SCHOOL DISTRICT OF PHILADELPHIA TECHNOLOGY DESIGN STANDARDS

This document is not intended to be a comprehensive construction specification.

It is a guide for architectural and engineering consultants that applies to ALL design projects, including but not limited to: the design of a new building project, a major renovation of an existing school, a classroom modernization in an existing school, or any "turnkey" schools where SDP Tech Services is expected to maintain the network systems upon completion.

A full set of construction documents and specifications MUST be submitted to SDP Tech Services for review and approval prior to being sent out to bid.

All electronics required to activate the IT infrastructure described herein shall be accounted for in **<u>SDP Capital Programs' overall project budget</u>**, in order for SDP Tech Services to procure and install said electronics at the final fit-out stage of the project.

AS A QUICK REFERENCE GUIDE, THESE ARE THE TOP 5 MOST COMMONLY MISSED TECHNOLOGY DESIGN & CONSTRUCTION REQUIREMENTS:

- 1. ALL DEVICES (SPEAKERS AND APS) MUST BE AT 12'-0" AFF OR LOWER.
- 2. ONLY WALL-MOUNTED SPEAKERS ARE APPROVED NO CEILING SPEAKERS.
- 3. CONTRACTOR MUST PROVIDE AND INSTALL ALL SPEAKERS.
- 4. CONTRACTOR MUST PROVIDE AND INSTALL ALL AP MOUNTS.
- 5. ALL PATCH PANEL PORTS (NOT JUST THE CABLES) MUST BE LABELED IN THE NETWORK CLOSETS ACCORDING TO SECTION 4-D.

TABLE OF CONTENTS

1 EXPECTATION OF RESPONSIBILITIES

Α.	Architect and Engine	er	Page 3
В.	SDP Capital		Page 3
C.	Contractor		Page 4
D.	SDP Tech Services		Page 5

2 DESIGN REQUIREMENTS BY SPACE

Α.	Classrooms	Page 5-6
В.	Computer Labs, Maker Spaces, Innovation Labs	Page 6
C.	Large Congregation Spaces	Page 6-7
D.	Building Entrance / Vestibule	Page 7
Ε.	Main Office	Page 7
F.	Staff Offices	Page 7
G.	Building Engineer's Office	Page 8
Η.	Storage Spaces	Page 8
I.	Generally Throughout the Building	Page 8
J.	Outdoor Areas	Page 8
K.	Trailers	Page 8-9
L.	Detached Buildings	Page 9
Μ.	Entrance Facility	Page 9
N.	MDF (Main Distribution Frame)	Page 9-10
О.	IDFs (Intermediate Distribution Frames)	Page 10-11

3 DESIGN REQUIREMENTS BY DEVICE

Α.	Phones	Page 11
Β.	Speakers	Page 12-13
C.	Wireless Access Points	Page 14
D.	Badge Readers	Page 15
Ε.	Interactive Flat Panels / AV Equipment	Page 16
F.	Security Cameras / CCTV / AI Phones	Page 16
G.	Classroom Clocks / Bells	Page 16

4 INFRASTRUCTURE GUIDELINES

A. <u>Copper UTP</u>	Page 17-18
B. Fiber	Page 18-19
C. Rack Installation Guidelines	Page 19-22
D. Labeling Guidelines	Page 22-24
GENERAL INSTALLATION PROVISIONS	Page 24-26
GENERAL WORK GUIDELINES	Page 26-27
APPLICABLE STANDARDS	Page 27
CONTACT INFORMATION	Page 27
APPENDIX	Page 27-32

5

6

7.

8

9

1. EXPECTATION OF RESPONSIBILITIES

The design of a school building is a collaborative process in which various stakeholders participate, particularly with regard to technology and IT infrastructure. To clarify the various roles and responsibilities within the design as well as construction processes, the following is a list of expectations of each party.

A. ARCHITECT AND ENGINEER shall provide:

- 1. All IT design and construction plans shall be provided to SDP Tech Services prior to being sent to bid. A "kick-off" meeting to acquaint all parties with the design and requirements shall be scheduled. SDP Tech Services will provide feedback that **shall** be incorporated into the final set.
 - a If any "Value Engineering" takes place, it is expected that SDP Tech Services shall be notified and another meeting shall be scheduled to discuss changes prior to the final documents being submitted for RFP.
- 2. All drop count numbers and closet locations shall be provided to SDP Tech Services and Capital Programs **prior to budget finalization and/or 120 days prior to project completion** (whichever occurs first). Without these drop counts, SDP Tech Services cannot accurately price and order network equipment, and therefore cannot guarantee installation prior to expected building opening. This includes:
 - a Data drop counts, and their respective closet locations
 - b. Voice drop counts, and their respective closet locations
 - c. WiFi drop counts, and their respective closet locations
 - d. Speaker counts and locations
- 3. Sufficient electrical support for all technology shall be included in the design. Minimum power requirements have been suggested in various sections below; however, it shall be the Architect and Engineer's responsibility to calculate the proper electrical loads and ensure sufficient support for all technology needs.

B. SDP CAPITAL Department shall provide:

- 1. A final fit-out BUDGET THAT INCLUDES COSTS FOR ALL ITEMS BELOW:
 - a. Network equipment
 - b. Wireless access points, mounting hardware, and all necessary antennas
 - c. Phones
 - d. PBX Local Controller/Survivable Gateway
 - e. Speakers
 - f. Badge readers and related access control equipment and hardware
 - g. Construction costs related to running a new outside fiber connection via SDP's designated contracted fiber leasing company
 - h. Rack mounted UPS for MDF equipment and PBX equipment
 - i. Any and all other equipment provided by SDP Tech Services upon project completion.

SDP Tech Services will use the quantities of drop counts and their corresponding closet location provided by the Architect and Engineer to determine the equipment needs for each closet. Based upon this equipment type and quantity, SDP Tech Services shall provide Capital with a cost to include in their budget. SDP Tech Services will leverage its existing contract agreements to provide the most cost sensitive pricing.

C. CONTRACTOR shall provide:

- 1. All infrastructure wiring, fiber panels, copper patch panels and conduit (if necessary), between and including classroom faceplate or termination, and closet patch panel termination.
- 2 All cut sheets for Fiber Optic cable, copper UTP cable, patch panels, station jacks, speakers, phone faceplates, and Wireless Access Point enclosures for approval by SDP Tech Services.
- 3. All floor standing and wall mounted racks, where needed, as described in Sections 2-N (MDF) and 2-O (IDFs).
- 4. Patch cables on both ends of each termination must be provided (but not installed) by the Contractor. SDP Tech Services will install Contractor-provided patch cables once the project is complete. Patch cord counts should include:

Cable Type	Patch Cord Length	Color
Every patch panel termination in a network closet	5-7 feet	Data & Voice: Gray WiFi: Yellow Speaker: Green
Every data drop on the classroom side	10 feet	Any
Every wireless drop on the AP side - WITH an enclosure	2 feet	Yellow
Every wireless drop on the AP side - WITHOUT an enclosure	15 feet, plenum rated	Yellow
Every speaker drop on the speaker side	5 feet, plenum rated	Any

- 5. Wireless Access Point enclosures or mounting solutions shall be provided and installed for every AP location with the exception of any spaces with a drop ceiling at 12 feet high or less (typically classrooms), where the APs can be clipped to the ceiling grid.
- 6. Metal faceplates for all wall phones must be provided, as described in Section 3-A.
- 7. All paging speakers and materials must be purchased, installed, and provided, as described in Section 3-B.
- 8. **TERMINATION, LABELING, and TESTING** of all copper and fiber cabling. Test results must be submitted to SDP Tech Services prior to SDP installation of equipment. All non-passing cable runs must be repaired/replaced until they pass all required certification specifications. Without acceptable test results for the cabling plant, SDP Tech Services shall not install any network equipment. See additional details on labeling and testing in further sections of this document.
- 9. Final warranty on all products and installation of said products.
- 10. While it is the preference that all construction work be complete prior to IT installation of equipment, if for any reason SDP Tech Services personnel is required to access an active construction site, the Contractor shall provide all necessary PPE including hard hat and reflective vest.

D. SDP TECH SERVICES shall provide:

- 1. Installation of network equipment:
 - a. Network switches
 - b. Wireless Access Points and necessary antennas
 - c. Phones
 - d. PBX Local Controller/Survivable Gateway
 - e. Configuration of all equipment, including configuration of paging zones
- 2. All costs associated with this network equipment will be calculated using the quantities of drop counts provided to SDP Tech Services by the Architect and Engineer. SDP Tech Services will provide this cost to Capital Programs to include in their final fit-out budget.
- 3. Once Tech Services receives all drop counts, network equipment, and acceptable test results for all cabling, technicians shall be deployed to install and verify the network equipment listed above. This process requires a minimum of one full week and unencumbered access to the facility before building occupancy, or if during school opening or other high volume work time, can take up to 2 weeks to complete.

2. DESIGN REQUIREMENTS BY SPACE

A. CLASSROOMS

- Every classroom or educational space intended to hold +/- 34 students shall have the following:
 - 4 CAT6A data drops (at a minimum) spaced around the room at +/- 18" above the floor, preferably 2 at the teacher's station and 2 on an opposite wall. More drops are welcome provided there is patch panel and rack space for the equipment in the MDF/IDF to accommodate them.
 - 2. 2 CAT6A data drops at the ceiling for a Wireless Access Point (AP).
 - a If the classroom has drop ceiling tile 12'-0" high or less, these two lines should run to the center of the room at the ceiling and terminate in an RJ45 biscuit jack, where SDP Tech Services technicians will clip the AP to the ceiling grid. No AP enclosure is needed.
 - b. If the drop ceiling is higher than 12'-0", or the classroom does NOT have drop ceiling tile, these two lines should be run to the center of the hallway wall, and terminate on an RJ45 biscuit jack within a wall-mounted AP Hoffman enclosure at no higher than 12'-0" above the floor, provided by the contractor. NO APs shall be mounted higher than 12'-0" anywhere in the project.
 - 3. 1 CAT6A data drop for a speaker
 - a All speakers should be run to the wall with the classroom door, and terminated at a wall-mounted box speaker at no higher than 12'-0" above the floor, provided by the contractor. NO speakers shall be mounted higher than 12'-0" anywhere in the project.
 - b. Only approved speaker models, as listed in Section 3-B of this document, shall be accepted. No other speaker models, including pendant or ceiling speakers, shall be included anywhere in any project. Requests for exceptions may be evaluated by SDP Tech Services on a case by case basis.
 - 4. 1 CAT6A data drop for a wall phone by the classroom door, terminated with a METAL CommScope faceplate as specified in this document. See Appendix for approved faceplate model. Do not include phone enclosures.
 - 5. 4 quad electrical outlets around the room, as well as 1 duplex for dedicated laptop cart charging.

- 6. A storage and charging solution for student devices must be provided in every classroom.
- 7. An interactive flat panel must be provided in every classroom. All interactive flat panel technology MUST be permanently affixed to the wall or floor, and must have a minimum of (1) CAT6A data drop as well as dedicated electrical power provided.
- 8. Any additional data & electrical requirements for AV or interactive flat panel technology as specified by the SDP Capital Facilities Planning team's classroom standards document.
- 9. Refer to the Appendix in this document for additional classroom layout information.

B. COMPUTER LABS, MAKER SPACES, INNOVATION LABS

Every school shall have a minimum of one (1) computer lab. This room will be intended to house +/- 34 desktop computers in accordance with any state, local occupancy limits/requirements for computer learning environments and state testing. This standard shall also apply to Maker Spaces, Innovation Labs, and any other similar spaces. In addition to the IT requirements for classrooms as listed in Section 2-A, the computer lab shall have:

- 1. A minimum of one (1) hardwired CAT6A data drop per computer workstation.
- 2 Additional CAT6A data drops as needed for scanners, printers, 3D printers, laser cutters, or specific computer lab equipment. All additional lab equipment must have a dedicated hardwired connection and a minimum of (1) CAT6A data drop per device as well as dedicated electrical power provided.
- 3. At least one electrical outlet per computer. Circuit sizing should be based on current electrical standards.
- 4. A teacher's station configuration.
- 5. All schools with students in grades K-8 shall have:
 - a A flexible lab space that has a combination of desktop and laptop computers that can accommodate +/- 34 students
 - b. An interactive flat panel
 - c. A charging and storage solution for laptops
- 6. All schools with student in grades 9-12 shall have:
 - a A computer lab with desktop computers that can accommodate +/- 34 students
 - b. An interactive flat panel
- 7. If temperature and heat dissipation from the computers is a concern, an optional independent air conditioning system shall be installed (24k BTU wall-mounted mini-split or window AC unit), not ducted from the building's HVAC system. Acceptable unit models, backflow preventer specifics, and warranty details MUST be coordinated with SDP Facilities Department.

C. LARGE CONGREGATION SPACES

Every large space intended for the congregation of more than a classroom-size of students (Auditorium, Cafeteria, Gymnasium), should have a higher density of both speakers and wireless APs. In addition to the IT requirements for classrooms as listed above - including a wall-mounted phone - each large congregation space shall include the following provisions:

 AP density should be calculated as 1 AP per approximately 50 students, and maximum occupancy values for these spaces shall be used. Due to typically higher ceilings and lack of drop ceiling tile in these spaces, all APs should be wall-mounted in AP Hoffman enclosures. Additional external antennas may be required. Specific AP layout shall be submitted to SDP Tech Services for review prior to being sent out to bid. NO APs shall be mounted higher than 12'-0" anywhere in the project.

- 2 All large congregation spaces shall have ubiquitous speaker coverage of the entire space. Specific speaker layout shall be submitted to SDP Tech Services for review prior to being sent out to bid. NO speakers shall be mounted higher than 12'-0" anywhere in the project.
- **3.** PA speakers shall be independent of any AV system that uses speakers for audio visual presentations in these areas. **No mixed use of speakers shall be permitted.**

Additionally, all auditorium, cafetorium, or gymnatorium spaces that have a performance stage shall provide a minimum of (2) CAT6A data drops (at a minimum) at +/- 18" above the floor on each side of the stage, as well as (4) CAT6A data drops (at a minimum) at +/- 18" above the floor on each side of the back of the room behind the audience seating, at the mixing / light desk area. Additionally, provide (2) CAT6A data drops on each side of the auditorium balcony if there is one.

D. BUILDING ENTRANCE / VESTIBULE

All school buildings are required to have both a Visitor Management kiosk as well as a Student ID check station at the main building entrance or at the Main Office. To accommodate these devices, the Building Entrance/ Vestibule shall require:

- 1. 2 CAT6A drops (minimum) 4 preferred
- 2. 4 duplex electrical outlets
- 3. 1 CAT6A drop for a wall-mounted speaker

The specific locations of the data drops and outlets shall be coordinated with the Principal as to the design of their Visitor/Student management plan. In the event that the Principal shall choose to locate the Student Entrance in a different area than the main Visitor Entrance - or in the case of large scale events that shall be held in any congregation spaces, which may need additional Visitor Management kiosks for attendance tracking in various other locations - those entrances shall also have the above listed requirements.

E. MAIN OFFICE

The Main Office layout and design shall be coordinated with the Principal. Minimum infrastructure requirements are as follows:

- 1. 2 CAT6A data drops (minimum) for every staff workstation
- 2. 1 quad electrical outlet for every staff workstation
- 3. 1 CAT6A drop per wall-mounted speaker. Speaker coverage shall be ubiquitous throughout the Main Office.
- 4. 1 CAT6A POE data drop shall be provided for a Kronos time clock, the top of which shall be no higher than 48" above floor level. The specific location of this drop in the Main Office shall be coordinated with the Principal, but shall be located such that:
 - a. all teachers will have access to clock in and out every day,
 - b. it is not blocking a walkway or in a high traffic area,
 - c. and it is in view of either a security camera or the Main Office staff.
 - Contractor shall mount the Kronos back bracket. See Photo Appendix for details.
- 5. 1 CAT6A data drop and 1 electrical outlet for a Visitor Management kiosk (should the Principal choose to locate this in the Main Office).

F. STAFF OFFICES

Every staff member office shall have:

- 1. A minimum of 4 CAT6A data drops at +/-18" above floor level
- 2. 2 duplex electrical outlets
- 3. 1 CAT6A drop for a wall-mounted speaker at no higher than 12'-0"

G. BUILDING ENGINEER'S OFFICE

In addition to the IT requirements for Offices as listed above, the BE's office shall include:

1. 1 CAT6A POE drop for a Kronos time clock, in or just outside the office, no higher than 48" above floor level to the top of the clock. Contractor shall mount the Kronos back bracket. See Photo Appendix for details.

H. STORAGE SPACES

Any storage space larger than 15 sq.ft. in size, including those within classrooms, shall have:

- 1. 1 CAT6A drop for a wall-mounted speaker no higher than 12'-0"
- 2 2 CAT6A data drops (minimum) at +/-18" above floor level
- 3. 1 duplex electrical outlet

I. GENERALLY THROUGHOUT THE BUILDING

- There shall be ubiquitous WiFi coverage throughout the building, including hallways, boiler rooms and mechanical spaces, and storage rooms. The only exceptions are elevators and bathrooms. Specific AP layout shall be submitted to SDP Tech Services for review prior to being sent out to bid.
 - a. Any location that has a drop ceiling 12'-0" or lower, may be installed without an AP enclosure. This excludes gymnasiums, cafeterias, and auditoriums.
 - b. Any location without a drop ceiling grid, or that has a ceiling higher than 12'-0", shall be wall-mounted in AP Hoffman enclosures, and no higher than 12'-0" above floor level. This includes gymnasiums, cafeterias, and auditoriums.
- 2 There shall be ubiquitous wall-mounted speaker coverage throughout the building, as well as every 30 feet in hallways. No speakers shall be mounted higher than 12'-0" above the floor, anywhere in any project. Specific speaker layout shall be submitted to SDP Tech Services for review prior to being sent out to bid.

J. OUTDOOR AREAS

All outdoor areas adjacent to the school building that are used as outdoor educational spaces, as well as locations where students, faculty, and staff congregate, shall have WiFi coverage as well as an outdoor PA speaker. All such locations shall require:

- 1. 2 CAT6A data drops, terminated on biscuit jacks on the AP end, coiled up on the **inside** wall behind each outdoor AP location. These shall be located no higher than 12'-0" above the ground. Contractor shall mount the SDP-provided outdoor APs. See Photo Appendix for mounting details.
- 2. 1 CAT6A drop for each outdoor wall-mounted speaker horn. These shall be located no higher than 12'-0" above the ground. See speaker Section 3-B for more details.

K. TRAILERS

Any trailer that is used as a classroom shall have the same interior infrastructure requirements as a typical classroom, as referenced in Section 2-A. In addition, as trailers will be detached from the main building and farther than 300 ft. from the closest network closet, they shall have:

- 1. A wall-mounted network rack within the trailer.
- 2. 12-strand Single Mode armored fiber between the trailer and MDF, terminated on LC connectors on both ends.
- 3. Four (4) CAT6A tie cables between the trailer rack and the MDF, terminated on patch panels on both ends.

- a If these tie cables are an aerial suspension (as opposed to an underground line), they shall be rated for outdoor use, and installed with lightning protectors rated for 90 volts on both ends.
- 4. All copper drops within the trailer will then be terminated on patch panels in that rack.

L. DETACHED BUILDINGS

Any detached buildings such as Annexes, Modular Buildings, Little School Houses, Stadiums, or Field Houses that are situated on the same physical property and do not cross a right of way, shall be treated as their own IDFs. They shall have:

- 1. A wall-mounted network rack within the building in an enclosed space as outlined in the IDF section in this document.
- 2. 24-strand Single Mode armored fiber between the building rack and the MDF, terminated on LC connectors on both ends.
- 3. Four (4) CAT6A tie cables between the building rack and the MDF, terminated on patch panels on both ends.
 - a If these tie cables are an aerial suspension (as opposed to an underground line), they shall be rated for outdoor use, and installed with lightning protectors rated for 90 volts on both ends.

M. ENTRANCE FACILITY

The Entrance Facility (EF, or also known as the Demarcation point or Demarc) is the location where any incoming fiber-based data services physically enter the building. For new construction, all services must be demarcated at the MDF.

N. MDF (MAIN DISTRIBUTION FRAME)

The MDF is the location within a building or complex of buildings, where the entire telecommunications system originates. It may include: the physical location of the enclosure, wire and cable management hardware, termination hardware, distribution hardware, and patching and equipment racks. EIA/TIA-569 refers to the room housing the MDF as the "Equipment Room."

The MDF shall be or include the following:

- 1. A fully enclosed room approximately 240 sq.ft. in size, and a minimum dimension of 12'x20' inside. It must be above grade (first floor or higher).
- 2. At least one (1) 84" four-post floor standing rack. Floor standing racks shall be installed to ensure 36" of free space behind and in front of racks, as well as located in such a way as to not block access to any other floor-standing or wall-mounted equipment.
- 3. Provide 24 strand, OM3 or better, 50µ Multimode fiber from the MDF to each IDF, terminated on a fiber patch panel with **LC connectors**.
- Provide four (4) CAT6A tie cables from the MDF to the EF, as well as to each IDF, terminated on a dedicated 1U copper patch panel at both ends. This dedicated patch panel shall be labeled LEGACY TIE CABLES.
 - a If tie cable count exceeds 1U panel capacity, additional panels shall be installed.
- 5. Electrical power should include a minimum of eight (8) quad-plex outlets, each served by a 20 amp dedicated circuit. All electrical power in the MDF shall be tied into the building's emergency generator.
- 6. Install a #6 (6 AWG) ground wire with terminal ground bar.
- 7. Provide two (2) plywood backboards of at least 4' x 4', one on each of two different walls in the MDF, that shall each be 3/4" thick, AC or better, and painted with two coats of fire retardant paint. Ensure 36" of free space in front of all plywood.

- 8. An independent air conditioning system must be provided (i.e. 24k BTU wall-mounted mini-split), not ducted from the building's HVAC system. Acceptable unit models, backflow preventer specifics, and warranty details MUST be coordinated with SDP Facilities Department.
- 9. 1 CAT6A data drop for a wall-mounted speaker at no higher than 12'-0" above the floor.
- 10. 1 CAT6A data drop for a wall phone by the door, terminated with a METAL CommScope faceplate as specified in this document. See Appendix for approved faceplate model.
- 11. An access control badge reader should be located outside at the entrance door to the MDF. See Badge Reader information in Section 3-D of this document for more details.
- 12 Racks in the MDF are intended specifically for Voice, Data, WiFi equipment, and speakers. Security equipment (Head End, CCTV, etc.) should be located in a separate closet. If another location is not possible, the MDF must be large enough to separate and partition the equipment, and power requirements must increase to accommodate additional equipment. Equipment co-locations must be approved by both SDP Tech Services and SDP School Safety.
- 13. No MDF nor IDF shall be installed or retrofitted into a space with a water source or excess humidity (i.e. janitors' closets, bathrooms, kitchens, etc.) nor in a location that can be accessed by students.
- 14. No water sprinkler system nor other fire suppression system is warranted in either MDF nor IDFs. A smoke detector in each closet shall be sufficient.

O. IDFs (INTERMEDIATE DISTRIBUTION FRAMES)

The IDF is the location in a building where a transition between the backbone or vertical riser system and the individual drop distribution system occurs. It may include: the physical location of the enclosure, wire and cable management hardware, termination hardware, distribution hardware, and patching and equipment racks. The IDFs provide the interface location between fiber distribution cable (backbone) and the station cable (horizontal distribution).

The IDF shall be or include the following:

- 1. A fully enclosed room approximately 100 sq.ft., and a minimum dimension of 10'x10' inside.
- 2. Floor standing racks shall be installed to ensure 36" of free space behind and in front of racks, as well as located in such a way as to not block access to any other floor-standing or wall-mounted equipment.
- 3. Provide 24 strand, OM3 or better, 50µ Multimode fiber from each IDF back to the MDF, terminated on a fiber patch panel with **LC connectors**.
- 4. Provide four (4) CAT6A tie cables from each IDF back to the MDF, **terminated on a dedicated 1U copper patch panel at both ends**. This dedicated patch panel shall be labeled LEGACY TIE CABLES.
- 5. Wall mounted racks, where appropriate, must be a minimum of 24" deep and mounted on ³/₄" plywood. They should also be installed to ensure 36" of free space in front of the rack.
- 6. Electrical power should include a minimum of one (1) quad-plex outlet per each pair of 48-port patch panels (96 drops), each served by a 20 amp dedicated circuit. All electrical power in the IDFs shall be tied into the building's emergency generator.
- 7. Provide one plywood backboard of at least 4' x 4' in the IDF, which shall be 3/4" thick, AC or better, and painted with two coats of fire retardant paint. Ensure 36" of free space in front of plywood.
- 8. 1 CAT6A data drop for a wall-mounted speaker at no higher than 12'-0" above the floor,

provided by the contractor.

- 9. 1 CAT6A data drop for a wall phone by the door, terminated with a METAL CommScope faceplate as specified in this document. See Appendix for approved faceplate model.
- 10. An access control badge reader should be located outside at the entrance door to the IDF. See the Badge Reader Section 3-D in this document for more details.

3. DESIGN REQUIREMENTS BY DEVICE

A. PHONES

Contractor shall provide all infrastructure, terminations, labeling, and faceplates for phones. SDP Tech Services shall provide all phone sets once construction is complete.

All phones shall require one CAT6A drop per phone, each individually run directly back to the MDF or nearest IDF. SDP Tech Services does not differentiate between a typical data drop and a voice drop. All voice cabling shall be CAT6A cabling terminated on a patch panel in the MDF, and terminated as a RJ45 data jack on the classroom or office side. All voice labeling shall be consistent with data drop labeling.

SDP Tech Services provides two types of Voice Over Internet Protocol (VOIP) phone sets: desktop sets and wall-mounted sets.

- For all desktop sets in locations such as offices, conference rooms, work desks, etc, SDP Tech Services will install desktop phone sets where requested, using the data drops provided by the Contractor.
- 2. For all wall-mounted phones, the following shall apply:
 - a Every classroom, educational space, large congregation space (cafeteria, gymnasium, auditorium), IMC, and computer lab, shall have one (1) wall-mounted phone installed by the room entry door. Do not include phone enclosures.
 - b. All wall-mounted phones must be installed on metal faceplates. The only acceptable faceplate model shall be:

CommScope M10LW4SP 1-port Single Gang Stainless Steel Telephone Faceplate, part #760100891

See additional details and cut sheets in attached Appendix. No other manufacturers shall be approved, and plastic wall faceplates are not acceptable.

SDP Tech Services provides assistance with the setup of dedicated phone numbers for:

- 1. Elevator emergency dial-out lines
- 2. PGW gas meter phone lines

Contractor is responsible for installing, testing, terminating, and labeling the CAT6A cabling between the elevator panel or gas meter panel, and the closest network closet. SDP Tech Services shall then extend and assign a DID (direct inward dialing number) on those lines as requested. Contractor is responsible for the final dial programming with the elevator company or PGW gas company.

SDP Tech Services does NOT manage fire alarm emergency phone lines, nor intrusion alarm emergency phone lines. Please contact the SDP School Safety Department for more information.

B. SPEAKERS

Contractor shall purchase and provide all speakers, equipment, cabling, and installation required for the speaker system. SDP Tech Services shall perform all speaker programming and paging zoning once construction is complete.

All speakers shall be wall-mounted Bogen or Quam products as specified here. No other speaker models, including pendant speakers or ceiling speakers, shall be approved. Requests for exceptions shall be evaluated on a case by case basis. See additional details and cut sheets in attached Appendix. All speakers shall be wall-mounted at no higher than 12'-0" above finished floor.

- 1. For all regular indoor classroom spaces, the only approved speaker model is: Bogen wall-mounted box speaker: MB8TSQVR
- 2. For all large indoor spaces such as gymnasiums, auditoriums, and cafeterias, a louder model speaker is required:

Quam wall-mounted box speaker: SYSTEM 6VPS

For all outdoor areas where staff and students congregate or outdoor learning occurs, a wall-mounted horn is required:
 Bogen wall-mounted horn: SPT15A

All speakers shall require one CAT6A drop per speaker, each individually home run directly back to the MDF or nearest IDF. No daisy-chaining allowed.

- 1. All speaker cabling shall be terminated on a patch panel at the closet, terminated on a RJ45 jack at the wall-mounted speaker, and shall be labeled at both ends according to the Labeling Guidelines in Section 4-D of this document.
- 2. Speaker-side installation shall be as follows:
 - a. Use a patch cord to connect the RJ45 end to the jack at the speaker, strip the opposite end, and use the blue pair of the CAT6A to terminate white to the common, blue to the watt. Remove the exposed silver ends of the other leads/taps and tape them together. Do not cut them at the transformer. Ensure that the bare wire ends are not touching each other, as this will create a short and cause issues. See Photo Appendix for more details.

Speaker Model Type and Location	Location	Wattage
Bogen wall-mounted speakers	Classrooms, Offices	2 Watts
Bogen wall-mounted speakers	Hallways	4 Watts
Quam wall-mounted speakers	Gyms, Auditoriums, Cafeterias	8 Watts
Bogen wall-mounted horns	Outdoor Areas	8 Watts

b. Speakers shall be tapped as follows:

All speakers shall be mounted at no higher than 12'-0" above the finished floor, anywhere, in any space. No exceptions shall be approved.

Every space throughout the entire school shall have speaker coverage. This includes: all classrooms, all offices, common areas, stairwells, entrance vestibules, elevator vestibules, mechanical areas, storage rooms larger than 15 sq.ft. (including those within classrooms), hallways, outdoor spaces used for educational or congregation purposes, trailers, and any other locations utilized by staff and/or students. Hallway speakers shall be spaced approximately every 30 feet. Specific speaker layout shall be submitted to SDP Tech Services for review prior to being sent out to bid.

PA speakers shall be independent of any AV system that uses speakers for audio visual presentations in these areas. AV systems in Auditoriums, Gymnasiums, Cafeterias, and other such spaces shall be standalone analog AV systems and are not allowed on the District's network. **No mixed use of speakers shall be permitted.**

Additionally, all other paging equipment required per school program shall be purchased and installed by the Contractor. Equipment models and manufacturers shall be as follows. No other paging equipment products shall be approved.

1. Bogen Controller PCM2000

- a. Only one controller is required for the MDF. No additional controllers are needed for any IDFs or any additional programs.
- SDP Tech Services requires the CPU (central processing module), TIM (telephone interface module), and three (3) ZPM's (zone paging module). SDP does not require the TBM (talkback module).
- c. Paging is integrated into the phone system. No external microphones are needed.

2. Bogen Amp TPU 250

a. Only one amp per program is required for the MDF. No additional amps are needed for any IDFs. In such locations where multiple school programs are located within the same building, an additional Bogen Amp TPU 250 in the MDF is required, per program.

In such locations where multiple school programs are located in the same building, the following is also required, per program:

- 1. An additional Bogen Amp TPU250
- 2. Bogen Multiple Tone Generator TG4C
 - a. Tone Generator also requires Power Supply PRS40C, sold separately
- 3. An additional classroom clock system, as coordinated with SDP Facilities.

C. WIRELESS ACCESS POINTS

All Wireless Access Points shall require two (2) CAT6A drops per AP location. All wireless cabling shall be terminated on a patch panel at the closet, terminated on a RJ45 biscuit jack at the AP side, and shall be labeled at both ends according to the labeling guidelines in this document.

Every space throughout the entire school shall have ubiquitous WiFi coverage. This includes: all classrooms, all offices, common areas, entrance vestibules, elevator vestibules, mechanical areas, storage rooms larger than 15 sq.ft. (including those within classrooms), hallways, outdoor spaces used for educational or congregation purposes, trailers, and any other locations utilized by staff and/or students. Specific AP layout shall be submitted to SDP Tech Services for review prior to being sent out to bid.

Location	Mounting Solution	Mounting Height
Gymnasiums, Cafeterias, Auditoriums	AP Hoffman Enclosure, wall-mounted	No higher than 12'-0"
Hard ceilings in any location (other than Gymnasiums, Cafeterias, Auditoriums), no higher than 12'-0"	Oberon mount	No higher than 12'-0"
Classrooms and offices with drop ceiling grids, no higher than 12'-0"	No mount needed - SDP Tech Services will clip AP to drop ceiling grid	No higher than 12'-0"

All Wireless Access Points shall be installed with mounting solutions as follows:

- Contractor must order, modify, and install all Wireless Access Point Hoffman Enclosures for wall-mounted AP locations, as well as order and install Oberon mounts for hard ceiling locations that are at 12'-0" or lower. See Appendix for details and cut sheets. SDP Tech Services will install the AP equipment into the enclosures and mounts once construction is complete.
- 2. Wireless Access Points shall NOT be installed higher than 12'-0" above floor level in ANY space. If wiring for APs is installed at higher than 12'-0" above the floor, SDP Tech Services will not install the Wireless Access Point equipment at this location.

It is apparent that automated technology has become more prevalent in a wide variety of school systems. In the event that any Mechanical, Electrical, Plumbing, or other non-IT systems being installed in a school require wireless communication, SDP Tech Services shall be notified for coordination and approval. Any such systems shall NOT create an independent network that use the following frequencies:

a. 2.4 GHz (2401-2473 MHz)

- b. 5 GHz (5150-5835-5.895 GHz)
- c. 6 GHz (5.925-7.125 GHz)
- d. 60 GHz (57.24GHz-74.52 GHz)

D. BADGE READERS

All badge readers and security access control hardware as well as access control setup and programming must be coordinated with and installed by SDP's awarded security access control vendor: MJR / GT Security. No other access control installation vendors will be accepted. Please contact Joe Snell at jsnell@gt-security.com for more information.

- 1. All access control badge readers shall require one (1) composite cable West Penn AC251822B per badge reader location. Composite cable shall have a 2 foot slack loop coiled up at each badge reader location.
- 2. All badge reader cabling shall be run back to the headend controller. Headend controller MUST be located in the MDF or in an IDF, and shall be wall-mounted on 3/4" plywood backboard. The maximum distance between the controller and any badge reader shall be no more than 500 feet.
 - a All card readers, door contacts, request-to-exit motion and electronic locks, auto door openers, and 3rd party lock power supplies to electric locks, will require a pathway/ raceway and string from the device to an accessible location.
- 3. (1) quad receptacle for AC power must be provided for the headend location. Additional electrical receptacles must be provided for all 3rd party lock and door hardware power supplies. Any electric locks powered by an access control power supply must be 12v DC.
- 4. Contractor shall provide two (2) CAT6A cables run to the headend controller, coiled up with a 2 foot slack loop, as well as terminated, tested, and labeled as Access Control. MJR / GT Security will do the final terminations and all programming following construction completion.
- The headend controller shall manage a maximum of thirty-one (31) badge readers. If more badge readers are needed that would require an additional controller, MJR / GT Security MUST be notified.
- All doors with badge readers shall need electrified door locks and hardware. As the design and location of electrified doors within a project may vary widely, MJR / GT Security as well as SDP Tech Services must be contacted for coordination. High current crash bars or other door hardware that requires a separate power supply is discouraged.

For all NEW CONSTRUCTION, badge readers shall be installed at the entry door of the following locations:

- 1. Main Building Entrance
- 2. Employee Building Entrance
- 3. Schoolyard Entrance
- 4. Food Service/ Delivery Entrance
- 5. Main Office
- 6. MDF
- 7. IDFs

For all RENOVATIONS to existing buildings, badge readers shall be at the discretion of the design team and Principal. If the decision is made to include ANY new badge readers in the renovation project, then the seven above mentioned locations shall also be included. **Specific badge reader layout shall be submitted to MJR / GT Security as well as SDP Tech Services for review prior to being sent out to bid.**

E. INTERACTIVE FLAT PANELS / AV EQUIPMENT

SDP Tech Services does not manage interactive flat panels nor any AV Equipment. Please coordinate with the Capital Facilities Planning team for interactive flat panel and AV needs. As described in Section 2-A, all interactive flat panel technology MUST be permanently affixed to the wall or floor, and must have a minimum of (1) CAT6A data drop as well as dedicated electrical power provided. All AV systems MUST use analog equipment, and are not allowed access to the District's network.

F. SECURITY CAMERAS / CCTV / AI PHONES

SDP Tech Services does not manage any security cameras, CCTV connections, nor AI phones. Any and all Security equipment must be located in a separate closet or rack space from IT equipment. All Security equipment must be labeled clearly as Security equipment. Please contact the SDP School Safety Department for more information.

G. CLASSROOM CLOCKS / BELLS

SDP Tech Services does not manage synchronized clocks nor bell schedules. SDP Facilities is responsible for all clocks and bell schedules. Please contact the SDP Facilities Department for more information.

4. INFRASTRUCTURE GUIDELINES

A. COPPER UTP

All copper cabling shall be CAT6A UTP, cable type CMP. This includes all data, voice, wireless, and speaker cabling, as well as all patch cords. Copper Clad Aluminum, CCA cable variants are not acceptable.

All copper cabling shall be terminated on a patch panel on the network closet side, in neat and logical consecutive order with appropriate labels as described in this document. All field terminations in all other spaces shall be an RJ45 jack, orange in color, also labeled as described. Patch panels and RJ45 jacks must be selected in accordance with cable manufacturers' specifications, installation guidelines and all other warranty requirements.

All CAT6A drops shall be routed in cable trays, conduit, j-hooks, and/or chases and sleeves as required. A minimum ten (10) foot slack loop shall be provided in each IDF or MDF for each copper cable run to avoid any cinching of cables. See General Installation Provisions section of this document for more detailed installation information.

For any renovations of existing buildings, **all copper cabling that is being replaced or is no longer in use shall be REMOVED** from all conduit, cable trays, j-hooks, closets, and patch panels. **Under NO circumstances shall discarded copper lines remain in ANY location.**

CAT6A Electrical Specifications shall meet or exceed the following:

- 1. Transmission Standards ANSI/TIA-568.2-D | ISO/IEC 11801 Class EA
- 2. dc Resistance Unbalance, maximum 4 %
- 3. dc Resistance, maximum 8 ohms/100 m | 2.438 ohms/100 ft
- 4. Dielectric Strength, minimum 1500 Vac | 2500 Vdc
- 5. Mutual Capacitance at Frequency 6.0 nF/100 m @ 1 kHz
- 6. Nominal Velocity of Propagation (NVP) 65 %
- 7. Operating Frequency, maximum 550 MHz
- 8. Operating Voltage, maximum 80 V
- Remote Powering Fully complies with the recommendations set forth by IEEE 802.3bt (Type 4) for the safe delivery of power over LAN cable when installed according to ISO/IEC 14763-2, CENELEC EN 50174-1, CENELEC EN 50174-2 or TIA TSB-184-A

On the rare occasion that CAT6 must be installed in an existing building, the CAT6 Electrical Specifications shall meet or exceed the following:

- 1. Transmission Standards ANSI/TIA-568.2-D, CENELEC EN 50288-6-1, ISO/IEC 11801 Class E
- 2. dc Resistance Unbalance, maximum 5 %
- 3. dc Resistance, maximum 7.61 ohms/100 m | 2.32 ohms/100 ft
- 4. Dielectric Strength, minimum 1500 Vac | 2500 Vdc
- 5. Mutual Capacitance at Frequency 5.6 nF/100 m @ 1 kHz
- 6. Nominal Velocity of Propagation (NVP) 69 %
- 7. Operating Frequency, maximum 300 MHz
- 8. Operating Voltage, maximum 80 V

 Remote Powering Fully complies with the recommendations set forth by IEEE 802.3bt (Type 4) for the safe delivery of power over LAN cable when installed according to ISO/IEC 14763-2, CENELEC EN 50174-1, CENELEC EN 50174-2 or TIA TSB-184-A

Testing of CAT6A and CAT6 cabling shall include those tests outlined in TIA standard (TIA-568-B.2, Addendum 1 for CAT6A and CAT6 cabling and for CAT6A and CAT6 connecting hardware) for each installed and terminated cable and an electronic and printed version of the report will be provided to the District.

- 1. Insertion Loss (IL)
- 2. NEXT, Near End Crosstalk, Loss (pair to pair)
- 3. FEXT, Far End Crosstalk loss
- 4. ELFEXT (pair to pair)
- 5. Return Loss
- 6. Propagation Delay (PD)
- 7. Delay Skew (DS)
- 8. Longitudinal Conversion Loss (LCL)
- 9. Longitudinal Conversion Transmission Loss (LCTL)

Any cable not passing testing requirements shall be repaired and tested again until it meets or exceeds requirements.

B. FIBER

All fiber cabling shall be cable type CMP, suitable for installation in Innerduct or encased in protective armored sheathing, and shall be terminated on fiber patch panels with **LC connectors**. A minimum thirty (30) foot service loop shall be provided at each fiber backboard terminal location. See General Installation Provisions section of this document for more detailed installation information.

All fiber cable types and quantities shall adhere to the following:

- 1. Fiber between the MDF and any IDF shall be 24 strand, OM3 or better, 50µ Multimode.
- 2. Fiber between any computer lab rack and the MDF shall be 12 strand, OM3 or better, 50µ Multimode.
 - a. All computer lab fiber MUST be run to the MDF, not any IDFs.
- 3. Fiber between any outside location (Little School House, PEC, Annex, building that is not physically connected to main school or which needs aerial or underground cable) shall be 24 strand Single Mode fiber.

50µ Multimode Fiber Optic Cabling should meet or exceed the following characteristics:

- 1. Type CMP, OM3 or better
- 2. Minimum Bandwidth 850 nm ONLY 2000 MHz.km
- 3. Minimum Bandwidth 850 and 1300 nm 1500 MHz.km and 500 MHz.km
- 4. Attenuation at 850 nm \leq 2.3 dB/km
- 5. Attenuation at 1300 nm \leq 0.6 dB/km
- 6. Macrobend Loss at 15 mm at 2 turns \leq 0.1 dB at 850 nm and \leq 0.3 dB at 1300 nm
- 7. Macrobend Loss at 7.5 mm at 2 turns \leq 0.2 dB at 850 nm and \leq 0.5 dB at 1300 nm
- 8. Refractive Index Difference 1%
- 9. Effective Group Index of Refraction (N_{eff}) at 850 nm 1.482
- 10. Effective Group Index of Refraction (N_{eff}) at 1300 nm 1.477

- 11. Fatigue Resistance Parameter (N_d) 20
- 12 Chromatic Dispersion
- 13. Zero Dispersion Wavelength (λ_0): 1295 nm $\leq \lambda_0 \leq 1315$ nm
- 14. Zero Dispersion Slope (S₀): \leq 0.101 ps/(nm2*km)

Single Mode Fiber Optic Cabling should meet or exceed the following characteristics:

- 1. Type CMP
- 2. Indoor/Outdoor rated cable
- 3. Attenuation at 1310 nm \leq 0.35 dB/km
- 4. Attenuation at 1383 nm \leq 0.35 dB/km
- 5. Attenuation at 1490 nm \leq 0.24 dB/km
- 6. Attenuation at 1550 nm \leq 0.20 dB/km
- 7. Attenuation at 1625 nm \leq 0.23 dB/km
- 8. Macrobend Loss at 5 mm at 1 turn \leq 0.1 dB at 1550 nm and \leq 0.3 dB at 1625 nm
- 9. Effective Group Index of Refraction (Neff) at 1310 nm 1.4670
- 10. Effective Group Index of Refraction (N_{eff}) at 1550 nm 1.4677
- 11. Fatigue Resistance Parameter (Nd) 20
- 12. Dispersion Wavelength (λ_0): 1550 nm $\leq \lambda_0 \leq$ 18.0 ps/(nm*km)
- 13. Dispersion Wavelength (λ_0): 1625 nm $\leq \lambda_0 \leq$ 23.0 ps/(nm*km)
- 14. Polarization Mode Dispersion Value: ≤ 0.06 ps/(nm2*km)

Testing of Fiber Optic Cabling shall adhere to the following:

- 1. Perform continuity testing using a visual fiber tracer, visual fault locator, or OLTS power meter and source. Test with appropriate laser sources to ensure that tests verify performance with that type of source.
- 2. Perform tests at 850 and 1310 nm for multimode. Perform tests at 1550 and 1625 nm for single mode. See above section for characteristics requirements to meet or exceed.
- 3. Test all fiber cable on the reel before installation to ensure continuity and no factory defects.
- 4. Perform insertion Loss tests.
- 5. Perform end-to-end loss testing for each fiber termination.

Any cable not passing testing requirements shall be repaired and tested again until it meets or exceeds requirements.

IMPORTANT:

For any new building location, AN OUTSIDE FIBER CONNECTION MUST BE SECURED from SDP's dedicated contracted fiber provider and terminated in the established MDF. This includes initial construction costs that shall be included in SDP Capital's construction budget, and must be initiated up to **SIX MONTHS PRIOR** to building opening. Not notifying the fiber provider of new building fiber needs will result in the building not having ANY functional network services, including data, wireless, phone, paging, and security cameras.

C. RACK INSTALLATION GUIDELINES

Contractor shall provide network racks in all telecommunication closets to accommodate fiber and copper patch panels, network backbone and distribution hardware, as well as all necessary power supplies and distribution devices. SDP Tech Services requires a combination of floor-standing and wall-mounted racks as described below. All racks must be a min. of 24" deep.

All network racks, fiber and copper patch panels, and any cable management (if applicable), must be installed following the guidelines listed herein. Any racks, panels, or other miscellaneous materials **not installed according to this document shall not be accepted** by SDP Tech Services and must be re-installed correctly.

1. For **NEW CONSTRUCTION**, Contractor shall provide the following:

MDF - The MDF shall have a minimum of one (1) primary 84" tall four-post floor standing rack, and one (1) secondary 25" high wall mounted rack installed. All racks must be a minimum of 24" deep, and maintain the required 36" of clear space in front of each rack.

- A. Primary Rack in MDF:
 - a. Patch panels in the Primary four-post floor standing rack shall be installed top down, in the following order:
 - i. Outside Plant Fiber Optic Panel at the top
 - ii. Fiber Optic Panels to IDFs, computer labs, and external buildings such as annexes, trailers, field houses, etc.
 - iii. 24-port 1U Copper UTP patch panel for copper Legacy Tie Cable connections
 - iv. 48-port 2U Copper UTP patch panels for WiFi Connections
 - v. 2U free space for each installed 48-port WiFi Patch Panel
 - vi. 48-port 2U Copper UTP patch panels for data and voice connections
 - b. The total number of patch panels, both fiber and copper, including the Outside Plant Fiber Optic panel, **shall not exceed 18U**.
 - c. All patch panels MUST be labeled as specified in this document.
 - d. Below the patch panels, SDP Tech Services shall install network hardware. For every 48-port copper UTP patch panel, installers shall leave an additional 2U of open space below panel section to accommodate said hardware.
 - i. For example, if there are seven (7) copper UTP 48-port patch panels at the top, installers shall leave 14U of open space in the hardware section of the rack.
 - e. Additionally, below the open hardware space, installers shall leave an additional 12U of open space to accommodate installation of network backbone equipment, power supplies, power distribution hardware, and possible expansion.
- B. Secondary Rack in MDF:
 - a. Patch panels in the secondary rack shall be installed from the top down.
 - b. A maximum of four (4) 48-port patch panels shall be installed in a wall mounted rack, leaving enough free space below to accommodate installation of network hardware, power distribution hardware, and future expansion.
 - c. In the event that the drop count exceeds the (4) 48-port panel limit in a wall mounted rack, a second floor standing rack must be installed alongside the primary data rack (in lieu of a wall mounted rack). All racks must be a minimum of 24" deep, and maintain the required 36" of clear space in front of each rack.

IDFs - The size and quantity of data racks installed in each IDF shall be determined by the number of network connections needed in the areas serviced by that closet. Wherever possible, each IDF shall have at least one (1) 84" high floor standing rack

installed. All racks must be a minimum of 24" deep, and maintain the required 36" of clear space in front of each rack.

- A. IDF Floor Standing Rack:
 - a. Patch panels in the Primary floor standing rack shall be installed top down, in the following order:
 - i. Fiber Optic Panel from MDF at the top
 - ii. Fiber Optic Panels to computer labs
 - iii. 24-port 1U Copper UTP patch panel for copper Legacy Tie Cable connections
 - iv. 48-Port 2U Copper UTP Patch Panels for Wifi connections
 - v. 2U free space for each installed 48-port WiFi Patch Panel
 - vi. Additional 4U free space for expansion
 - vii. 48-Port 2U Copper UTP Patch Panels for Data connections
 - viii. 2U free space for each installed 48-port Data Patch Panel
 - ix. 4U free space for power distribution devices
 - b. All patch panels MUST be labeled as specified in this document.
- B. IDF Wall Mounted Racks:

In the event that a floor standing rack will not properly fit in an IDF closet, multiple wall mounted racks may be installed instead.

- a. This solution can accommodate a maximum of 192 drops per rack.
- b. Patch panels in the wall mounted racks shall be installed from the top down.
- c. A maximum of four (4) 48-port patch panels shall be installed in each wall mounted rack, leaving enough free space below to accommodate installation of network hardware, power distribution hardware, and future expansion. All racks must be a minimum of 24" deep, and maintain the required 36" of clear space.
- 2. For **RENOVATIONS**, it is expected that all new wiring shall be retrofit into the school's existing closets. As many of SDP's existing school buildings were built, renovated, and then further modernized at varying points throughout the last century, it is expected that the state of each network closet within these buildings shall vary greatly.

It is the Architect and Engineer's responsibility to determine within existing school:

- 1. How much space is available in each patch panel for additional drops
- 2. How much space is available in each rack for additional patch panels (if needed)
- 3. How much space is available in each closet for additional racks (if needed)

The verification of this information MUST be done before the completion of design, as it will affect the layout and quantity of new network connections.

All new cabling shall be grouped in kind, as designated in the descriptions above. New copper and fiber cabling may be terminated on respective existing panels, provided that all installation complies with manufacturer recommendations and applicable industry standards. All new terminations shall be installed in a neat, logical, and sequential fashion, and comply with all labeling guidelines in this document.

If existing network hardware must be lowered to accommodate new patch panels in the existing patch panel section of the rack, Contractor shall notify SDP Tech Services prior to construction. SDP Tech Services shall be responsible for all network hardware installation and changes.

Under no circumstances shall Contractor remove any network switches, network backbone equipment, power supplies, or power distribution hardware. If the existing closet space is too limited to accommodate the proposed new network connections, an entirely new IDF closet must be created, and shall follow the guidelines for IDF Design above as well as New Construction in this section.

D. LABELING GUIDELINES

All copper and fiber network cabling shall be labeled on both ends - at the classroom/ workstation termination end, as well as the network closet patch panel termination end. All labels shall be comprised of a sequential numbering scheme that meets TIA/EIA-606 requirements, and shall include room location numbers as described herein.

All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive labels, or type written onto adhesive labels, with legible block characters that are at least one-eighth inch (1/8") in height. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the width of the tape shall not exceed 3/8".

CLASSROOM/ WORKSTATION TERMINATIONS

1. All copper cable terminations on the classroom/ workstation side shall be labeled in logical order with the respective network closet number, room location number, drop type, and drop number. The numbering and abbreviation scheme shall be as follows:

CLOSET# - ROOM# - TYPE INITIAL - DROP#

- a. For example, in room 205 there may be 8 Data drops which all terminate in IDF3. Those drops shall be labeled in sequential order as such:
 - i. "IDF3-205-D1"
 - ii. "IDF3-205-D2"
 - iii. "IDF3-205-D3", etc...
- b. If data drops are grouped together on a multi-port faceplate, and label space on each faceplate is limited, the network closet label may be shown once per group, provided that all drops in that group run to the same closet. Using the example above, if the 8 data drops in room 205 are grouped into (2) 4-port faceplates, they shall be labeled as such:
 - i. Faceplate 1 label: "IDF3"
 - 1. Data drop 1: "205-D1"
 - 2. Data drop 2: "205-D2"
 - 3. Data drop 3: "205-D3"
 - 4. Data drop 4: "205-D4"
 - ii. Faceplate 2 label: "IDF3"
 - 1. Data drop 5: "205-D5"
 - 2. Data drop 6: "205-D6", etc...
- 2. Type initials shall be designated as follows:
 - a. Data: "D"
 - b. Wireless: "W"
 - c. Speaker: "S"
 - d. Phone: "P"

- 3. Room initials for non-numbered locations shall be as follows:
 - a. Auditorium: "AUD"
 - b. Cafeteria: "CAF"
 - c. Gym: "GYM"
 - d. Library: "IMC"
 - e. Hallway: "HALL"
 - f. Main Office: "MO"
 - g. Any other locations not listed here which do not have a numerical room designation shall be abbreviated logically.
- 4. Other classroom/workstation side labeling examples are as follows:
 - a. 2 WiFi drops at the ceiling of classroom 104, which run back to the MDF:
 - i. "MDF-104-W1"
 - ii. "MDF-104-W2"
 - b. 8 speakers in the Cafeteria, which run back to IDF2:
 - i. "IDF2-CAF-S1"
 - ii. "IDF2-CAF-S2", etc...
 - c. 4 phones in the Main Office, which run back to IDF1:
 - i. "IDF1-MO-D1"
 - ii. "IDF1-MO-D2", etc...

NETWORK CLOSET TERMINATIONS

- 1. All cable terminations on the network closet side shall be terminated on patch panels and grouped together by type, as described in the Rack Installation section above.
 - a. All patch panels shall be labeled by drop type in order as follows:
 - i. "OUTSIDE FIBER" (if applicable only in MDF)
 - ii. "FIBER"
 - iii. "LEGACY TIE CABLES"
 - iv. "WIRELESS"
 - v. "DATA" (Data includes all: network data, voice, and headend controller drops.)
 - vi. "SPEAKERS"
 - b. All copper cable terminations on those patch panels shall be labeled in logical order with the respective room location number, drop type, and drop number. The numbering and abbreviation scheme shall be as follows:

ROOM# - TYPE INITIAL - DROP#

- 2. For example, all non-Wireless and non-Speaker copper cabling from classroom 201 and classroom 202, including 4 data drops each and 1 wall phone each, shall be terminated on the DATA patch panel. Those drops shall be labeled sequentially as such:
 - a. "201-D1", "201-D2", "201-D3", "201-D4", "201-P", "202-D1", "202-D2", "202-D3", "202-D4", "202-P"
- Additionally, in that same example, the Wireless Access Point cabling from both classrooms 201 and 202 shall be terminated in the WIRELESS patch panel in that same closet, and labeled sequentially as such:
 - a. "201-W1", "201-W2", "202-W1", "202-W2"

- 4. Additionally, in that same example, the Speaker cabling from both classrooms 201 and 202 shall be terminated in the SPEAKER patch panel in that same closet, and labeled sequentially as such:
 - a. "201-S", "202-S", "203-S", etc.
 - b. Hallways, offices, and shared spaces such as cafeterias and gymnasiums should be grouped together and labeled accordingly:
 - i. "HALL-S1", "HALL-S2", "HALL-S3", etc followed by "CAF-S1", "CAF-S2", "CAF-S3", or "AUD-S1", "AUD-S2", etc.

FIBER TERMINATIONS

1. Optical fiber cable segments shall be labeled at each end with the respective closet or classroom/lab identifier, as well as the cable type, as follows:

ROOM# - TYPE INITIAL

- a. For example, a 24 strand, OM3, 50µ Multimode fiber cable between the MDF and IDF1 shall be labeled as follows:
 - i. In the MDF: "IDF1-MM"
 - ii. In IDF1: "MDF-MM"
- b. For example, a 12 strand, OM3, 50µ Multimode fiber cable between the MDF and a computer lab in room# 305 shall be labeled as follows:
 - i. In the MDF: "Lab 305-MM"
 - ii. In the computer lab: "MDF-MM"
- c. For example, a 24 strand Singlemode fiber cable between the MDF and the Annex shall be labeled as follows:
 - i. In the MDF: "Annex-SM"
 - ii. In the Annex: "MDF-SM"
- 2. Additional fiber cable labeling shall include Warning Tags:
 - a. At each location where the fiber cable is exposed to human intrusion, it shall be marked with warning tags. These tags shall be yellow or orange in color, and shall contain the warning: "CAUTION FIBER OPTIC CABLE." The text shall be permanent, black, block characters, and at least 3/16" high.
 - b. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not more than five (5) feet. Any section of exposed cable which is less than five (5) feet in length shall have at least one warning tag affixed to it.

See Photo Appendix for additional information. Any additional labeling questions not addressed in this document shall be sent to SDP Tech Services for further clarification.

5. GENERAL INSTALLATION PROVISIONS

All IT infrastructure installation shall adhere to the following:

1. Where fiber or copper cable enters an MDF or IDF it shall be supported on horizontal or vertical cable support structures.

- 2. All fiber and copper cable in exposed areas shall be installed in conduit (Panduit or equivalent) or EMT as determined by installation location. Acceptable conduit types shall match existing sites as closely as possible. While many sites have existing conduit, Contractor should assume existing conduit is or will be full at time of installation, and thus should assume that new conduit will need to be installed where required.
 - a. Copper cabling may be run outside of conduits and above T-Bar suspended ceilings only when between the cable tray and the conduit wall stub-up, as per current electrical building code.
 - b. For any renovations of existing buildings, all copper cabling that is being replaced or is no longer in use shall be REMOVED from all conduit, cable trays, j-hooks, closets, and patch panels, as well as all other locations. Under NO circumstances shall discarded copper lines remain in ANY location.
- 3. All fiber and copper cable above dropped ceilings shall be installed in J-hooks, cable trays, wire rod cable trays, cable chases, conduit, or a combination thereof. J-hooks must be used between conduit stub-ups and wire rod cable trays (if applicable) for support.
 - a. IN NO CASE shall any cable be supported on ceiling tiles, t-bars, or tie-wrapped to any conduit or pipes. Cable MUST BE supported in all areas. Bridle rings and tie-wrapped supporting means are NOT ACCEPTABLE. Laying cable on a T-bar ceiling is not allowed by the NEC and is NOT ACCEPTABLE for support of CAT6A cabling.
- 4. All fiber and copper cable Interconnect Equipment and patch panels shall be mounted on the equipment racks with a minimum of four (4) of the mounting holes provided to be utilized for fastening.
 - a. All mounting screws shall be tightened to the extent that they hold the patch panels snug, but not so tight as to distort or damage them.
 - b. Screws shall be of the correct size and thread configuration for the holes in the rack.
 - c. All large openings into wall mounted cabinets shall be covered by a grommet.
 - d. All cable ties shall be of VELCRO TYPE tie-wraps only.
- 5. All fiber or copper cable patch panels and station termination points shall be assembled and installed in accordance with the manufacturer's instructions and recommendations. All necessary fiber or copper cable bends shall comply with minimum specified cable bending radii.
- 6. Fiber-specific installation shall adhere to the following:
 - a. From the MDF to each IDF or classroom/lab a continuous segment of fiber cable shall be installed.
 - b. Routing shall be via existing chases, cable trays, conduit, sleeves, and/or concealed above dropped ceilings (if applicable). Through each conduit section, the optical fiber cable shall be housed in a minimum 1-1/4" innerduct (if not armored cable), care being taken not to exceed NEC specifications regarding conduit fill.
 - c. For armored fiber in exposed areas, attach cables with plastic or metal clamps having large surface areas. Avoid pinching or squeezing cable. Cable clamps should be installed manually with gentle pressure. Special care shall be taken during the installation of fiber optic cable segments into the conduit system, to avoid damage to the cable. Fiber service loop shall be supported by a Re-Closeable Storage Ring.
 - d. Under pulling tension, the fiber optic cable shall not be bent into a curve with a radius of less than twenty (20) times the cable diameter, or no less than the manufacturer's minimum. Pulling tension shall not exceed the manufacturer's recommended maximum

tensile load. Contractor shall utilize a winch with tension control or a "break-away" link designed to break away at or below the recommended maximum tension.

- e. Mechanical, field polished, or fusion spliced connector termination is acceptable as long as it meets all optical characteristics required during testing.
- f. Dielectric armored fiber may be used in lieu of armored fiber as long as it conforms to building and electrical codes.
- 7. If any Fiber Innerduct is required for non-armored fiber cable, the following innerduct installation guidelines shall apply:
 - a. All fiber innerduct shall be installed in accordance with manufacturer's instructions and industry standards.
 - b. Innerduct shall be riser rated, pre-lubricated, ribbed, 1-1/4" optical fiber Innerduct with all necessary accessories. Use plenum rated Innerduct only where required.
 - c. From the MDF to each IDF, segments of optical fiber innerduct shall be installed and surface supported in chases and in dropped ceilings (if applicable) in the existing building.
 - d. Innerduct runs do not have to be continuous throughout breaks are expected at the pull boxes/pulling points although couplings shall be installed to keep Innerduct as continuous as possible for each run. Contractor is responsible for determination of actual lengths of innerduct required.
 - e. Enough innerduct shall be provided and installed to extend from the fiber service loop in the MDF to the fiber service loop in each IDF or classroom/lab. If the route passes through a pull box, the segments of innerduct shall extend twelve inches into the pull box.
 - f. If the route passes through an enroute IDF, each segment of innerduct shall extend at least twelve inches beyond the end of the service conduit.
 - g. DO NOT exceed manufacturers bend radius of the innerduct. Care shall be taken to avoid kinking the innerduct or applying excessive tension during the installation process.
 - h. At termination locations innerduct shall extend from the end of conduit to four (4) feet above the floor and shall be affixed to the backboard/wall by means of clamps designed for that purpose.

6. GENERAL WORK GUIDELINES

- Contractor shall provide installation materials and equipment for all necessary components, whether directly mentioned in this document or not, to install cabling components to create or complete a functional Structured Cabling System (SCS) in accordance with all applicable standards, as well as the guidelines contained in this document.
- 2. Installation materials and equipment shall be of high quality, and be installed with products that are approved/ recommended by the original manufacturer for such use. These include but are not limited to all cabling (optical fiber and UTP copper) and where required: innerduct, interconnect/ patching equipment (fiber and copper), racks, cabinets, cable trays, cable runway, fire stops, core bores, sleeves, supports (vertical and horizontal), cable management, connectors (fiber and copper), fan-out kits, wiring blocks, telecommunications outlets, and any other equipment required to support the physical SCS.
- 3. Material quantities are not given. Contractor shall provide appropriate quantities of all materials.

- 4. Contractor shall provide labor and any incidental material required for a neat, quality, and standards compliant installation. All installers must be authorized/ trained/ certified for the installation of all cable products being installed.
- 5. Contractor must certify the SCS and provide the manufacturer's warranty on the SCS before the District will accept the installation, including all as-builts and all test reports for the new fiber and copper connections.

7. APPLICABLE STANDARDS

All work shall comply with the following standards:

- 1. All current TIA/EIA Telecommunications Cabling standards and guidelines related to installation, testing and termination of Single Mode and Multimode fiber.
- 2. All current TIA/EIA Telecommunications Cabling standards and guidelines related to installation, testing and termination of UTP CAT6 and CAT6A.
- 3. BICSI Information Transport Systems Installation Manual current edition.
- 4. BICSI Data Centre Design Manual current edition.
- 5. BICSI Network Design Reference Manual, latest edition.
- NFPA-70-NEC Compliance: Comply with NEC requirements as applicable to construction, installation and color coding of both power type wires/cables and control/signal transmission media.
- 7. Products shall be UL-listed and labeled meeting or exceeding:
 - a. UL Standards 83, "Thermoplastic Insulated Wires and Cables"
 - b. UL 486A-486B, "Wire Connectors"
 - c. UL 2043, "Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces"
- 8. ASTM compliance with applicable requirements of D-2219 and D-2220. Provide copper conductors with conductivity of not less than 98% at 20°C (68°F).
- 9. FCC compliance with U.S. Federal Communications Commission Class 8 standard for allowable radiation from network equipment and wiring.
- 10. Most current NECA (National Electrical Contractors Association) Standards of Installation.
- 11. Electrical Code Compliance: Comply with all current applicable local and code requirements of the authority having jurisdiction.

8. CONTACT INFORMATION

SDP Technology Services: it-infrastructure@philasd.org

9. APPENDIX

Refer to the following pages for additional detailed information, including:

- 1. Photo Appendix
- 2. Typical Classroom Layout diagrams
- 3. Specifications for Wireless AP Hoffman Enclosure
- 4. Specifications for Oberon Wireless AP mounts
- 5. Metal Faceplates for Wall-Mounted Phones
- 6. Paging Amp Specifications
- 7. Speaker Specifications

PHOTO APPENDIX

A. Labeling Guidelines



1. Labeling Example #1: Wireless patch panel in the network closet.



2. Labeling Example #2: Data patch panel in the network closet.



3. Labeling Example #3: Fiber patch panel in the network closet.



4. Labeling Example #4: Data patch panel in the network closet.



5. Labeling Example #5: Classroom side terminations.

B. Speaker Installation



1. Speaker Installation Example #1: Use a patch cord to connect the RJ45 end to the jack at the speaker, strip the opposite end, and use the blue pair of the CAT6A to terminate - white to the common, blue to the watt.



2. Speaker Installation Example #2: Remove the exposed silver ends of the other leads/taps and tape them together. Do not cut them at the transformer. Ensure that the bare wire ends are not touching each other, as this will create a short and cause issues.

C. Kronos Bracket Installation



1. Kronos back bracket to be provided by SDP, installed by Contractor.

D. Outdoor AP Mount Installation



1. Acceptable mounting solutions for outdoor Wireless APs. Mount provided by SDP, installed by Contractor.





SPECIFICATIONS FOR ACCESS POINT MOUNTING ENCLOSURE

Each wireless access point and associated antenna(s) must fit and securely mount within the District's standard wireless access point enclosure – the nVent Hoffman Model #. AB811-A12106CHSCFG is an RF-transparent fiberglass enclosure containing a solid front hinged access door with key lock, and approximate exterior dimensions of 12 x 10 x 6 inches. Each enclosure contains four (4) internal screw mounts on the inside rear panel to accommodate a mounting bracket or other fabricated mounting solution for the access point hardware. Please refer to Figure 1 of the modified nVent Hoffman Model # AB811-A12106CHSCFG enclosure used throughout all District facilities.

To assist with heat dissipation and airflow, each nVent Hoffman enclosure has been modified by the District to include six (6) plastic vented plugs – Heyco® 2559 Louvered Plugs Black, oriented as three (3) vent plugs on opposing sides of the enclosure.

SPECIFICATIONS FOR ACCESS POINT MOUNTING ENCLOSURE

1. Each AP enclosure box will be mounted vertically, lock side up, on the designated wall. Maximum installation height will be 13' from top of box to the floor.



Figure 1. Front view



900-00-WH

Surface Wall Mount for Wi-Fi Access Points / White

Collection: H-PlaneM I Series: 90000

Oberon's H-Plane[™] Model 900-00 mounts and secures Cisco, Meraki, and HP Aruba APs directly on the wall or hard ceiling, with a convenient location to terminate the cabling. The 900-00 can be mounted directly over a wall outlet or cable cutout in the wall or ceiling. The 900-00 back plate is fastened to the wall, the AP is fastened to the 900-00 front plate, cabling is terminated inside, and the two halves are fastened together to form a low profile surface mount box. Available in white or black. Add a matching black AP cover to help to conceal AP in open ceiling environments.

NOTE: This product may be subject to Minimum Order Quantities (MOQ). Please contact your Oberon representative to find out more about possible MOQs for this product.



Features & Benefits

- · Conveniently surface mount APs on walls or hard ceilings
- Built-in mounting features for Cisco, Meraki, and HP Aruba AP
- · Provides for location to terminate local patch cord inside box
- AP cover can help to conceal AP in open ceiling environments. See the AP Cover Accessory Guide in the Resources section below

Technical Specifications

- Design: Surface mount box for APs. Designed to mount AP directly over wall outlet or anywhere on ceiling or wall with cable fed through, or surface raceway or conduit.
 Facilitates structured cabling compliant termination of horizontal cable inside box, and connecting patch cord to AP
- Low-profile 2-part construction. Base fastens to wall, AP fastens to cover. Cover slides
 onto base and fastens
- Available in White and Black
- · Kensington lock slot to protect AP and cabling
- Knockouts: (2) ¾ in. trade conduit, (2) Keystone jack module, (1) TIA 569-B compliant furniture faceplate for 2 jack modules
- Construction: 20 ga. powder-coated steel
- Size: 6.31 x 6.20 x 2.05 in. (160.274 x 157.48 x 52.07 mm)
- · Made in the USA

Fits the following AP's:

Aerohive AP110/120, AP20, AP250, AP320, AP330, AP340/350, AP370 Aruba AP-205, AP-214, AP-215, AP-224, AP-225, AP-303, AP-305, AP-314, AP-315, AP-324, AP-325, AP-334, AP-335, AP-344, AP-345, AP-515, AP-535, AP-635 Cisco 1600e/2700e/3500e/3600e/3700e/3700p Series, 1600i/1700i/2600i/2700i/3500i/3600i/3700i Series, 1830e/1850e Series, 1830i/1850i Series, 2800e/3800e Series, 2800i/3800i Series, 4800 Series, 9115AXE, 9115AXI, 9117AX, 9120AXE, 9120AXI, 9130AXE, 9130AXI Corning Spidercloud SCRN-310, SCRN-320/SCRN-220 Extreme Networks

AP410e, AP410i, AP505i / AP510i

Have questions about any of our solutions?

Contact us at 877-867-2312 or Sales@oberoninc.com

Shown with AP (not included)





3D view for 900-00-WH 🗙

Measurements (Maximum values*):

Width: 6.2 in. Back-box: xx in. Height: 6.31 in. Depth: 2.05 in. Item Weight: 1.5 lbs. Shipping Weight: 2 lbs.

Includes:

- (1) Two Part Surface Mount Box
- (1) Cable Tie
- (12) #6-32 Philips Head Screws
- Installation instructions

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Application	UPCB w tF 6 SCO CP mLBRIaO nDLOmat Ln LRtICt
Mounting	2IRPF
Total Ports, quantity	Ι

Dim9nEionE

Height	l I 5 824 mm l 4 56 n			
Wi,th	71 374 mm l 2 81 n			
Depth	7 366 mm l 0 29 n			

06F9Di6l SC97ifi76FionE

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Telephone Paging Amplifiers

Models TPU35B, TPU60B, TPU100B, & TPU250



TPU250 pictured

Description Bogen models TPU35B, TPU60B, TPU100B, and TPU250 are wall-mounted telephone paging amplifiers rated at 35, 60, 100, and 250 watts, respectively. All models can also be rack-mounted*. These TPU amplifiers permit paging from telephone and/or microphone; music input through an RCA jack or screw terminals; and voice-activated, variable level, music mute with fade back after page. These TPU amps include a night ringer which sends an electronic ringing tone signal through all speakers, alerting personnel of incoming calls. Jacks are also provided to bridge two TPU amplifiers to double the number of inputs and output power.

* B-Models require accessory kit.

Features

- 35, 60, 100, and 250-watt models
- Inputs for 600-ohm balanced telephone line, Lo-Z balanced microphone, and background music
- · Music input (RCA jack or screw terminals)
- Integral automatic level control (ALC) circuit for controlling pages made by persons with varying voice levels and paging techniques
- · Page from telephone and/or microphone
- Signal-activated paging channel automatically mutes background music
- Adjustable background music muting level during a page
- Music gradually returns to its normal level after a page
- Audio Enhancement circuit increases intelligibility, improves perceived loudness (with no increase in power), and reduces listener fatigue
- Separate controls for page volume, music volume, night ringer, music mute, and Audio Enhancement
- · Bass and treble controls

- Built-in night ringer activated by contact closure or by 90V ring signal
- Balanced or unbalanced 16-ohm, 25V, 25V CT, and 70V outputs are available for the TPU35B/60B/100B models; 25V and 70V outputs are available on the TPU250
- VOX sensitivity level control eliminates accidental transmission of background noise from a paging telephone
- · Thermal and electronic overload protection
- Jacks provided for bridging additional TPU amplifiers
- Brackets are attached to each model for easy wall mounting; the TPU250 can also be rack-mounted with included brackets; TPU-B models can be rackmounted with RPK82 mounting kit (sold separately)
- Peak level indicator lights when amplifier is driven into clipping
- 120V AC, 60 Hz power source
- · Listed to UL Standard 60065 for U.S. & Canada



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Technical	Power Output:	TPU35B: 35W RMS; TPU60B: 60W RMS; TPU100B: 100W RMS; TPU250: 250W RMS
Specifications	Frequency Response:	70 Hz to 15k Hz ±1 dB
opcomoations	Distortion:	Less than 1%
	Hum & Noise:	(20 Hz to 20 kHz) MUSIC: -70 dB: TEL: -70 dB: MIC: -55 dB
	Sensitivity:	MUSIC: 85mV; TEL: -20 dBm (77mV); MIC: 600µV
	Tone Control:	BASS: ±9 dB @ 100 Hz; TREBLE: ±9 dB @ 10 kHz
	Regulation:	2 dB
	Inputs:	TEL: 600-ohm balanced line, transformer-isolated
		MUSIC: Hi-Z source, RCA jacks or screw terminals
		MIC: Lo-Z balanced, screw terminal connection (dynamic only)
		MUSIC MUTE: Mutes music when shorted
		CONTACT RING: Sounds night ringer tone when customer-supplied dry
		contacts are closed
		TEL RING: Sounds night ringer in response to 90V ring signal
		BRIDGING: Permits bridging of two amplifiers
	Outputs:	25V, 25VCT, and 70V, 16 ohms balanced or unbalanced for 35/60/100-watt models;
		25V and 70V for TPU250. Provision for WMT1A line-matching transformer
	Controls & Indicators:	POWER & PEAK LEVEL LED indicators. ENHANCE, TREBLE, BASS, VOX SENS,
		RINGER VOLUME, MUSIC MUTE, MUSIC VOLUME, MIC VOLUME, TEL VOLUME,
		ALC controls (screwdriver-adjustable)
	Overload Protection:	All models have thermal and electronic overload protection.
		TPU35B: 1.0A, 120V AC circuit breaker; TPU60B: 1.6A, 120V AC circuit breaker;
		TPU100B: 2.5A, 120V AC circuit breaker; TPU250: 6.0A slow blo fuse, 120V AC circuit breaker
	Power Requirements:	(120V AC, 60 Hz) TPU35B: 0.75A; TPU60B: 1.5A; TPU100B: 2A; TPU250: 5A
Therr	nal Emissions (Full Power):	TPU35B: 166.3 BTU/hr.; TPU60B: 211.7 BTU/hr.; TPU100B: 396.2 BTU/hr.; TPU250: 853.8 BTU/hr
	Finish:	Black with silver lettering
	Dimensions:	<i>TPU35/60/100B models</i> : 14-1/4" W x 8-3/8" H x 3-5/8" D
		<i>TPU250</i> : 19" W x 10-1/2" H x 3-7/8" D
	Product Weight:	TPU35B: 12 lb.; TPU60B: 15 lb.; TPU100B: 18 lb.; TPU250: 28 lb.

Architect
and EngineerThe telephone paging amplifier shall be a Bogen Model
____, with a full power rating of _____watts. (Specify:
TPU35B/35 watts, TPU60B/60 watts, TPU100B/100
watts, TPU250/250 watts.) The amplifier shall provide a
frequency response of ±1dB from 70Hz to 15kHz, and
shall deliver rated power at less than 1% distortion.

The amplifier shall permit paging from telephone and/or microphone. The signal-activated paging channel shall automatically mute background music during a telephone page, eliminating the need for manual activation of switches and the use of external relays. Provision shall be included to set to mute the level of background music during a page. Music level shall be returned to its normal level after a page.

The telephone paging channel shall have a VOX sensitivity adjustment to eliminate transmission of background noise, and automatic output leveling (ALC) to compensate for varying voice levels and paging techniques of persons using the system.

An Audio Enhancement circuit shall be included to regenerate the harmonics lost during the amplification process and improve intelligibility. A control shall be provided to set the level of this effect.

A night ringer shall be included to alert personnel of incoming calls. The night ringer shall be activated by a contact closure or by 90-volt ring signal from the telephone line.

Input terminals shall be furnished for a telephone line and Lo-Z balanced microphone. A choice of RCA jack or screw terminals shall be provided for the music source. Terminals shall also be provided to control music muting, typically during a mic page, and for contact closure or ring signal activation of the night ringer. Bridging jacks shall be provided to bridge two TPU-series amplifiers.

Balanced or unbalanced outputs shall be provided for 16ohm, 25V, 25VCT, and 70V speaker lines (for TPU250, 25V and 70V only). Provision shall be included to drive a 600-ohm telephone line, using an accessory line-matching transformer (Model WMT1A).

Individual controls shall be provided to set the telephone and mic page volume, music volume, night ringer volume, VOX sensitivity, and music mute level. Bass and treble controls shall permit tonal adjustments. An automatic level control (ALC) and VOX sensitivity control shall be included. A peak level indicator shall illuminate when the amplifier is driven into clipping. A power indicator shall also be provided. The amplifier shall operate from a 120V AC, 60Hz source, and shall be equipped with a resettable circuit breaker and thermal and electronic overload protection (TPU250 has a 6A slow-blo fuse).

Installation shall be facilitated by flanges with keyhole slots for mounting on a suitable backboard. Dimensions for the 35, 60, and 100 models shall be 14-1/4" W x 8-3/8" H x 3-5/8" D. Dimensions for the TPU250 shall be 19" W x 10-1/2" H x 3-7/8" D.

The amplifier shall carry the necessary safety agency listings for both U.S. and Canada.





Zone Paging System

PCM2000



Features

- One zone to 99 zones of simultaneous high-power and low-power paging
- · Up to 32 paging zone groups
- Universal analog telephone interface designed for direct connection to loop start and ground start trunks, to PBX or KEY paging ports which supply DTMF capability, and to analog T/R lines
- Modular integration assures reconfiguring and expansion with minimum time and expense
- Optional talkback paging and time-triggered signaling events with PCMTBM module
- · Field programmable using DTMF and switches

- Signaling features include night ringer zone group, emergency/shift change zone group, code call zone group
- · Emergency All-Facility Override Paging
- Background music assigned per zone; Local Background music sourcing capability
- · Relay drivers and AUX contacts included
- · Allows total system amplifier power of up to 250W
- Mounting Kit for 2 to 6 modules available as an accessory (RPK84)
- Mounting Kit for up to 10 modules available as an accessory (RPK88)

Technical Specifications

Registered under Part 68 of FCC Rules

Ringer Equivalence: Operating Voltage: Operating Current (max.): Audio Power Capability: Operating Temperature: Operating Humidity: Dimensions (single module): Shipping Weight (each module):

ce: 1.0B
ge: 12V DC
x.): 1.5A (9-zone system)
ity: 250W
ity: 25 to 100°F
ity: 0 to 90% non-condensing
le): 1-1/2" W x 7-1/2" H x 4-1/4" D
Approximately 1-2 lb.



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Description

The Bogen **PCM2000** is a modular telephone zone paging and control system. By integrating unique, multi-function modules, the PCM2000 offers both incredible flexibility and capability for future expansion.

The Bogen PCM2000 Zone Paging System is designed for direct connection to loop start and ground start trunks, to PBX or KEY paging ports which supply DTMF capability, and to analog T/R lines. The unit allows total system amplifier power of up to 250W.

The PCM2000 is a fully-integrated zone paging and signaling system with an extensive list of features:

- Simultaneous high- & low-power paging
- Zone and zone group paging (32 paging zone groups, each with up to 99 zones)
- Talkback capabilities (requires PCMTBM module)
- Background music assigned per zone
- Local BGM sourcing capability
- Night ringer zone group
- Emergency zone group with choice of built-in tones or outside tone source
- · Emergency all-facility page override
- Eight daily time-triggered signaling events (requires PCMTBM module)
- Pattern & echo code calling
- Daily master clock synchronization
- Relay driver per zone
- Auxiliary contacts

The PCM2000 allows for the design of a system that is specifically tailored to the requirements of the facility owner. The basic system supports up to three paging zones and consists of only three modules:

PCMCPU - Central processor

PCMTIM – Telephone interface

PCMZPM - Zone module (3 zones)

The **PCMCPU** module includes a set of DIP switches to set the system ID, a Program/Run switch that allows system programming, a Power jack for 12V DC power, and audio connections for central amplifier, low-power BGM, high-power BGM, emergency/shift change trigger, and auxiliary trigger. The **PCMTIM** telephone interface module incorporates a universal interface so that connection to any telephone system is rapid and trouble-free. The module connects to the telephone system via a standard RJ11 plug and port type is selected simply by using slide switches. All other connections are made to built-in terminal blocks.

Setup is also easy. Zone group programming, selection of all signaling functions, and all other parameters are set by simply dialing in with a touch-tone telephone.

The telephone interface module is equipped with three RJ11 jacks for Override, Page Port/Trunk, and 90V Night Ring/Station. The Night Ringer feature can be activated from 90V ring signal or contact closure. The Page Port/Trunk jack can be used to program the system locally and provides 48V talk battery. The Override feature permits all-zone override paging from a dedicated telephone, trunk, or microphone (with suitable pre-amp).

The **PCMZPM** zone paging module can operate high-power or low-power paging to self-amplified paging systems (only one type per PCMZPM module). For high-power paging, a single amplifier can be used for paging and supplying background music (when not paging). Background music can also be continuously supplied to all zones not being paged with the addition of a second amplifier. For low-power operation, background music is always supplied to zones not being paged. Each module can also be disconnected from the background music bus and connected to a local background music source.

Two additional zone modules can be added to the basic system to increase capacity to 9 zones. When more than 9 zones are required, a central processor module with power supply and up to 3 zone modules can be assembled as a satellite system. Ten additional 9-zone satellite systems can be installed to bring total capacity to 99 zones.

A talkback module (PCMTBM) can also be added to the system to provide hands-free talkback capability. Only one talkback module is required regardless of the number of zones or satellite systems on the PCM2000 system.

Relay driver outputs are provided for each zone. Two C-form contact sets are also provided to control the activation of accessory equipment.

DTMF Programmable Features:

- Privacy Beep
- Pre-announce Tone
- Confirmation Tone
- Emergency Override Tone
- All-Call
- Dialing Timeout
- Trunk Disconnect

- 1 Amp BGM
- Default Timer
- VOX Timer
- Zone Groups
- Emergency/
 Shift Change

- Night Ring
- Code Call
- Clock Set
- Clock Sync.
- Time Trigger 1-8
- Reset Default
- Setup Tone

Modules Required For Zone Paging Applications:

		Total Number of Zones in System									
	3	6	9	12	15	18	21	24	27	More Than 27 Zones	99 Zones
PCMTIM	PCMTIM										
PCMCPU*	J* 1			2			3			1 PCMCPU for every 9 Zones	11
PCMZPM	PCMZPM 1 2 3		4	5	6	7	8	8 9 1 PCMZP every 3 Z		33	
РСМТВМ	A Module Required For Each Total System (optional module for talkback or time tone options)										
*Note: One P(MPS2 Power Supply (not included) is required for each PCMCPLI Module										

Architect & Engineer Specifications

The zone paging system shall be the Bogen PCM2000 Zone Paging System, designed for direct connection to loop start and ground start trunks, to PBX or KEY paging ports which supply DTMF capability, and to analog T/R lines. The unit shall allow total system amplifier power of up to 250W.

The unit shall include flanges with keyhole slots for wallmounted installation. Operation shall require a 12V (1.5A) DC power supply. A suitable power supply shall be provided (PCMPS2 power supply).

The system shall consist of the appropriate modules as specified and shall be registered under Part 68 of FCC rules.

Modules

All modules shall be designed for wall-mount installation. All modules shall be equipped with a ribbon cable and connector and power cable with connector to permit them to be interconnected to each other. The face plates of each module shall be finished in black, with each control/connector clearly labeled in white. Each face plate shall have knockouts to facilitate cable and wire dressing. All connections shall be made using a small regular screwdriver or common jacks (RJ11 or RCA).

The following modules shall be available:

PCMTIM - Telephone Interface Module. One PCMTIM module shall be provided per PCM2000 system. The module shall provide for telephone interface selection via slide switches. It shall include a volume control for tone and BGM source, and RJ11 jacks for Override, Page Port/Trunk, and 90V Night Ring/Station inputs. A connector block, using screw terminal connections, shall be provided for BGM source, and two (2) C-form relay contact sets. A power-on LED indicator shall be provided to indicate power-applied status.

PCMCPU - Central Processing Module. One PCMCPU module shall be provided for the first nine (9) zones in the system. One PCMCPU module shall be needed for each satellite system.

The module shall provide for satellite system identification via built-in DIP switches. It shall include a locking program/run selector switch (with program LED), satellite data link RCA jack, and 12V DC power source jack. A connector block, using screw terminal connections, shall be provided for paging amplification connection, low-power and high-power BGM connections, emergency/shift change signal activation, AUX contact closure, and 12V DC power source connection. A power-on LED indicator shall be provided to indicate powerapplied status.

PCMZPM - Zone Paging Module. One PCMZPM module shall be provided for each three (3) paging zones in the system. Up to three (3) PCMZPM modules may be connected to the master system, for a total zone capacity of 9 zones. Up to three (3) additional PCMZPM modules may be connected with a PCM-CPU module to form a satellite system to further increase zone capacity.

The PCMZPM module shall provide built-in DIP switches to set talkback on/off for each zone. It shall include a power-on LED, low-power background music volume control, background music out/in jumper field, local BGM selection jumpers, and high-power/low-power operation selector switch. A connector block, using screw terminal connections, shall be included to connect local background music, zone wiring, and relay driver outputs.

PCMTBM - Talkback Module. One PCMTBM talkback module shall be provided per system (including any satellite systems). The module shall provide for talkback operation in centrallyamplified zones (only). The module shall provide a power-on LED, talkback volume control, and talkback switching delay control. A connector block, using screw terminal connectors shall be included for paging amplification wiring.

Architect & Engineer Specifications, cont.

The PCM Zone Paging System shall supply the following features and functions:

- 1. Simultaneous high-power and low-power paging. Total system high-power audio capacity of 250W.
- 2. A minimum of three paging zones and maximum zone capacity of ninety-nine (99) paging zones. The system shall be expandable in groups of three zones.
- 3. Up to 32 field-programmable paging zone groups, each consisting of 1 to 99 zones.
- 4. Field-programmable Night Ringer Zone Group, consisting of from 1 to 99 zones. This feature shall be activated by high-voltage ring signal or contact closure.
- 5. Field-programmable Emergency/Shift Change Zone Group, consisting of from 1 to 99 zones. This feature shall require activation by a customer-supplied contact closure, and sound a user-selected tone. The user shall have the choice of no tone (allowing use of outside tone source), tone burst (1-7 sec. duration, user-selected), single chime, or quad beep.
- Emergency All-Facility Page Override. This feature shall be activated through a loop start trunk or through contact closure and dry audio input. It shall override the normal paging features of the system, sound a user-defeatable alert tone in all zones, and open an audio channel for a voice page.

- 7. Built-in, talkback amplification of central-amplified zones. This feature shall require the addition of the PCMTBM module.
- 8. Background music assigned per zone and local background music sourcing capability.
- 9. Field programmable Code Call Zone Group, consisting of from 1 to 99 zones. The user shall have the choice of pattern or echo code calls, and repeat functions.
- 10. Eight daily time-triggered signaling events. This feature requires the use of the PCMTBM module.
- 11. Two (2) C-form relay contact sets for activating external equipment. The contacts shall change state when the unit is activated.
- 12. Capability of providing uninterrupted background music to all zones not being paged.
- 13. Non-volatile RAM shall be included to allow for retention of programming information during power interruptions
- 14. Screwdriver-adjustable volume control of confirmation, pre-announce, error, and shift change/emergency-call tones.

Mounting Accessories

RPK84 Rack Mount Kit

- Holds up to 6 Modules in one assembly
- Fits in a standard rack, 4 rack spaces high



RPK88 Rack Mount Kit

- Flush mounts up to 10 Modules in two assemblies
- Fits in a standard rack, 6 rack spaces high
- Includes wiring saddles and knockouts for wire management





Metal Box Speakers

Models MB8TSQ, MB8TSL, MB8TSQVR, and MB8TSLVR



Description Bogen's MB8TSQ and MB8TSL speakers feature an all-steel surface-mounted enclosure with an 8" cone loudspeaker and multi-tap 4-watt 70V/25V transformer. The MB8TSQ speakers are suitable for ceiling or wall mounting. The MB8TSL speakers are designed primarily for wall mounting, with front face angled downward by 12.5 degrees. Models with VR suffix have a recessed volume control at the center of the grille (see *inset*).

	 Compatible with 25V or 70V amplifier systems Multiple taps at 4, 2, 1, 1/2, 1/4, 1/8 watts 	 Knockouts for Wiremold[®] VR Models feature recessed volume control at the center of front speaker grille
Features	 Rugged all-steel surface-mounted enclosure Full range 8" cone speaker for excellent intelligibility 	 4-Watt maximum output power Mounting hardware included (toggle bolts, wood screws and wire crimps)

Technical	Cone Diameter:	8" (paper)
Specifications	Magnet Weight:	6 oz.
specifications	Power Rating (max.):	4 Watts
	Transformer Power Taps:	4, 2, 1, 1/2, 1/4, 1/8 Watts
	Constant Voltage Amp Type:	70V or 25V
	Frequency Response:	110 Hz -15 kHz
	Sensitivity (min.):	96 dBspl (1W @ 1m on axis)
	Dispersion (min.):	100°
	Product Weight:	9 lb.
	Enclosure Size:	MB8TSQ(VR) - 11-5/8" W X 11-5/8" H X 4-1/4" D; MB8TSL(VR) - Top: 11-5/8" W X 11-5/8" H X 5-3/8"; - Bottom: 11-5/8" W X 11-5/8" H X 3-1/8" D
	Construction:	Painted steel enclosure

Architect & Engineer Specifications The speaker shall be a Bogen Model (specify MB8TSQ, MB8TSQVR, MB8TSL, or MB8TSLVR). The unit shall include an 8" paper cone speaker with 6 oz. magnet. The frequency response shall be 110 Hz to 15 kHz. Dispersion angle shall be no less than 100°. Sensitivity, measured 1 watt @ 1 meter on axis, shall be a minimum of 96 dBspl.

The unit shall incorporate a transformer with tap selection wires corresponding to power settings of 4, 2, 1, 1/2, 1/4, and 1/8 watts for both 70V and 25V constant voltage speaker systems.

Models with VR suffix shall feature a recessed volume control centered in the front speaker grille.

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The speaker enclosure shall be full steel construction and allow for surface mounting. The enclosure shall be painted off-white and measure___ [specify 11-5/8" W X 11-5/8" H X 4-1/4" D for MB8TSQ(VR) or 11-5/8" W X 11-5/8" H X 5-3/8" D (top) and 11-5/8" W X 11-5/8" H X 3-1/8" D (bottom) for MB8TSL(VR)]. The speaker enclosure shall also provide Wiremold® knockouts.

Front face of models MB8TSL(VR) shall be angled by 12.5 degrees downward. Product weight shall be 9 lb.





The SYSTEM 6VPS is a complete, vandal resistant horn assembly featuring a double re-entrant, compression horn with an integrated 16W, 25/70V, multi-tap transformer that is mounted on a vandal resistant, stainless steel baffle. It also includes a square, heavy gauge stainless steel, surface mount enclosure with four (4) threaded inserts for baffle attachment, a single $\ensuremath{\ensuremath{\mathcal{I}}}^{"}$ conduit entrance and a Wiremold entrance on the top and bottom. Tamper resistant, 8-32 x 1", 'pin-in-torx' screws are included. It has a high durability, white, powder coat finish.



APPLICATION	Intended Use:	Indoor or protected outdoor environment				
	Program Material:	Signal tones, and voice				
	Installation:	Vertical or horizontal surface mount				
AUDIO	Average Sensitivity:	110dB SPL, 1W/1M				
PERFORMANCE	Loudspeaker Power Rating:	16W RMS, EIA 426A Standard				
	Calculated Output:	121dB SPL, 16W/1M				
	Magnet Type & Weight:	BeFe Ceramic, 5 oz. Nominal				
	Frequency Response:	350Hz - 10kHz, EIA 426A Standard				
	Nominal Coverage Angle:	90° Included Angle, -6dB/2kHz, HalfSpace				
	Audio Connection:	7", Color-coded, Pre-tinned Leads				
COMPONENT	Dimensions:	11 ^{5/8} " (H) x 11 ^{5/8} " (W) x 4 ^{1/8} " (D)				
	Weight:	12 lbs.				
	Loudspeaker Model:	H16				
	Loudspeaker Specs:	Double re-entrant horn				
	Transformer:	16W, 25/70V, with 5 taps (1W, 2W, 4W, 8W, 16W)				
	Baffle:	BS8VPS: square, stainless steel				
	Enclosure:	SE1WVPS, stainless steel				
	Finish:	White powder coat finish				
	Other:	Tamper resistant, 8-32x1" 'pin-in-torx' hardware included				









Reentrant Horn Loudspeakers

Models SPT15A and SP158A



Description The Bogen SPT15A and SP158A are compact, high intelligibility, reentrant type loudspeakers, designed for one-way or two-way sound and communication systems. Their sturdy, weatherproof, all-metal construction is ideal for indoor and outdoor use in industrial plants, warehouses, schools, construction sites, transportation terminals, and recreational areas.

The Model SPT15A has a built-in, rotary impedance selector switch for matching the speaker power requirements to a 25V or 70V constant-voltage line. The model SP158A has an 8-ohm impedance only.

- High intelligibility and efficiency; ideal for both one-way and talk back applications
- Weatherproof, all-metal construction

Features

- 15 watts; 25/70 volt (SPT15A) or 8-ohm (SP158A) operation
- Tap settings for 70V: 15, 7.5, 3.8, 1.8, 0.9 watts; for 25V: 15, 7.5, 1.8, 0.94, 0.46 watts
- Rotary tap impedance selector on SPT15A
- Tilt and swivel base for easy positioning
- Screw terminals make installation fast and easy

- All-purpose mounting bracket
- Self-aligning, field replaceable diaphragm
- Mocha enamel finish
- Limited lifetime warranty
- Mountable to I-beam flange using Bogen's BC1 Beam Clamp (sold separately)
- Mountable to electrical box using Bogen's HSES10 mounting strap (sold separately)
- Terminal Cover (TCSPT1) allows connection of conduit fittings to horn speakers (sold separately)



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	Power Rating (RMS):	15 watts co	ntinuous, 20	watts ec	qualized		
Technical	Frequency Response:	275 Hz to 14 kHz					
Specifications	Impedance:						
•	SPT 15A —	25/70 volts					
	SP 158A —	8 ohms 121 dB @ four feet on axis with 15 watt input					
	Sound Pressure Level:						
		@ 1000 Hz					
	Dispersion:	110°					
	Sensitivity as Microphone:	-22 dBm [Ref: 10 dynes/cm2]					
	Dimensions:	9" Diameter x 9-1/4" D					
	Product Weight:						
	SPT 15A —	4 lb.					
	SP 158A —	3 lb.					
	Finish:	: Textured mocha enamel					
Impedance Se	elector Switch Settings (SPT15A only):	: 25V @ 15, 7.5, 1.8, 0.94, 0.46 watts 70V @ 15, 7.5, 3.8, 1.8, 0.9 watts					
	Sound Pressure Level in dB @ 1000Hz:	Watts	Feet on Axis				
		Input:	4	8	16	32	64
		15	121	115	109	103	97
		7.5	118	112	106	100	94
		3.8	115	109	103	97	91
		1.8	112	106	100	94	88
		0.9	109	103	97	91	85
		0.46	106	100	94	88	82

Architect and Engineer Specifications The loudspeaker shall be a Bogen Model_____ (specify SPT15A or SP158A), or approved equal, reentrant type horn loudspeaker. The frequency response shall be 275 Hz to 14 kHz. Rated power output shall be 15 watts, RMS continuous. Dispersion shall be 110°. Sound pressure level, measured four feet on axis with 15 watt input @ 1000 Hz, shall be at least 121 dB.

Use for SPT15A. The unit shall incorporate a seven-position weather-sealed switch, to allow matching the loudspeaker to a 25V or 70V constant-voltage line. Power handling capacity shall be adjustable at 70V to 0.9, 1.8, 3.8, 7.5, or 15 watts, and at 25V to 0.46, 0.94, 1.8, 7.5, or 15 watts.

Use for SP158A. The unit shall have an impedance of 8 ohms.

The loudspeaker shall be of weatherproof, all-metal construction, with driver enclosed within a weatherproof housing. The loudspeaker shall include a self-aligning, field-replaceable diaphragm.

Screw terminals shall be provided for connection to the audio line. A plastic cover shall be provided to protect the connectors and impedance selector switch, and provide strain relief for the audio line.

An all-purpose mounting bracket shall provide precise positioning in the vertical and horizontal planes with a single adjustment. The bracket shall include banding slots to permit mounting the loudspeaker on beams or pillars. Bracket and loudspeaker shall be finished in textured mocha enamel. The unit shall measure 9" diameter by 9-1/4" D. Product weight shall be _________(insert 4 lb. for SPT15A, 3 lb. for SP158A).

