified by manufacturer of this equipment.

7.8. WARRANTY

7.8.1. Provide guarantee of installed system against defects in material and workmanship, including cost of corrective labor and materials at no expense to the BSD Representative, for duration of one year from date of acceptance by the BSD Representative.

7.9. PRODUCTS

7.9.1. For new construction or upgrade/replacement of system, Rauland paging systems shall be used as the basis of design (ControlKom for the bell scheduling and InformaCast compliant IP devices for the hardware).

7.9.2. This design should include rack mounted IP based campus controller connected via the network to Rauland district server and IP based zone controllers.

7.9.3. Provide adequately powered amplifier circuit for each remote station to allow absolute flexibility for simultaneous paging, program distribution and time-tone schedules.

7.9.4. For equipment requiring a single power amp for these functions, size to deliver a minimum power of 150% of the measured connected load at 100% duty cycle.

7.9.5. Station speakers: Analog 8” dual-cone design with a frequency response of 70Hz-15kHz.

7.9.6. Voice coil: 1” diameter with 10 oz. magnet. Sensitivity of at least 96dB measured at 1w, 1m. Capable of handling 10 watts of program power. Bogen S810, or equal.

7.9.7. When recommended by the manufacturer for enhanced sound quality, ceiling speaker enclosures with tile bridges will be used. Line-matching transformer shall be a dual 70V/25V primary, rated for at least 5 watts. Power levels will be tapped at .25 watts to 5 watts with at least 5 taps. Speco T-7025/5, or equivalent. Individual speaker volume controls are not approved.

7.9.8. Provide weatherproof outside paging loudspeakers with vandal proof grille and a minimum power rating of 15 watts. The speaker shall have switch selectable power levels from .46 watts to 15 watts using 70V/25V distribution. Bogen SPT15A, or equal. The speaker shall have a minimum frequency response of 275Hz-14kHz and a dispersion angle of 120°.

7.9.9. Provide a program distribution control panel with AM/FM/CD player.

7.10. CABLING

7.10.1. Furnish and install all cable as recommended by the manufacturer. Size wiring to match line length. Route each speaker to the MDF room and terminate on a 66 split block.

7.11. SYSTEM COMPATIBILITY

7.11.1. For new construction the District has standardized on Rauland paging systems as basis of design (ControlKom for the bell scheduling and InformaCast compliant IP devices for the hardware).

7.11.2. For renovations on buildings with existing Rauland systems, the paging system will be able to utilize all spare boards currently used in the Rauland telecenter Integrated Communications System (ICS) intercom.

8. RADIO COMMUNICATIONS

8.1. DISTRIBUTED ANTENNA SYSTEM (DAS)

8.1.1. Install DAS for first responders in accordance with the results of the antenna reception testing.

8.1.2. DAS shall be on emergency power and have battery backup.

8.1.3. DAS shall be monitored by fire alarm system.

8.1.4. Provide protection for DAS antennas in gymnasiums or other areas with potential for damage.

8.2. VERY HIGH FREQUENCY (VHF) SYSTEM

8.2.1. Evaluate reception for radio operation and install repeater if needed.

8.2.2. Work with BSD Representative to coordinate FCC license.

Revision History

Rev 1: 1/14/15

Section	Section Title	Revision
		Updated all references to current industry standards.
		Added Aruba Wireless Devices, ShoreTel Telephone Systems and Brocade Network Switches to Brand Name Approvals, 2014.12.15
II.B.	GENERAL; DESIGN REQUIREMENTS	¶2 Change; three data drop locations to "three duplex data drop locations…"
II.C.1.	GENERAL; TOPOLOGY; Voice	Change heading; Voice to "Alarm/Security/Elevator Voice Lines" Change; Voice backbone cabling from the MDF to each IDF shall be 100Ω, multi-pair….to "….100Ω , 6-pair"….
II.C.2.	GENERAL; TOPOLOGY; Data	Change; 12-strand 50/125µm laser to "12-strand 50/125µm OM3 laser…" Add; "OM4 cable should be used for pulls greater than 300 meters."
II.C.3.	GENERAL NETWORK TOPOLOGY DIAGRAM	Change; 100 pair, 100Ω CAT3 to "6 pair, 100Ω CAT3"
II.C.4.	GENERAL; TOPOLOGY; Voice Over IP (VoIP)	¶1 Change; "VoiP connections will be provided using the data outlets described above. ~~shall be an interconnection from the patch panel to a powered Ethernet switch (Poe) using Category 6 modular patch cables.~~ A PoE Ethernet switch in an IDF shall be connected to the intra-fiber optic patch cable connecting the Ethernet switch to the rack mounted fiber optic cabinet, the PoE switch will be installed by the District. ~~The VoIP will typically be routed to the main MDF."~~
II.C.5.	GENERAL; TOPOLOGY; Wireless Access Point (WAP)	¶1 Change; The District has standardized on an ~~Motorola~~ Aruba enterprise wireless solution. Data jack will consist of a ~~single~~ dual CAT 6plenum cable to each WAP.

III.A.	DATA; DATA DISTRIBUTION ROOMS	¶4 Insert text to end of paragraph; "Security and other systems should have their own frame or rack. In remodel situations where this is not possible the MDF or IDF frames must be in locking enclosures. Due to noise, MDF and IDF frames should not be placed in learning or office environments and moved during remodels where possible."
III.A.1.	DATA; DATA DISTRIBUTION ROOMS; Data Communication Racks	¶1 Insert text to middle of paragraph; "Security Systems should have their own frame or rack. Locking enclosures must be used in environments where the space is shared with other areas other than data communications."
III.A.2.	DATA; DATA DISTRIBUTION ROOMS; Power Distribution	¶5 New; Insert new text; "Uninterrupted Power Supplies (UPS) shall be provided meeting the VoIP phone system specifications to provide power to all switches, networking equipment and VoIP system hardware in order for phone system to remain operational in a power outage."
III.A.16.	DATA; DATA DISTRIBUTION ROOMS; Intermediate Data Frame (IDF) Distribution Room	¶1 Insert text to middle of paragraph; "The IDF shall be a dedicated space and should not be in a learning or office environment."
IV.B.2.	STRUCTURED CABLING, DATA OUTLETS;DATA OUTLETS; Wireless Access Points (WAP)	¶1 Change text; "The system must be designed ~~by a Wireless Design Consultant~~ in conjunction with the District Aruba Wireless Design Consultant and based on the coverage range for IEEE 802.11b/g,n,a/c. The WAP shall be located so that ~~each~~ WAPs provide adequate capacity (up to 80 devices per classroom in a high school, 60 devices per classroom in middle school and 40 devices per classroom in elementary) for that area. ~~One~~ Two CAT 6 cables will be installed from the serving MDF or IDF to ~~the~~ each WAP location. Provide ~~one~~ two CAT 6 data drops in the location determined by the design…"
IV.B.5.	STRUCTURED CABLING, DATA OUTLETS;DATA OUTLETS; Classrooms	¶2 Delete text at end of paragraph; "…a minimum of one standard Data outlet on three of the walls ~~and one for the instructor~~." ¶3 Change text; "WAP outlet~~s shall be placed in every classroom ceiling throughout the school~~ locations should be determined by consulting with the District Aruba Wireless Design Consultant. ~~Specific high use areas requiring higher density coverage shall be indicated on Project drawings.~~
IV.B.7.	STRUCTURED CABLING, DATA OUTLETS;DATA OUTLETS; Portable Classrooms	¶1 Change first sentence; "…will have a 6-strand 50/125~~m multimode~~ µm OM3 fiber cable…" ¶2 Change to; "…Master portable will have a ~~12~~ 6-pair CAT 6 outdoor cable terminated ~~on a 110 block~~ to the closest data frame within the school. ~~Slave portables will have a 12 6-pair CAT 3 outdoor cable terminated on a 110 block from master portable."~~

V.	VOICE COMMUNICATIONS - VoIP	Delete this heading; ~~(Future VoIP standards will be described here)~~

Rev 2: 8/26/15

Section	Section Title	Revision
II.F.	GENERAL; POST-INSTALLATION AND TEST SYSTEM DOCUMENTATION	¶2 Change to "The BSD Representative may request that a 50% random field re-test be conducted on fiber and a 10% random field re-test be conducted on other ~~the~~ cable systems, at no additional cost, to verify documented findings."
III.A.17.	DATA; DATA DISTRIBUTION ROOMS	Shift 17. to 18. New text for 17. "17. Data frame patch cables should follow the below color scheme: ●Data – Grey ●VoIP – Green ●Wi-Fi/Access Points – White ●IP based management systems ○HVAC – Black ○Lighting ▪General – Blue ▪Specialty (ex. Stage) – Orange ○Paging – Pink ○Other Mechanical Systems – Purple
		○AV systems – Green ●Security IP systems/cameras – Red ●Other systems – verify color with Beaverton School District
VI.	CLOCK SYSTEMS	¶4 Change/delete to "….external switching device connected to the ~~Rauland~~ paging equipment…"
VII.8.	PAGING SYSTEM; Products	8. Change text from Rauland, or approved equal to "For new construction, Atlas Paging Systems only (ControlKom for the bell scheduling and InformaCast compliant IP devices for the hardware)."
VII.10.	PAGING SYSTEM; System Compatibility	¶1 Change to "For new construction the District has standardized on Atlas paging systems (ControlKom for the bell scheduling and InformaCast compliant IP devices for the hardware). For renovations on buildings with existing Rauland systems, the paging system will be able to utilize all spare boards currently used in the Rauland telecenter Integrated Communications System (ICS) intercom."
VII.10.	PAGING SYSTEM; System Compatibility	¶2 Delete ~~For systems other than the Rauland telecenter ICS, provide a separate set of spare boards, technical manuals, and all software necessary for servicing and programming the system. If required, the installing Contractor will be responsible for the cost to obtain District technician certification.~~

Rev 3: 4/30/17

Section	Section Title	Revision

II.C.2.	GENERAL; TOPOLOGY; Data	Data backbone cables for new building construction shall be at minimum 12-strand 50/125µm OM~~3~~ 4 laser optimized multimode fiber optic cable. ~~OM4 cable should be used for pulls greater than 300 meters.~~
II.C.5.	GENERAL; TOPOLOGY; Wireless Access Point (WAP)	The District has standardized on an Aruba enterprise wireless solution. Data jack will consist of a dual CAT 6a-plenum cable to each WAP. WAP will be interconnected at each MDF/IDF to a District provided/installed PoE switch. WAP connections shall be an interconnection from the patch panel to a powered Ethernet switch (PoE) using CAT 6a modular patch cables. The PoE Ethernet switch in a Frame Room shall be connected to the intrabuilding data backbone cabling using a 50/125µm fiber optic patch cable connecting the Ethernet switch to the rack mounted fiber optic cabinet. The WAP traffic will typically be routed to the main MDF. Active Electronics will be furnished and installed by the District.
II.E.	GENERAL; APPROVED CONTRACTOR	▪ Personnel trained in the installation of CAT 6 and CAT 6a rated pathways and support for housing horizontal, backbone, and campus cabling.
II.G.	GENERAL; TEST RESULTS	The field test equipment shall meet the requirements of ANSI/TIA-568-C series, including applicable TSB's and amendments. The appropriate Level 3 tester shall be used to verify CAT 5e ~~and~~, CAT 6 and CAT 6a cabling systems.
III.A.17.	DATA; DATA	*Update to Appendix A: Category Cabling (5e, 6, 6a) which was published*

	DISTRIBUTION ROOMS	*4/4/16* 17. Data frame patch cables should follow the below color scheme: ●Data – Grey ●VoIP – Green ●Wi-Fi/Access Points – White ●IP based management systems ○HVAC – Black ○Lighting ▪General – Blue ▪Specialty (ex. Stage) – Orange ○Paging – Pink ○Other Mechanical Systems – Purple ○AV systems – ~~Green~~ Orange ●Security IP systems/cameras – ~~Red~~ Pink ●Other systems – verify color with Beaverton School District

IV.B.2.	STRUCTURED CABLING, DATA OUTLETS; DATA OUTLETS; Wireless Access Points (WAP)	The system must be designed in conjunction with the District Aruba Wireless Design Consultant and based on the coverage range for IEEE 802.11b/g, n, a/c. The WAP shall be located so that WAPs provide adequate capacity (up to 80 devices per classroom in a high school, 60 devices per classroom in middle school and 40 devices per classroom in elementary) for that area. Two CAT 6a cables will be installed from the serving MDF or IDF to each WAP location. Provide two CAT 6a data drops in the location determined by the design. A 10'-0" service loop shall be coiled in the ceiling space above the WAP without exceeding the manufacturer's bend radius.
IV.B.7.	STRUCTURED CABLING, DATA OUTLETS; DATA OUTLETS; Portable Classrooms	Data/VoIP – Master portables will have a 6-strand 50/125µm OM~~3~~ 4 fiber cable terminated in the data enclosure on a rack mounted FDU.
VII.8.	PAGING SYSTEM; Products	For new construction, Rauland paging systems shall be used as the basis of design (ControlKom for the bell scheduling and InformaCast compliant IP devices for the hardware).
VII.10.	PAGING SYSTEM; System Compatibility	For new construction the District has standardized on Rauland paging systems as basis of design (ControlKom for the bell scheduling and InformaCast compliant IP devices for the hardware).

Rev 4: 4/30/18

Section	Section Title	Revision
III.A.17.	DATA; DATA DISTRIBUTION ROOMS; Data Frame Patch Cables	Data frame patch cables should follow the below color scheme: See the Technical Standards Appendix A for Category Cabling (5e, 6, 6a)

Rev 5: 6/30/18

Section	Section Title	Revision
All	All	Complete revision

Rev 6: 12/31/18

Section	Section Title	Revision
various	various	~~In accordance with ORS 279C.345, a link to a list of brand name products approved via School Board Resolution 14-409 which are used throughout the BSD Technical Standards can be found at:https://www.beaverton.k12.or.us/depts/facilities/development/Pages/Technical%20Standards.aspx~~ See List of Brand Name Products as approved via School Board Resolution 14-409 in accordance with ORS 279C.345.
n/a	n/a	~~Brocade Network Switches~~ HP-Aruba Network Switches, Brand Name Approvals 2018.09.24

VII.3. VII.4.	PAGING SYSTEM; System Capabilities PAGING SYSTEM; Installation	3. System Capabilities System shall be able to provide the following ~~functions~~: … - **Provide a paging console in the main office to operate the system** 4. Installation … **Paging console to be located in the main office. All other ~~P~~p**aging equipment shall not be installed in office space or teacher workrooms without approval of the BSD Representative.
VIII.A. (new)	RADIO COMMUNICATIONS; DISTRIBUTED ANTENNA SYSTEM (DAS)	1. Install DAS for first responders in accordance with the results of the antenna reception testing. 2. DAS shall be on emergency power and have battery backup. 3. DAS shall be monitored by fire alarm system. 4. Provide protection for DAS antennas in gymnasiums or other areas with potential for damage.
VIII.B. (new)	RADIO COMMUNICATIONS; VERY HIGH FREQUENCY (VHF) SYSTEM	1. Evaluate reception for radio operation and install repeater if needed. 2. Work with BSD Representative to coordinate FCC license.

Rev 8: 3/2025

Section	Section Title	Revision
All	All	Renumbered all sections of the Technical Standard; included other minor formatting and edits for clarity.