



# Washington Elementary School District #6

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IT Infrastructure Standards

Rev. 1.5  
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## Acknowledgement

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## 1. GENERAL INFORMATION

The Washington Elementary School District telecommunications cabling system supports a number of non-vendor specific systems. These specifications are applicable for new buildings, renovations and additions to existing buildings. The Management Information Systems - Networking Department is responsible for designing and implementing the following cabling systems:

- Data Communication
- Video Surveillance
- Video Distribution
- Telecommunications
- Intercom

### A. Regulations and Code Compliance

All work specified within this document shall comply with the applicable requirements of:

- ANSI/TIA/EIA-568-B. (Except as noted)
- ANSI/TIA/EIA-569
- ANSI/TIA/EIA-606
- ANSI/TIA/EIA-607
- FCC - Federal Communications Commission.
- OSHA (Standards-29 CRF) Telecommunications -1910.268
- BICSI Telecommunications Distribution Manual
- NFPA-National Fire Protection Association
- NESC - National Electrical Safety Code

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

## B. Acronyms / Definitions

- **ADA** – Americans with Disabilities Act of 1990
- **Approved** – Written permission to use a material
- **Backbone** – Intra-building and inter-building connections
- **Building Entrance** – Cable termination equipment where an outside plant enters the building.
- **Buried Cable** – A cable installed under the surface of the ground (not in conduit) in a manner that it cannot be removed without disturbing the soil.
- **WESD-MIS** – Washington Elementary School District, Management Information Systems Staff
- **Cable Tray** – A ladder, trough, solid-bottom or channel raceway intended for the support of telecommunications cables.
- **District** – Washington Elementary School District
- **Equivalent** – Equally acceptable as determined by WESD-MIS
- **Exposed** – Not concealed
- **Furnish** – Supply and deliver to installation location
- **MDF** – Main Distribution Frame (This room also known as the “Server Room”)
- **Provide** – Furnish, install, test, place in operation and service, and connect ready for use.
- **IDF** – Intermediate Distribution Frame
- **General Contractor** – a group or individual contracted with WESD for the construction or renovation of a building or other structure
- **Contractor** – A person(s) under direct employment of WESD or a General Contractor
- **Owner** – WESD or Washington Elementary School District
- **Home Run** – Any fiber or copper cable terminated at each endpoint with no intermediate splices or terminations.
- **Data/Voice** – Any device used to transmit digital data or voice signals across the data network.
- **Analog/POTS** – Any device used to transmit data or voice signals using category 3/5 wiring.
- **Special Systems** – Any device other than standard computer, telephony, or intercom systems. (ex. HVAC controllers, Security/Fire panels, Card Access controllers, IP Cameras, etc.)



### C. Working Environment

- 1) All contractor employees shall sign in at the site office each working day unless reporting directly to a General Contractor. A visitor's badge (or sticker) is required at all times.
- 2) It is preferred that all contractor employees wear an identification badge with photograph. This badge should have the company name as a minimum. Shirts with a company logo will be accepted as an alternate means of identification.
- 3) All work will be performed in a neat and workman like manner. All methods of construction or details of workmanship that are not specifically described or indicated shall be subject to the approval of WESD-MIS
- 4) All computer equipment and furniture shall be covered during the project to keep down the debris residue.
- 5) Daily clean up is required of all site areas.
- 6) No equipment or personnel allowed in hallways during classroom changes.
- 7) Rope off any areas that may become a safety concern, especially if they are not monitored overnight or on a weekend. Appropriate materials must be used, e.g., high visibility caution tape or barricades.
- 8) Store equipment and supplies only in areas designated by WESD-MIS, the school staff, or the General Contractor.
- 9) Any disruption in service (Data, Phone, TV, INTERCOM, etc.) must be scheduled and coordinated with both WESD-MIS and the school staff.
- 10) All work that may require classroom disruption during working hours (7:30am-4:30pm) must be coordinated with WESD-MIS and the school staff.
- 11) All after hours (4:30pm-7:30am) work must be coordinated with and pre-approved by WESD-MIS or the General Contractor in charge of the job.
- 12) Keys will only be distributed to a designated person or contractor when necessary and must be signed out. All keys must be returned upon job completion.
- 13) Vendor will be responsible for notifying WESD-MIS of any work that requires disturbing of building materials other than wood, glass, or steel so the proper asbestos testing can be performed or verification of previous test results can take place prior to work commencing.

## 2. SITE INSTALLATION INFORMATION

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

### A. Ceilings and Walls

- 1) Carefully remove existing tiles as required. Store removed tiles in a location specified by WESD-MIS or school staff.
- 2) Do not modify the grid structure in any way.
- 3) Any tiles that are damaged during the installation process must be replaced

and installed by the contractor. New tiles must match the type and design of the adjacent areas.

- 4) Any grid members that are damaged during the installation process must be replaced and installed by the contractor.
- 5) The contractor must repair any solid ceiling area that may become damaged during the installation process. The contractor may contact the District Maintenance office to locate a contractor skilled in this area.
- 6) All wall surfaces shall be restored to their original finish, e.g., must match the appearance of the adjacent surfaces.
- 7) Brick penetrations must be patched with mortar of a matching color in visible locations; otherwise standard patching will suffice.
- 8) Fire stop products and Silicone type sealants shall not be used to seal masonry penetrations.

## **B. Penetrations of Building Surfaces**

- 1) Grade level or non-waterproof areas (interior)
  - a) Seal annular space between conduits or cable and building surfaces. Pack space with ceramic fiber, wool, or backer rod materials. Cover with appropriate fire-resistant sealant or other materials per the manufacturer.
  - b) Provide sleeves as specified in section “**C. Sleeves**”, for conduit and cable penetrations. Seal any space between conduit or cable and sleeve.
- 2) Waterproof areas (above and below grade)

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

## **C. Sleeves**

- 1) Prior to the start of any job, each contractor is responsible for identifying sleeves installed for the purpose of their trade. Any cables that are installed in improper sleeves will be removed at no cost to the District.
- 2) Openings to accept sleeves in new building construction will be installed during building construction by the General Contractor for general construction work.
- 3) Openings to accept sleeves in existing building construction shall be provided under this division of the Specifications and is the Communications Contractors responsibility to install.
- 4) Use galvanized rigid conduit/ sleeves for penetrations through exterior masonry/concrete walls and foundations, concrete floor slabs on grade and above grade, and concrete-filled decks.
- 5) Use only fire-rated listed assemblies for the type of sleeve being installed through CMU walls or gypsum walls for communications penetrations. Sleeve type shall be galvanized rigid conduit or electrical metallic tubing.
- 6) Secure sleeves firmly in place using filling and patching materials (mortar) that match with surrounding construction. Fire stop material shall not be used to

- fill large voids.
- 7) In floor penetrations, extend sleeve 1" to 3" above finished floor unless noted otherwise.
  - 8) Seal voids between sleeves and building construction with joint sealants.
  - 9) Make allowances for and coordinate the work with installation of fire stopping, conduit insulation, and waterproofing, as applicable.
  - 10) The Contractor shall be fully responsible for final and correct location of sleeves.
  - 11) Sleeves that are omitted or incorrectly located within existing building construction shall be corrected and provided by the Comm. Contractor.
  - 12) Corridor sleeves will have a diameter of 4" unless directed to change by a licensed structural engineer.
  - 13) A minimum of four (4) 4" sleeves is required in all IDF's. Additional sleeves will be installed as needed.

#### **D. Conduits**

- 1) Prior to the start of any job, each contractor is responsible for identifying conduits installed for the purpose of their trade with WESD-MIS or the General Contractor. Any cables that are installed in improper conduits will be removed at no cost to the District.
- 2) In existing structures, the contractor must install all necessary conduits, unless otherwise provided by the District.
- 3) In new construction, all conduit pathways should be installed prior to the communications contractor's arrival.
- 4) In new construction, it is the communications contractor's responsibility to make sure that their conduit is in the correct location. If the conduit is located incorrectly, it is also their responsibility to inform the General Contractor in order to have it relocated.
- 5) All conduits must meet applicable codes and guidelines to determine material, type, and sizing.
- 6) All conduits should be marked "Communications Cabling."
- 7) Each conduit must be attached to building structure at intervals to prevent sagging, or movement in joints. Conduit systems shall not attach to other trade work.
- 8) Cables must be installed in conduit from the wall outlet up into the grid. This "stub" conduit shall have one 45° bend and sleeve with an anti-short bushing at the top in order to prevent excess stress on the cables. (New construction)
- 9) All open-ended conduits shall have an anti-short bushing placed in the opening to prevent cable damage.
- 10) Conduit must be installed from the cable tray to the speaker locations in the classroom.
- 11) All conduits must have a nylon pull string before and after cable installation.
- 12) There shall be no more than two (2) 90° bends between any pull points.
- 13) The use of "LB's" is strictly prohibited, unless approved by WESD-MIS.

## E. Cable Trays

- 1) Note that all new buildings, renovations and additions to existing buildings are required to have a concealed raceway system, whether or not the wiring and the remainder of the system is to be included at the time of construction.
- 2) Cable trays with solid bottoms or covers shall not be used unless required to meet codes. Consult WESD-MIS prior to designing a system which requires cable trays with solid bottoms or covers.
- 3) Flexible trays shall be used whenever possible. Designers must ensure that the installers use proper mounting methods.
- 4) Cable trays with “hooks” or “ribs” shall not be used, unless one tray per trade is installed, e.g., tray for Intercom, tray for analog/POTS, tray for Data)
- 5) Cable trays shall be installed in all main corridors, and any other area that will have a large cable count.
- 6) Trays should be stopped 6” – 12” away from firewalls. Install the appropriate number of sleeves through the firewall to connect both trays. The sleeves must provide the same number of square inches as the tray.
- 7) Sleeves will be required to accommodate data, analog/POTS, video, intercom, surveillance, and alarm cables. Size the tray and sleeves accordingly.
- 8) Each cable trade must be bundled and separated in the trays.
- 9) Cables must follow a consistent routing through the trays. Please refer to Section 7.D. [Cable Tray Routing](#) for proper cable placements.
- 10) Cable bundles must be attached to the tray at all elevation changes. Attach them with a loose fastener to keep the cables on the tray through the entire run. Refer to Section 7.B. [Cable Tray Elevations 1](#) and [Cable Tray Elevations 2](#) for attachment methods.
- 11) Cables that are not bundled, or poorly managed in the cable trays will be removed and replaced at the contractor’s expense.
- 12) Trays may be installed using either of the fastening methods in Section 7.C. [Fastening Methods 1](#) or [Fastening Methods 2](#)

## F. Other Supporting Systems

- 1) “J” hooks may be used in some areas, providing they meet the specifications for Category 5e and Category 6 cable installations. Distance between “J” hooks should be within 3’ to 5’ or as recommended by the manufacturer.
- 2) “D” rings or Bridle rings shall be used only when necessary in the ceiling area and cannot be used in place of a cable tray.
- 3) Other manufactured support structures may be used with permission of the WESD-MIS staff. One example of this type of structure is a “Snake Tray”™.
- 4) Data/Power poles may be used only when absolutely necessary and must be approved by WESD-MIS prior to installation. Include the use of these devices in each Scope of Work that incorporates them. Poles must be fastened to the ceiling grid with proper hardware, and securely fastened to the floor with anchors.

## **G. Exterior Pathways**

- 1) All chosen pathways must be addressed independently, and described in detail for each Scope of Work.
- 2) On an existing campus, trenching is allowed. Consult WESD-MIS prior to designing a system that involves trenching. The contractor will be responsible for replacing landscaping or concrete when trenching is necessary.
- 3) In new construction, coordinate trenching with the WESD-MIS staff and the General Contractor. It may be possible to include technology conduits with other trade conduits in the same trench.
- 4) All trenches must be back-filled with a “mound” of dirt to accommodate settling. A site visit must be performed within four (4) weeks. The contractor must fill any recessed earth.
- 5) It is the responsibility of the contractor to contact a service locator to mark all existing buried infrastructure prior to any digging or trenching. The contractor assumes all responsibility for damage to marked or un-marked facilities and services
- 6) Manholes / Handholes – These devices should be installed only where necessary to provide pulling points, and splicing access. The maximum distance between manholes/handholes shall not exceed 200’. All covers must be marked with a “Communications” label. These devices shall be noted on the architectural drawings.
- 7) Direct Buried Cable - All direct buried cables shall have a minimum ground cover of 36”. A metallic tape shall be installed 24” above the top of the cable. The tape shall be labeled Telecommunications Cable, Fiber Optic Cable, or similar markings to identify what lies beneath.
- 8) Aerial cables – All aerial cables will be self-supporting (figure eight) cable, or must be attached to a messenger. Contact WESD-MIS prior to design completion. Contractor must show proof of proper training, and attaching hardware for each application.
- 9) Transition Points – Any outdoor rated cable that enters the building must be transitioned to an indoor rated cable. Ensure that the 50’ ruling is followed. Fusion splices must be utilized, and splice cases shall not be installed above the ceiling. Coordinate locations with the WESD-MIS.

## **H. Grounding**

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

## I. Abandoned Cables

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

## 3. FIRE STOPPING

### A. General Guidelines

- 1) New and existing raceways, cable trays, and cables for power, data, and communications systems penetrating *non-rated* and *fire-rated* floors, walls, and other portions of building construction shall be fire stopped where they penetrate new or existing building construction.
- 2) Fire stopping shall be accomplished by using a combination of materials and devices, including, fire stopping materials (caulks, putties, pillows), to make up a complete fire stop. Cabling contractors must coordinate with the electrical contractor on site to ensure compliance with other fire stop systems.
- 3) Verify that cabling and other penetrating elements and supporting devices have been completely installed and temporary lines and cables have been removed.
- 4) Products may be in the form of caulk, putty, strip, sheet, or devices that shall be specifically designed to fill holes, spaces, and voids at communications penetrations.
- 5) Fire stopping materials shall also provide adhesion to substrates and maintain fire and smoke seal under normal expected movements of substrates, conduits, and cables, as well as hose streams.
- 6) All telecommunications sleeves shall be sealed with a re-enterable sealant whenever possible. Caulk may be utilized around the outer surface of the sleeve, but not inside the sleeve. Non-hardening putty is the preferred material to seal the inside of the sleeve.
- 7) Each sleeve shall be labeled with the UL system, "F" & "T" rating, and the manufacturer's name and products used. If all sleeves are identical in design, this information may be listed on the as-built documentation.
- 8) Installed fire stopping systems shall meet approval of Washington Elementary School District.

## **B. Fire Stopping References**

- 1) ASTM E814, Standard Method of Fire Tests of Through-Penetration Fire Stops.
- 2) ASTM E 119, Fire Tests of Building Construction and Materials (for fire-rated architectural barriers).
- 3) 2002 NFPA National Electrical Code, Section 800-52, Paragraph 2(b), Spread of Fire and Products of Combustion.
- 4) 9<sup>th</sup> edition of the BICSI Telecommunications Distribution Methods Manual, Chapter 15, Fire stopping.

## **C. Fire Stopping Products**

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

## **4. LAN CABLING**

### **A. Backbone Distribution**

#### **1) Fiber Optic Cable**

- a) All IDFs shall have, as a minimum, one multimode fiber cable with twelve strands homerun to the MDF; placing additional as necessary.
- b) When fiber optic cable runs through a vertical riser closet secure fiber to the wall every 48" or follow manufacturer's recommendations.
- c) High density fiber termination cabinets shall not be installed. Fiber termination cabinets that allow three (3) 12 strand modules in a horizontal fashion for a total port count of no more than 18 pairs should be used. Add additional cabinets as needed.
  - i. 1U rack mount fiber cabinet (AMP part number: 1348876-4)
  - ii. Acceptable modules (AMP part number: 559596-1)
- d) All fiber strands should be terminated using an SC style connector and shall be terminated from left to right in the cabinet.

- e) Do not include fiber optic patch cords under the cable distribution scope. They will be included in the purchasing of electronics.
- f) All fiber optic backbone cables that are to be installed shall be located within orange inner-duct. There will be no exceptions.
- g) Any design that includes a splice of any kind must be approved by WESD-MIS prior to installation. All splices shall be performed using only the fusion splice method.
- h) All splices must be clearly annotated at the termination point to provide location of splice point, and type of splice.
- i) No splices shall be made for the purpose of stripping out pairs.
- j) Fiber optic cables should terminate in rack mount enclosures whenever possible.
- k) Each strand of the fiber bundle shall be terminated unless directed otherwise by WESD-MIS staff.

## 2) Copper Cable

- a) Copper backbone cables will be used primarily for analog/POTS and Intercom applications. Copper backbone cables will not be used for data applications unless specified by WESD-MIS.
- b) The Cabling contractor is responsible for cross-connecting all analog/POTS and Intercom cables from the outlet, through the IDF, into the MDF. A continuity test and certification is required.
- c) Each IDF shall have one 25 pair Cat5 UTP for possible analog/POTS service. This cable will be terminated to the left side of one 66-block termination panel.
- d) All blocks shall be clearly labeled by block, and pair.

## B. Horizontal Distribution

### 1) General Information

- a) All horizontal distribution cable shall be installed in one continuous run from the MDF/IDF, to the workstation outlet. No splicing or splitters will be allowed. WESD must approve designs including consolidation points.
- b) All pull-strings in conduits will be replaced after cables are installed.
- c) All copper connectivity hardware shall be branded Tyco/AMP Netconnect.
- d) Category 5e UTP plenum cabling is to be used for installation to existing data and analog/POTS infrastructure. Category 6 UTP plenum cabling is to be used in new construction. Cables will be from the same manufacturer throughout each project, and will be from one of the following list of cables in order of preference:
  - i. AMP (White)
  - ii. Superior/Essex (White)
  - iii. Belden (White)



- iv. Substitutes must be approved prior to the bid award.

## 2) Data Cabling

- a) Solely 48 port patch panels shall be used. Any other size will not be accepted.
- b) All Data terminations shall follow the EIA/TIA 568B wiring scheme using Tyco/AMP Netconnect modules. All data jacks shall be White in color (406372-3) and will terminate into any of the following faceplates:
  - i. 2 port – (1375155-3) white
  - ii. 4 port – (406185-3) white
  - iii. 6 port – (1479447-3) white
  - iv. Any unused ports will have a blank jack installed – (1116412-3)
- c) The contractor shall provide a minimum of 10 feet of cable slack at each MDF/IDF, and a minimum of 1 foot of cable slack for each workstation outlet.
  - i. Do not form a loop with the cable slack at either end of the run. A serpentine design should be used if possible.
- d) All new network drops being installed shall be placed into the next numerical port available on the next patch panel available in all MDFs/IDFs. No exceptions will be made.
- e) All Special Systems installed into MDF/IDF rooms requiring a data cable shall have a rigid conduit stub up to the cabling ladders in order to route the cable properly to the racks
  - a. The data cabling shall be terminated and labeled in the same manner as standard data cabling.
- f) External Devices
  - a. All external devices (eg. security cameras or access points) located on the same building as the IDF they terminate to shall be cabled in the same manner as standard data drops with the following exceptions:
    - i. All drops will be terminated inside the plenum to a surface mount, single gang box within 5' of the location of the external device.
    - ii. Outlets shall be mounted on the interior side of the wall containing the external device.
    - iii. All drops shall follow labeling standards from section [4.C](#).
  - b. All external devices that are not mounted to the building structure and require data connectivity shall be cabled as follows:
    - i. Cabling used from the device leading into the building shall be OSP rated.

- ii. Cables shall be converted from OSP-rated to Plenum-rated within 50' of the building point of entry following the NEC 800-50 standard.
- iii. The conversion device used shall provide lightning and surge protection as well as support Power-over-Ethernet.
- iv. The cabling from the conversion point to the IDF/MDF shall be plenum rated and run in the same manner as standard data drops.
- v. All drops shall follow labeling standards from section [4.C](#).

### 3) Analog/POTS Cable

- a) Terminate analog/POTS cables to the right side of the wall-mounted 66 block in each IDF.
- b) The two sides will be clipped together when connectivity becomes necessary.
- c) Do not terminate analog/POTS wiring to the 66 blocks containing the intercom systems.

### 4) Intercom Cable

- a) All copper connectivity hardware, when necessary, shall be TYCO/AMP Netconnect components.
- b) Terminate Intercom cables on 66 blocks in each IDF.
  - i. Do not terminate Intercom systems to the 66 blocks containing any analog/POTS services.
- c) All speakers shall have a 22 AWG, 2 pair cable with overall foil shield and drain wire. All speaker locations must also have a 22AWG single pair cable with drain wire for the clock.
- d) There shall be no splicing or splitting of cable except as "e." describes.
- e) Hallway speakers may be "looped" to allow no more than 6-8 speakers in series. Large classrooms or general purpose areas may use this method as well. (Ex. Cafeteria, Gym, large classrooms.)
- f) Each proposal must ensure that the Intercom Administration stations and bus loops are included.
- g) Intercom cabling must consist of one of the following:
  - i. CommScope 5504M -- Green
  - ii. Belden 1501-A -- Green
  - iii. Various West Penn multi-pair 22 AWG shielded cables
- h) Any cabling that will be ran underground, must be rated to do so.
- i) All offices that contain an intercom speaker must also have a volume knob installed within the office.
- j) All lobbies located in main administrative buildings at school sites shall be wired with a volume knob.

## 5) Rack/Patch Panel Format

### a) General

- i. All racks must be configured in a similar manner throughout each project. Refer to Section 7.G. [Rack Elevation 1](#) and [Rack Elevation 2](#).
- ii. Preferably, racks shall be built based on the AMP Netconnect Rack System using part number (1933559-1). Additional accessories should be utilized as needed.
- iii. Racks may also be built based off from the Chatsworth Standard Rack system using part number (55053-703). Additional accessories should also be utilized as needed.
- iv. All publicly accessible IDFs must consist of one wall-mounted cabinet containing network gear, and shall be built using the APC Cabinet System part number (AR100HD). Refer to Section 7.F. [Wall-Mount Elevation 1](#) for the rack elevation.
- v. All rack accessories that are to be utilized with any rack system shall be preferable to AMP Netconnect parts unless these parts are otherwise unavailable or will not work as intended.
- vi. AMP horizontal/vertical Network Cable Managers shall be installed using Section 7.G. [Rack Elevation 1](#) and [Rack Elevation 2](#) as a guide, regardless of which rack system is used. Part numbers are as follows:
  - a) (Vertical – 1375257-1)
  - b) (Horizontal – 1375163-1)
- vii. The use of cable ties, “zip strips”, tie wraps, etc. shall not be allowed anywhere on the rack system. The contractor shall use “Velcro”, “hook and loop”, or similar product to manage cables beneath the ceiling.
- viii. Cables shall be neatly dressed in the overhead cable trays, wire managers, and at the attachment point. The LAN Cabling contractor may need to install additional cable tray in each IDF for cable management. All cables shall be labeled at the termination point on the patch panel.

### b) Patch Cables

- i. LAN Cabling contractor shall deliver 100% of the rack device patch cords to the project site.
- ii. Provide one patch cord per horizontal distribution run in all quotations. This will be used in the MDF/IDF.
- iii. Patch Cord lengths should be limited to:
  - 1’, 3’, 5’, and 7’ for Patch Panels to network equipment in existing IDFs.

- iv. AMP Cat5e Booted Patch Cords shall be provided for each network cable that is installed using the following part numbers:
  - Blue: 219242-X
  - Yellow: 219246-X
  - Orange: 219184-X
  - Red: 219244-X
  - Green: 219243-X
  - Part Numbers vary
    - i. E.g. 219242-X for a blue cable – where X denotes length)
- v. Color Codes are as follows:
  - Patch Panel to Network Equipment – Blue
  - Network Equipment to Network Equipment – Yellow
  - Other X-Over Connections – Orange
  - Servers to Network Equipment – Red
  - Servers to KVM Switches – Red
  - Wireless Radios and other Devices – Green
  - Outlets to Workstations – Blue
- vi. Patch Cord lengths shall be limited to the shortest possible length needed to perform the patching function.
  - At this time, all new construction IDF's shall be patched with 1' cables and no horizontal wire management.
  - All existing IDF's, unless being rebuilt, will require the contractor to match the existing layout.
  - Any exception to these rules must be approved by WESD-MIS prior to installation.

## C. Labeling

### 1) Labeling Standards

- a) Labeling shall meet the intent of ANSI/TIA/EIA-606-A Administration Standard for Commercial Telecommunications Infrastructure standards. In addition, provide the following:
  - 1) Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters.
  - 2) Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in the following locations:
    - i. Inside receptacle box at the work area.
    - ii. Behind the IDF patch panel or punch block.
  - 3) Use labels on the face of data patch panels.
  - 4) Labels shall be machine-printed. Hand-lettered labels will not be acceptable
  - 5) All labels printed for the device end of the cable shall consist of the following labeling scheme.
    - i. Standard network drops will be labeled with the IDF-patchpanel-room#-outlet# layout (ex. A-B-209-07 for IDF-A, Patch Panel B, Room 209, port 7. Refer to Section 6.I. [Outlet Labeling 1](#) and [Outlet Labeling 2](#))
    - ii. Special Systems drops will be labeled with the IDF, patch panel, port # layout. (ex. A-A-24 for IDF-A, patch panel A, port 24)
    - iii. All devices that exist outside of the building structure and require data connectivity will be labeled at the outlet in the following format: "IDF# - Patch Panel # - EXT – Exterior Device #" (ex. A-B-EXT-01)
- b) Label cables, outlets, patch panels, and punch blocks with the labeling scheme outlined later in this section.
- c) Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to WESD-MIS two (2) weeks prior to move-in to allow the WESD-MIS personnel to connect and test equipment in a timely fashion.

### 2) IDF Labeling Format

- a) Each IDF designation will be assigned during the initial design and labeled on the architectural drawings. If IDF assignments have not been provided, use the following guidelines to create the labeling assignments.
- b) All building labeling will be done by the WESD-Capitol Projects department. The assignment of IDF labels should follow building labeling schemes. If the building is labeled "Building-A", then the IDF shall be labeled "IDF-A". Refer to Section 6.H [IDF/Backbone Labeling 1](#).

- c) When multiple IDFs are located within the same building, a number designation shall be assigned following the letter designation. Start with the bottom floor, then additional floors should follow, e.g., IDF-A1, IDF-A2, etc.
- d) If IDFs are located in a single building that uses wing designations, then the wing designations shall be treated as separate buildings and labeled accordingly.

### **3) Rack/Patch Panel Labeling Format**

- a) All racks must be labeled to show the IDF number. Place a large label near the top of the rack, usually on the top wire manager cover.
- b) Ports on Patch panels must be labeled using the same 3/16 in. label tape as the outlets. Refer to Section 6.E. [Patch Panel Labeling 1](#) for the correct labeling scheme.
- c) Patch panels will be labeled consecutively starting with “A” and continuing for each patch panel. This label shall be placed on the left side of the panel.
- d) Each MDF/IDF will have an “A” panel.
- e) All drops being installed to an existing IDF with a pre-existing labeling scheme different than what is described in this document will adhere to the pre-existing labeling scheme.
- f) Above each port shall be labeled as: “room#-port#” (Ex. 501-01).
  - 1) All Special Systems patch panel ends will be labeled in the room-port# layout as well, except if the IDF does not have a room number designation, in which case the IDF letter designation will be substituted. (ex. B-21 for IDF-B, port 21)
  - 2) All devices that exist outside of the building structure and require data connectivity will be labeled “EXT-Exterior Device Number” (ex. EXT-01) and will not be numbered in relation to other IDFs. EXT-01 can exist in multiple IDFs.

### **4) Backbone Cable Labeling Format**

- a) All backbone cables will be clearly marked at each termination point showing the local IDF, and the far end MDF/IDF. See Section 6.H. [IDF/Backbone Labeling 1](#).

### **5) Intercom Configuration Labeling**

- 1) When assigning dialing plans for new intercom installations, the building letters are not compatible and cannot be used to separate the buildings. In this case, the letters shall be substituted with numbers in ascending order. (ex. Building-A is 1 and Building-B is 2.)
- 2) The format to be used for dial plans is “Building # substitution followed by room number” (ex. For room B-101, the number to be dialed is 2101.)

## D. Testing

### 1) Fiber Optic Testing (Horizontal and Backbone)

- a) Contractors shall provide the results of bandwidth and attenuation tests performed by the manufacturer prior to shipping. The test results shall be provided on the original form provided by the manufacturer.
- b) WESD-MIS highly recommends the testing of optical cable on the spool with a light source and power meter utilizing procedures as stated in **ANSI/TIA/EIA-526-14A: OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant**. This will prevent additional costs after installation if damage occurred during shipping.
- c) WESD-MIS requires attenuation and/or OTDR tests of every terminated fiber after installation is completed.
- d) The fiber optic installation and testing procedures must comply with ANSI/TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard.
- e) All test results must be presented to WESD-MIS in printed and electronic format. The test results **MUST** be in the original form provided by the manufacturer's software. Printed results may be in "Summary" format.
- f) Maximum dB loss at a multimode connector shall be 0.75dB at 850 nm as viewed by the OTDR.
- g) Maximum dB loss at a splice shall be 0.3dB at 850nm, as viewed by the OTDR.
- h) A minimum 200 foot fiber test lead shall be used between the OTDR and the fiber under test.
- i) No fiber optic cable installation will be accepted without the following tests being performed:
  - i. For every multimode fiber installed end-to-end attenuation loss testing shall be performed at both 850 nm and 1300 nm wavelengths.
    - The results must be recorded and delivered on CD.
    - OTDR tests need to be taken only at one wavelength (850), and they are also to be recorded to 3.5" disks.
  - ii. For every single-mode fiber installed end-to-end attenuation loss testing shall be performed at both 1310 and 1550 nm wavelengths.
    - The results must be recorded and delivered on CD.
    - OTDR tests need to be taken only at one wavelength (1310), and they are also to be recorded to CD.
- j) Contractor shall follow the ANSI/TIA/EIA-598-A Optical Fiber Cable Color Coding guidelines.
- k) Provide a loss budget of proposed multi-mode fiber cable plant and

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

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

## **2) Copper Testing (Horizontal and Backbone)**

- a) Testing shall conform to TIA/EIA TSB-67 Transmission Performance Specifications for Field Testing of Unshielded Twisted Cabling Systems and ANSI/TIA/EIA-568-A-1, Propagation Delay and Delay Skew Specification for 100 ohm 4-pair cable. Testing shall be accomplished using level II field testers.
- b) Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on as-built drawings.
- c) If copper backbone cable contains more than 5% bad pairs, or outer sheath damage is the cause of bad pairs, remove and replace the entire cable.
- d) If horizontal cable contains bad conductors or shield, remove and replace cable.
- e) All test results must be presented to WESD-MIS in printed and electronic format. The test results MUST be in the original form provided by the manufacturer's software. Printed results may be in "Summary" format.
- f) Where any portion of system does not meet the specifications, correct deviation and repeat applicable testing at no additional cost to the owner.



## 5. VIDEO DISTRIBUTION SYSTEM

### A. General Information

- 1) WESD has standardized on Blonder Tongue equipment for our video distribution needs.
- 2) The system must meet basic radiation limits as specified by FCC Rules, Parts 15 and 76. (Ex. All equipment must be radiation shielded.)
- 3) The system, as installed, must provide for distribution of properly balanced and adjusted television signals.

### B. Backbone Cable Distribution

- 1) All backbone cabling shall be, at minimum, RG-11 cable.
- 2) All IDF rooms will have, at minimum, 1 RG-11 cable homerun to the MDF.
- 3) No IDF room shall be connected in sequence to another IDF.
- 4) If, during any new construction, the MDF is not located adjacent to the library:
  - a) One homerun coaxial cable pull shall be made from the MDF to a location in the library designated by WESD-MIS.
  - b) This cable shall be capable of providing a direct input into the video distribution system, and shall be used for VCR/DVD player access.

### C. Horizontal Cable Distribution

- 1) All outlets installed into classrooms should be installed at the same height as normal convenience outlets and located in the secured area of the technology cabinet, wherever that may be placed, unless otherwise designated by WESD-MIS.
- 2) All outlets installed into administrative or non-instructional areas shall be installed at the same height as normal convenience outlets in the same area unless the viewing devices are to be wall-mounted.
  - a) If the device is to be wall-mounted, then the outlet is to be placed no more than 24 inches from where the device is to be mounted.
- 3) All outlet boxes must be two-gang type, 4" x 4" x 2-1/4", with single-gang plaster rings. Plaster rings must be of sufficient depth to face with the finish of the wall and to extend to the block void or wall hollow.
- 4) All standard classrooms shall have, as a minimum, one RG-6 cable terminated inside the technology cabinet originating from the closest IDF/MDF. This cable shall then be tapped and terminated to an outlet on the side of the cabinet for camera cart injection.
- 5) Multiple classrooms should not be connected in series.

- 6) All receptacles must be radiation shielded with F-type connectors.
- 7) Plenum rated cables must be used in all environmental air return areas.
- 8) Do NOT use any outlet box as a junction point.

#### **D. Labeling**

- 1) All video backbone distribution labeling shall be done as depicted in Section 6.H, [IDF and Backbone Labeling 1](#), which follows the same labeling scheme as the Data Network Backbone.
- 2) All video horizontal distribution shall be labeled on both ends of the cable as well as the faceplate. The labeling shall appear as follows:
  - a) If the distribution IDF is IDF-A and the outlet is located in room A104, the label should read "A-A104".

#### **E. Electronic Equipment Information**

##### **1) General**

- a) All active or passive devices shall be placed in designated areas only, including IDFs, MDFs, or Classroom Distribution Points.
- b) Solid-state or Transistorized equipment is required.
- c) All equipment must be rated for continuous duty operations and must be installed/operated as recommended by the OEM.
- d) No devices shall be installed above the ceiling grid or attached to cable trays.
- e) All broadband amplifiers must pass 50-450 MHz not to exceed  $\pm 0.75$  db of flatness.
- f) Television signal levels at all receivers must be balanced. System levels will be termed "balanced" when the difference across the bandwidth of 5-300 MHz does not exceed 6db.
- g) The minimum output at any outlet in the system must be +6 dbmV, and the maximum signal available at any receptacle must not exceed +20 dbmV.

##### **2) MDF**

- a) Cable TV demarcation point shall be located in the MDF unless otherwise approve by WESD-MIS.
- b) All necessary inline traps and filters to remove channels from the cable TV provider feeds shall be placed as close to the source tap as possible.
- c) Channels 2, 4, and 14 must be eliminated from the cable TV feed for the purpose of internal modulation using the part numbers listed below.
  - i. Channel 2 will receive and distribute a VCR/DVD player feed.
  - ii. Channel 4 will receive and distribute a camera cart feed.

- iii. Channel 14 will receive and distribute a digital signage feed.
- d) Installed in each MDF Head-End rack will be the following devices according to Section 6.J, [Video Head End and Distribution Layout](#).
  - i. MAVM-751 Modulator (Channel 2)
  - ii. MAVM-751 Modulator (Channel 14)
  - iii. CEF-750 Channel Elimination Filter (Channel 2)
  - iv. CEF-750 Channel Elimination Filter (Channel 4)
  - v. CEF-750 Channel Elimination Filter (Channel 14)
  - vi. SAVP Heterodyne Processor (Input CH T8, Output CH 4)
  - vii. OC-8d Passive Combiner

### 3) IDF

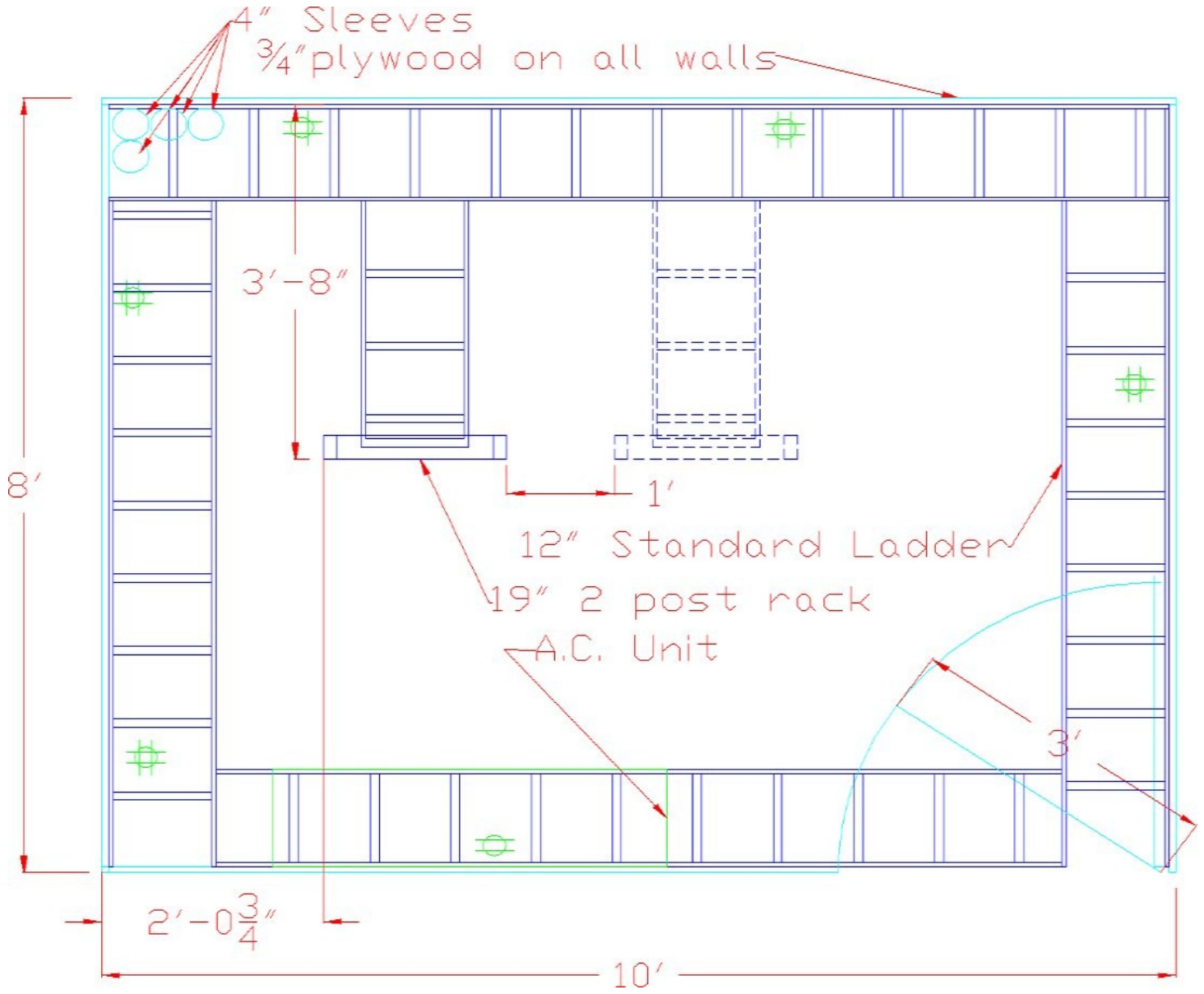
- a) All amplifiers, taps, and splitters necessary to feed and balance CATV system within the respective building shall be located here.

### 4) Other

- a) Each site shall be equipped with one camera cart containing:
  - a. 1 - Agile Modulator (p/n: BAVM-860SAW), broadcasting on channel T-8.

## 6. IMAGES

### A. IDF/MDF Room Layouts

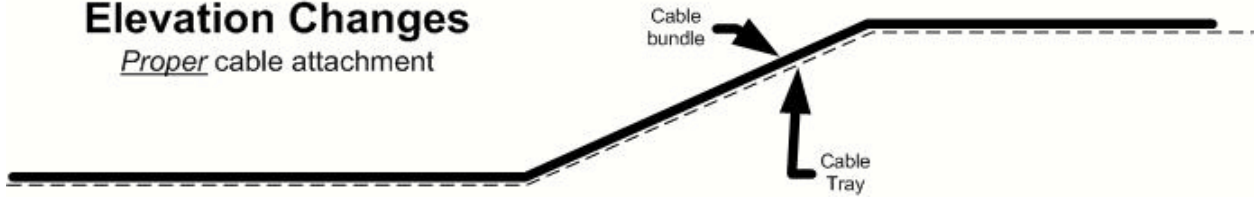


IDF Layout 1

## B. Cable Tray Elevations

### Elevation Changes

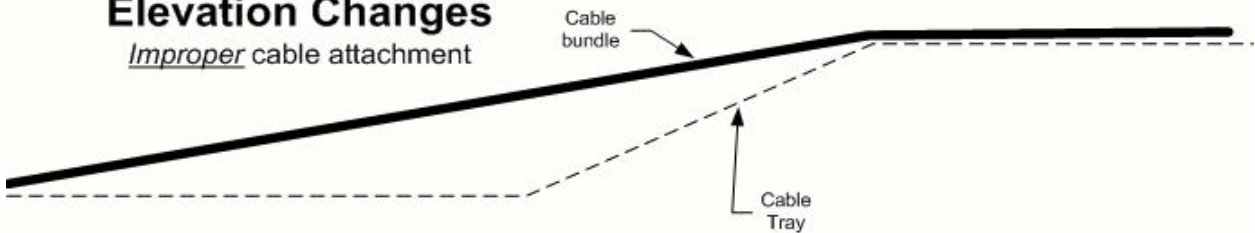
*Proper* cable attachment



Cable Tray Elevations 1

### Elevation Changes

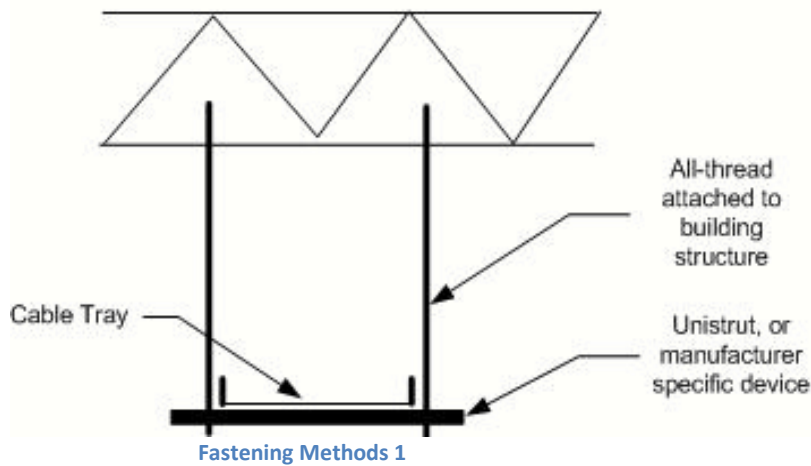
*Improper* cable attachment



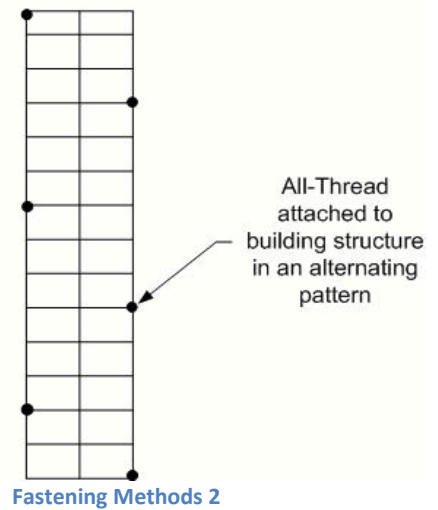
Cable Tray Elevations 2

## C. Cable Tray Fastening Methods

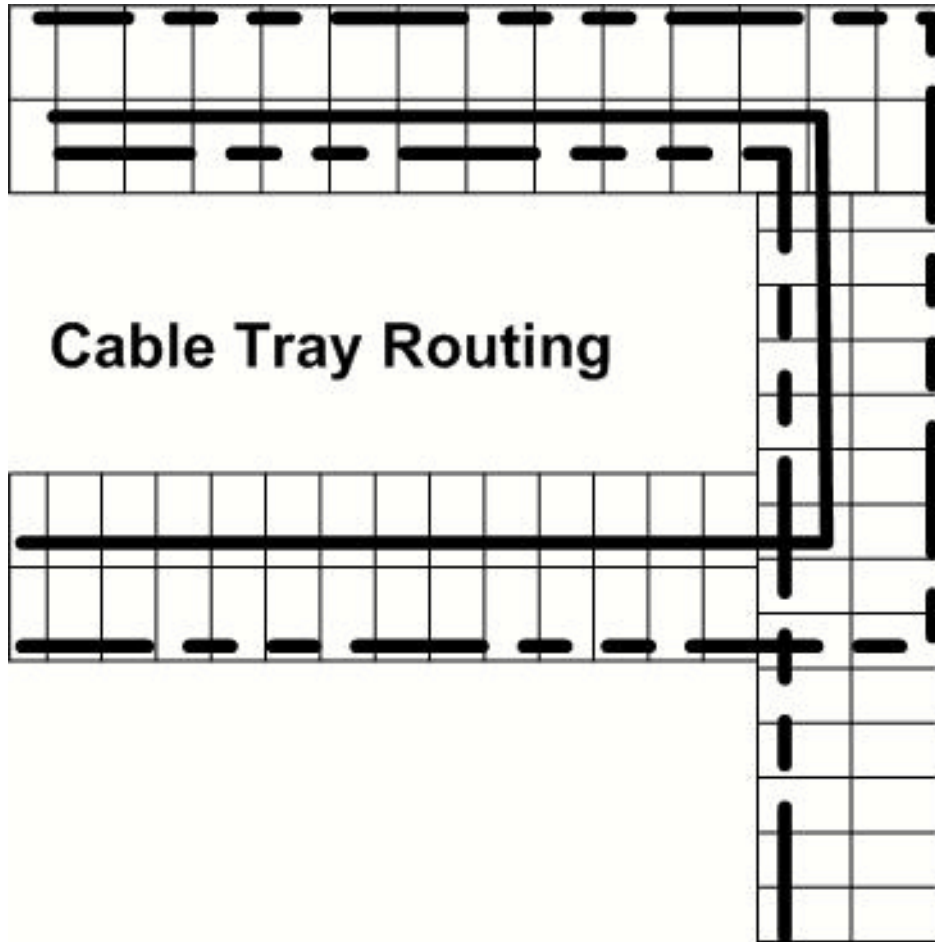
### Trapeze - Style Method



### Direct Fastening Method

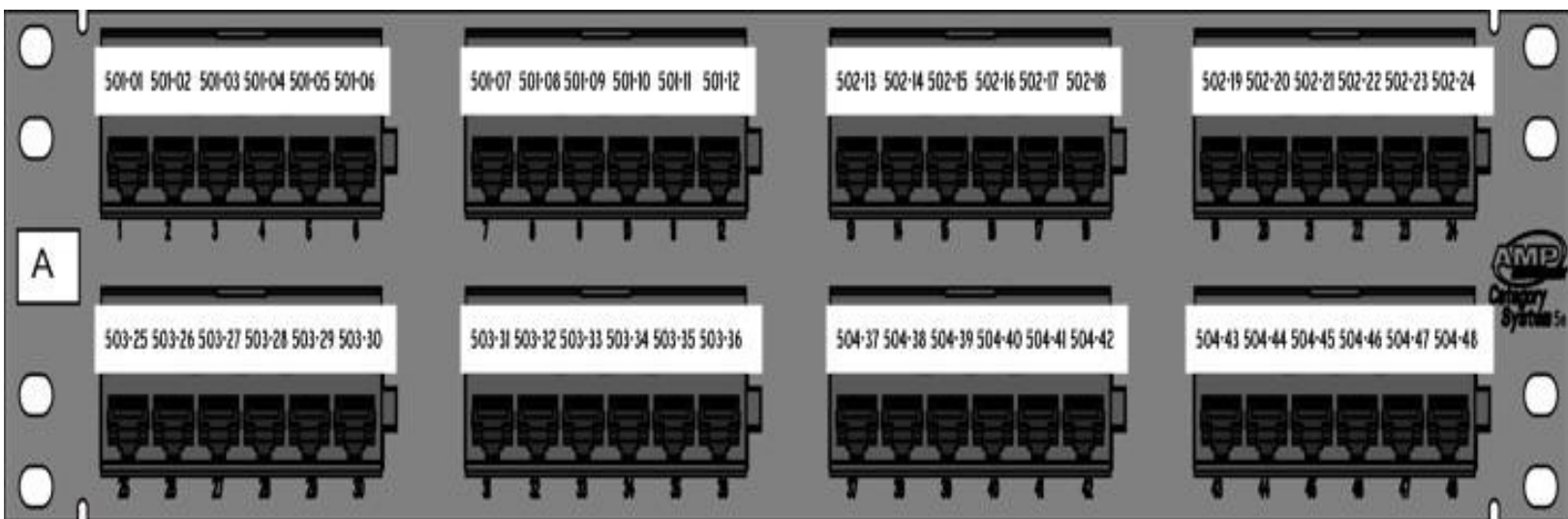


D. Cable Tray Cable Routing



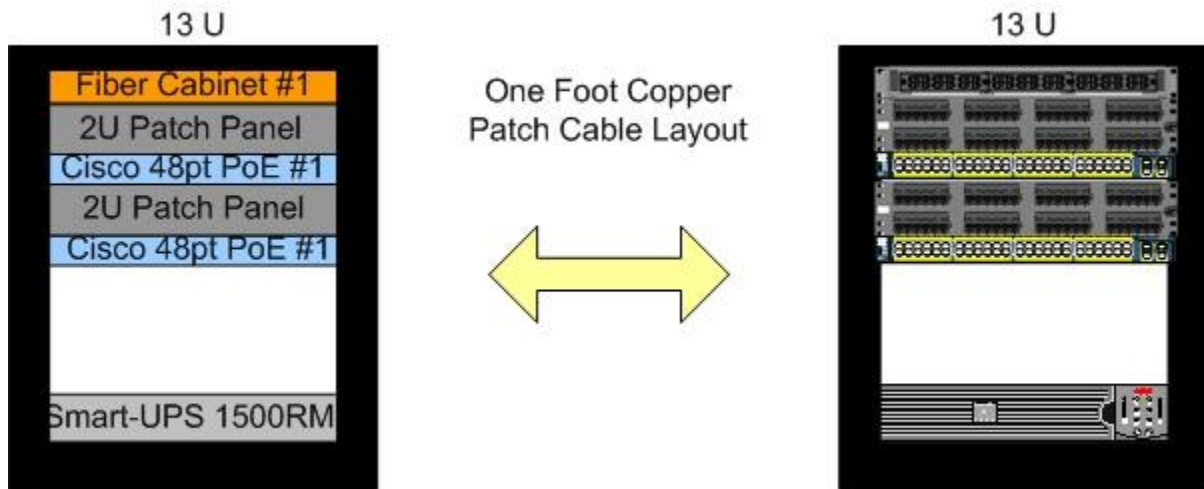
Cable Tray Routing 1

E. Patch Panel Labeling



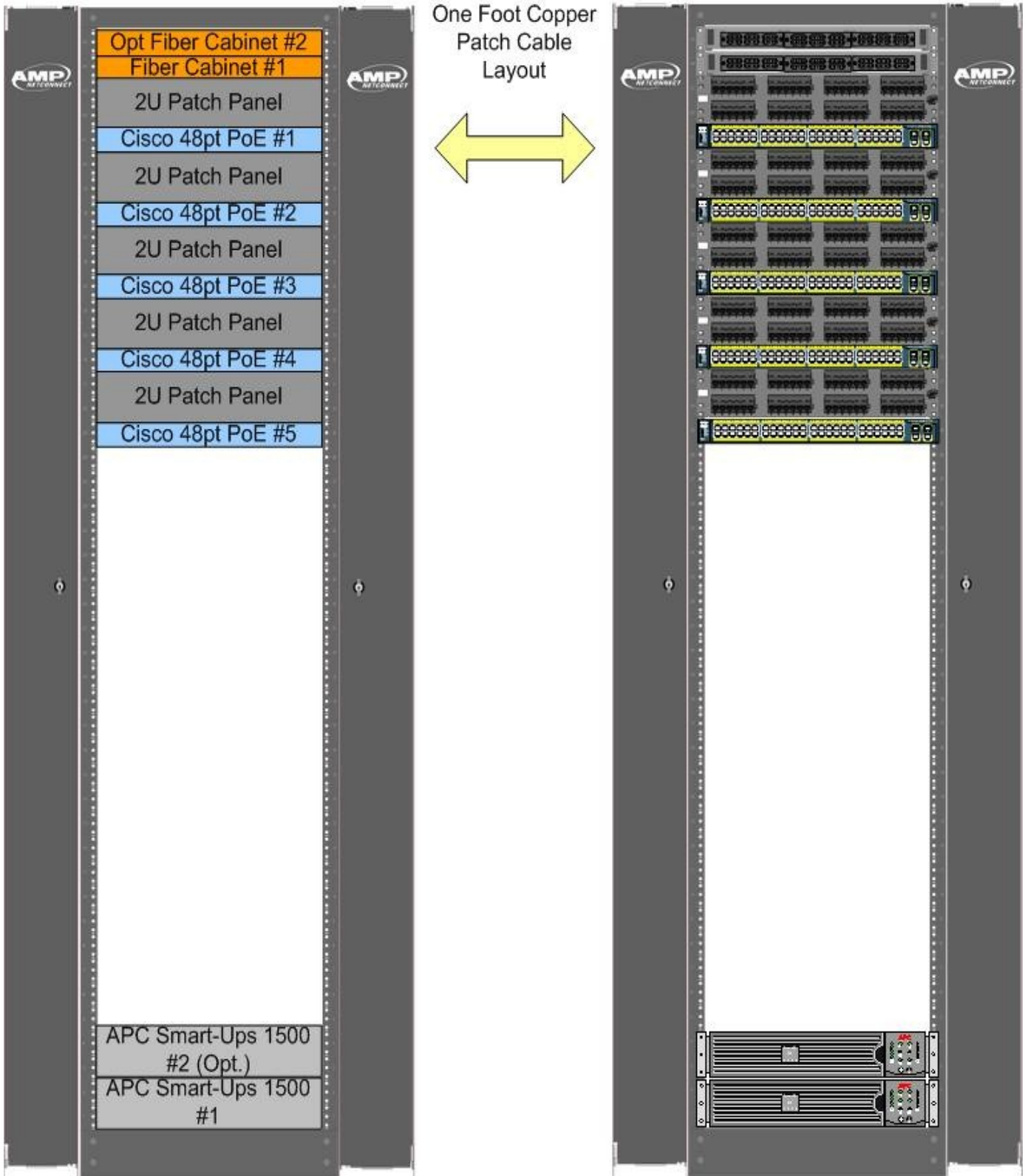
Patch Panel Labeling 1

## F. Wall-Mount Cabinet Elevation



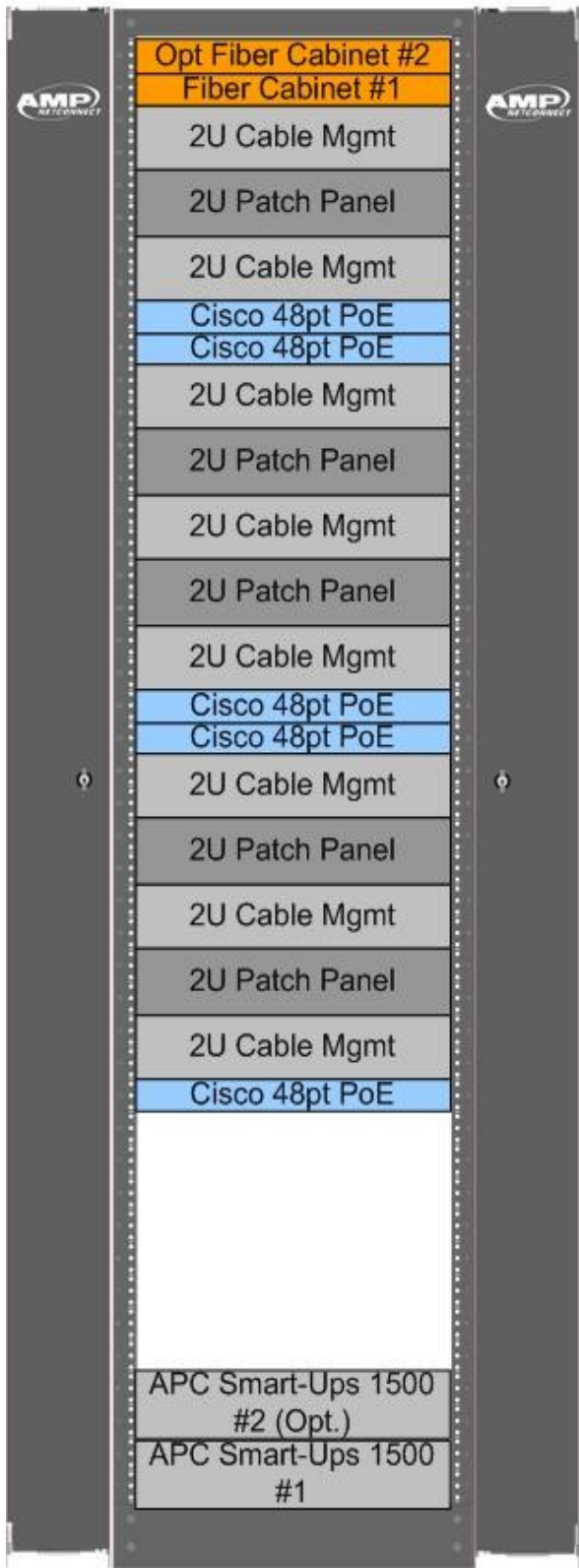
Wall-Mount Cabinet Elevation 1

## G. IDF Network Rack Elevations and Cable Management

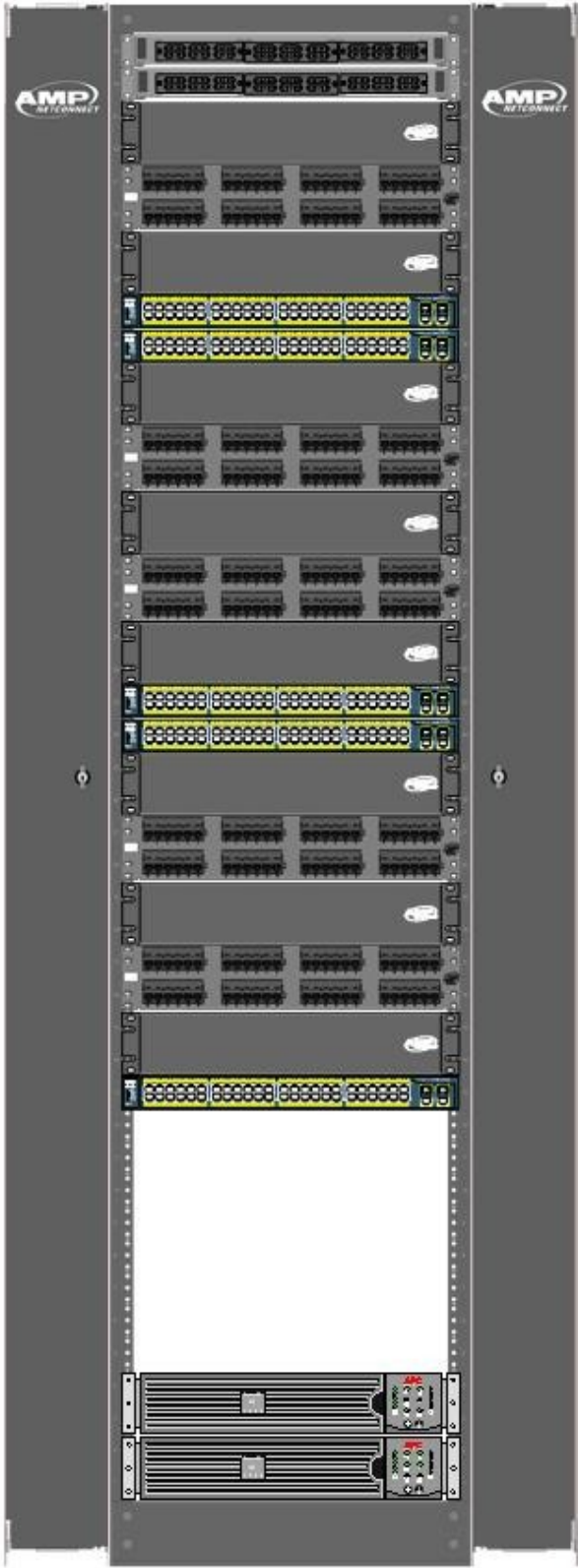
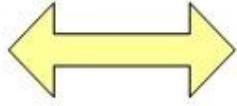


IDF Rack 1



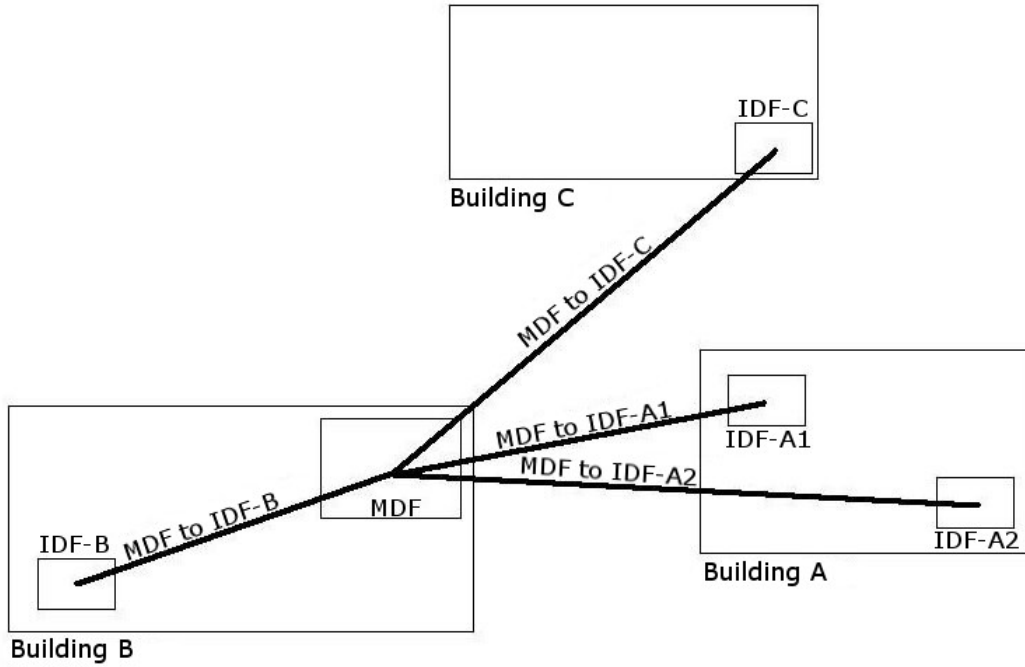


3 Foot Copper Patch Cable Layout



IDF Rack 2

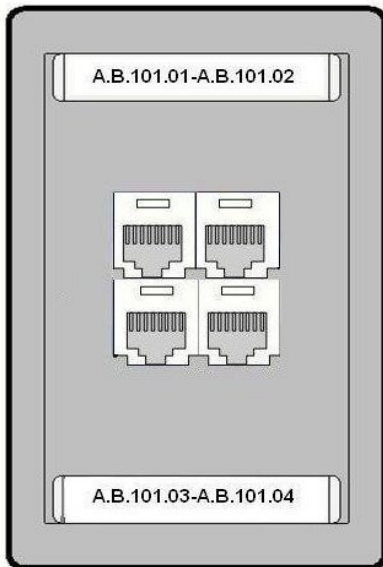
## H. IDF and Backbone Labeling



### Sample Backbone and IDF Labeling

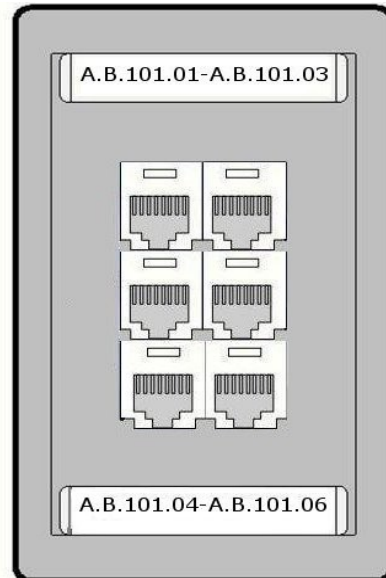
IDF and Backbone Labeling 1

## I. Outlet Labeling



MDF/IDF#.Panel#.Port#

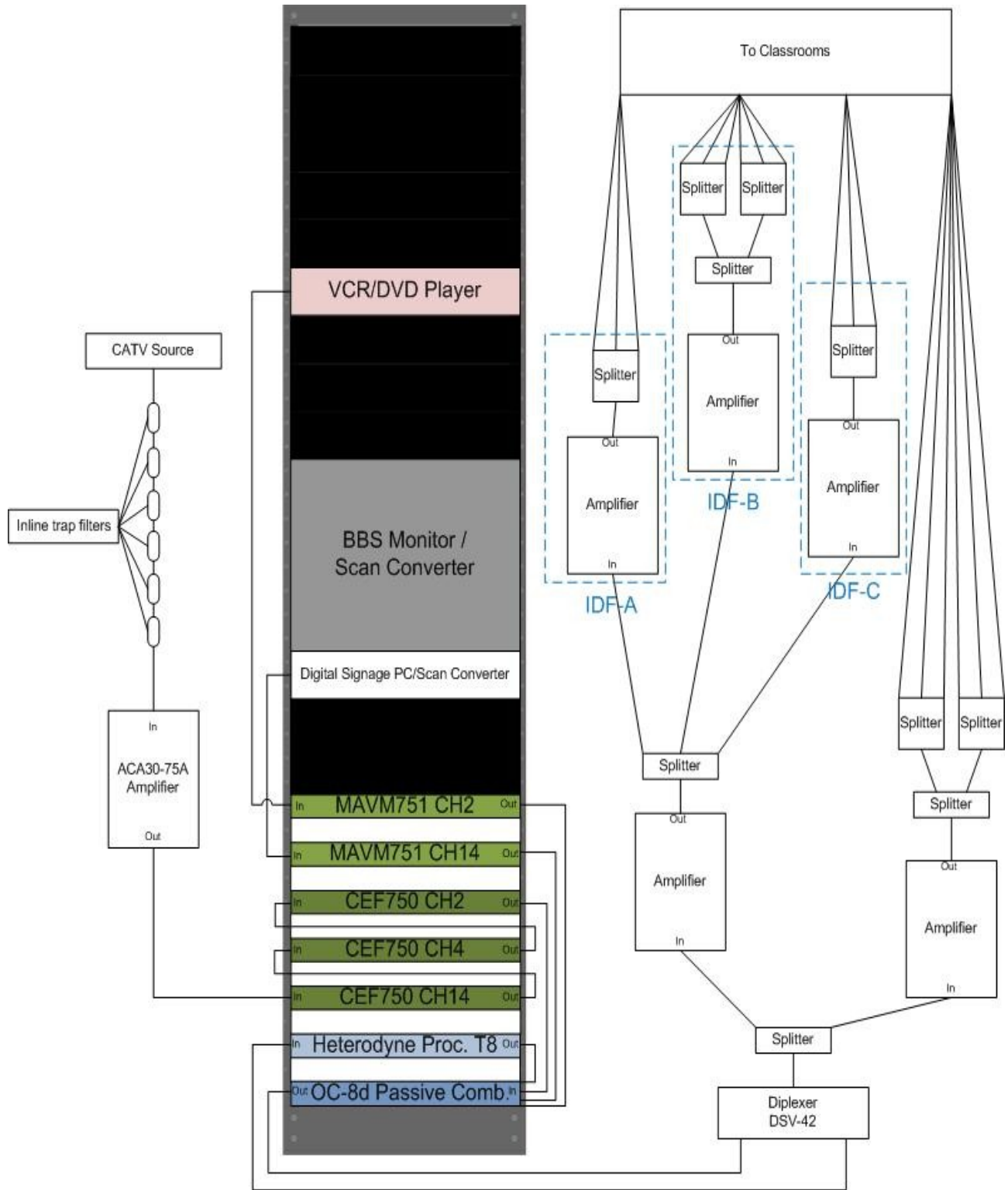
Outlet Labeling 1



MDF/IDF#.Panel#.Port#

Outlet Labeling 2

## J. Video Head End and Distribution Layout



Video Distribution Head End and Distribution

# Inspection Checklist

---

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

Vendor's Project Manger \_\_\_\_\_

## SITE INSPECTION

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

## CABLING

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

## MISCELLANEOUS (IF APPLICABLE)

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

## WESD PROJECT MANAGER RESPONSIBILITIES (IF APPLICABLE)

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

Notes (please note any previous failed inspections): \_\_\_\_\_

\_\_\_\_\_

Payment Approval:    Yes    No

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

## 7. CHANGELOG

### A. Revision 1.1

- 05/13/2010 – Added requirement for volume knobs to be placed in all office areas and lobbies at school sites in Section 4-B-4-i and j.
- 05/13/2010 – Added labeling standards for Special Systems in Sections 4-C-1-a and 4-C-3-f.
- 05/13/2010 – Added definition for term “Special Systems” to the Acronyms/Definitions listing.
- 08/11/2010 – Modified image example for IDF/Backbone Labeling format in Section 6-H.
- 08/11/2010 – Modified IDF labeling format in Sections 4-C-2-b and 4-C-2-c.
- 08/11/2010 – Added Exterior Device labeling for Outlet side in Section 4-C-1-a-5.
- 08/11/2010 – Added Exterior Device labeling for Patch Panel side in Section 4-C-3-f-2.
- 08/11/2010 – Added clarification for labeling of drops in IDFs with pre-existing labeling schemes that differ from the scheme listed in this document in Section 4-C-3-e.
- 08/11/2010 – Modified Section B-2-b to reflect newly agreed upon part numbers for outlet faceplates and jacks.
- 08/11/2010 – Added section 1-C-13 to specify the requirement for vendors to notify WESD-MIS prior to performing work requiring asbestos testing.
- 08/11/2010 – Added Section 4-C-5 regarding correct configuration of Dial Plans within new intercom installations.

### B. Revision 1.2

- 02/14/2011 – Modified Section 4-B-2-b to reflect correct part numbers for outlet jacks.

### C. Revision 1.3

- 05/16/2011 – Added section 4-B-2-d to provide instruction on where to install additional drops on patch panels in IDFs/MDFs.

### D. Revision 1.4

- 09/17/2012 – Added Section 5 – Video Distribution System.
- 09/17/2012 – Added Section 6-J to provide an image of the Video Distribution System HeadEnd.

### E. Revision 1.5

- 01/14/2014 – Added Section 4-B-2-e requiring conduit stub for special systems located in IDF/MDF.

- 01/14/2014 – Added Section 4-B-2-f regarding cabling installation for external devices.
- 01/14/2014 – Modified Section 4-B-1-d indicating category 6 cable requirement for new construction data installations.