

**SECTION 27 51 24
INTERCOM SYSTEMS
(NEW and MODERNIZED SCHOOLS)**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Intercom equipment
- B. Intercom cable
- C. Accessories
- D. Surge Protection

1.2 REGULATORY REQUIREMENTS

- A. System: Listed by UL, ETL, or FM

1.3 SYSTEM DESCRIPTIONS

- A. The system shall consist of integrated IP based & intercommunication equipment, network distribution equipment, software-controlled system, power supply, overhead paging system, station loudspeaker assemblies, call-in switches, a UPS system, surge suppression, and all associated material, hardware, wiring, and options as described herein to provide a complete working system that shall meet the specified requirements.
- B. The system shall provide the following communications functions:
 - 1. Communication between classrooms and administrative areas utilizing VoIP (Voice over Internet Protocol)
 - 2. Communication between all offices, corridors, restrooms, exterior locations, cafeteria, gymnasium, auditorium, and all administrative spaces.
 - 3. System shall provide VoIP, overhead paging, emergency paging, class change time tones and program material.
 - 4. Remote activation of emergency tones
- C. The system shall provide the facilities for paging or sounding emergency signals or time event signals to selected groups or to all remote speakers.
- D. The system shall provide facilities for the control and distribution of up to two program channels to individual, selected groups or all remote speakers.
- E. The system shall include a built-in master clock and programmer capable of correcting appropriate secondary clock displays and controlling events based on user-programmed time schedules.
- F. The system will use industry standard 25-volt Technology to the classroom speakers.
- G. Furnish and install a UPS system to provide 90 minutes standby operation.
 - 1. UPS shall maintain continuous battery power through the inverter at all times.
- H. Surge suppression for each intercom conductor terminated in the main intercom terminal cabinet.
 - 1. Provide manufacturer recommended transient absorption devices.
 - 2. Each terminal point at the main console shall have individual surge suppression.
- I. Additions to an existing system shall be compatible to the existing manufacturer's control specifications.
- J. The ability to be distributed via a fiber 10/100/1000Mb switched, VLAN (Virtual Local Area Network) enabled network or 10/100/1000Mb switched stand-alone intercom network. It shall be possible to eliminate the need for copper feeder cables between the Main and Intermediate distribution frames using fiber optic cabling.

- K. Shall have SIP (Session Initiation Protocol) Integration to connect all talk-paths to the VoIP phone system of choice. This shall support registering as an extension on the system or through the use of a SIP Trunk.
- L. The system shall provide the ability to support a SIP tunnel from the building's VoIP phone system to provide two-way communication from all administrative telephones to any location equipped with a talkback speaker or audio system with room microphone.
- M. System shall interface with any VoIP telephone system using SIP type integration thus allowing the school(s) to upgrade or replace their telephone system without suffering a requirement to replace, or lose any feature of, their internal communications (intercom) system. Any system that limits system features based upon any selected telephone system and is not SIP based shall not be acceptable.
- N. Automatically sound a tone over any loudspeaker connected for two-way communication to alert the classroom teacher that this 2-way call has been established. This is intended to prevent unauthorized monitoring.
- O. Distribution of emergency announcement(s) from any authorized telephone to all areas furnished with a loudspeaker. Emergency announcements shall have the highest system priority.
- P. Distribution of general announcements from any administrative telephone, staff telephone, or classroom telephone. The system shall be capable of providing all-call, group call, or multiple group call.
- Q. Classroom speakers or audio systems with room microphone shall be software assignable to unlimited paging groups.
- R. System shall support a strobe light to be used in conjunction with audible messages for loud areas.
- S. The system shall provide an administrative console for the front office, consisting of a touch screen interface no less than 22" diagonal interface.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate cable routing and connections.
- C. Submit product data for each item of equipment.
- D. Submit manufacturer's installation instructions.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01 77 00.
- B. Provide as built AUTOCAD drawings; indicating actual locations of all devices, terminal boxes, junction boxes, as well as the conduit run, wiring and point-to-point wiring diagrams.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Sections 01 77 00 and 01 78 23.
- B. Operation Data: Include instructions for routine operation of master and remote stations.
- C. Maintenance Data: Include instructions for repair trouble-shooting (with replacement parts list), preventive maintenance, and cleaning of all equipment supplied.
- D. Include manufacturer representative's letter stating that the system is fully tested and operational.
- E. Provide one set of factory service and installation manuals, which shall include schematics on each component in the system.

1.7 EXTRA MATERIALS

- A. Provide six sets of any keys used in the system.
- B. Provide two complete complements of spare fuses used in the system.
- C. Provide one spare CPU card, one auto-routing card, and one auto-switching card.

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1. Deliver all cards and pertinent information on the intercom system to the M&PO Intercom Shop upon substantial completion.

1.8 QUALIFICATIONS

- A. Manufacturer
 1. Company specializing in manufacturing the products specified in this Section with minimum 5-years of experience.
 2. Company shall have a representative within 150 miles of Palm Beach County School District.
- B. Supplier: Company authorized by manufacturer and specializing in supplying products specified in this Section with minimum 5-years of experience.
- C. Installer: A company specializing in installing the products specified in this Section with minimum 5-years of experience and factory trained.

1.9 TRAINING

- A. Provide minimum of six hours classroom instructions and training for school center.
- B. Schedule the training times with school principal.
- C. Provide minimum of six hours classroom instruction and training on programming and troubleshooting to the School District Maintenance Department Electronic Technicians.

1.10 WARRANTY

- A. The manufacturer and installation contractor shall guarantee the system, equipment and all its components for a minimum of one (1) year from date of final acceptance of the system as documented by the Architect / Engineer. This guarantee shall cover the replacement of all parts and labor to replace the same made necessary by normal usage and wear.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Audio Enhancement – EPIC (Education Paging & Intercom Communications) System
- B. Substitutions: Under provisions of Section 01 60 00

2.2 GENERAL REQUIREMENTS:

- A. Intercom Paging System:
 1. The system shall be a software-controlled system, whose primary interface is a web-based portal, accessible from any authorized computer.
 2. The system shall provide a simple calendar-based scheduling system for bells. It shall provide the ability to have an unlimited number of bell schedules.
 3. The system shall provide a map-based User Interface. All major functions, including Intercom, Paging, Notifications and Alerts shall be done using the map as the foundation for those actions. Paging shall clearly show on the map where the page audio will be transmitted to.
 4. Bell Schedules shall be easily assigned to days and changed simply with authenticated access to the system through any browser-based device. Bell schedules shall be able to be changed even if a current schedule is active in the system same day and apply immediately.
 5. The system shall support utilizing a shared data network and support (VLAN [Virtual Local Area Network] enabled) or dedicated network as means of distribution for all voice overhead paging, emergency paging, emergency tones, intercom, and class change tones. System shall support routing of traffic across multiple subnets and network segments.
 6. The system shall be capable of accessing all classrooms including portables, and temporary classrooms etc. via IP interface or room audio system with room microphone. This shall

- provide intercom, class change tones, emergency tones, and normal / emergency paging via a wired network to these remote locations.
7. Exterior speakers shall be capable of being on separate zones and programmed separately.
 8. The system shall have the ability to produce user defined tone signals for time tones or emergency tones.
 9. The system shall have SIP Integration to connect all talk-paths to the VoIP phone system of choice.
 10. The system shall provide the ability to support a SIP trunk from the building's VoIP phone system to provide two-way communication from all administrative telephones to any location equipped with a talkback speaker or audio system with room microphone.
 11. The system shall interface with any VoIP telephone system using SIP type integration thus allowing the school (s) to upgrade or replace their telephone system without suffering a requirement to replace, or lose any feature of, their internal communications (intercom) system.
 12. The system shall provide its own SIP environment, and in the case of a failure of the schools VoIP telephone system, be capable of operating completely independently for all functions, save access from the handsets connected to the schools VoIP system.
 13. The system shall not be reliant on WAN or internet connectivity for operation.
 14. The system shall provide web access, which will give ability to monitor operations and functions of the system.
 15. The system monitors the status of all connected devices for health, SIP connectivity and connected devices including the XD receiver. If a device becomes in a degraded or offline state, the system will monitor a technical contact via email and or SMS as well as show status on the map of the console.
 16. The system shall provide web-based off-site programming and diagnostics of the system. It shall also be capable of determining basic circuit faults.
 17. The system shall have a Web based administration programming tool which allows the administrative personnel to easily manage Audio Sources, Class Change schedules, paging groups, time updates, holiday schedules and day/night mode operation from an internet browser. System shall support HTML5.
 18. The system shall provide calendar-based scheduling up to four years in advance. The system shall be capable of displaying a fully year calendar and differentiating which bell program is scheduled to run on each day. The calendar shall be based on a standard school year and provide a selectable start month for example, it can be configured to run from August to July.
 19. The system shall provide discreet control over roles for the system. Roles shall be definable down to the individual feature level and provide the district with the ability to restrict or grant access to any roll individual features or groups of features.
 20. The system shall provide web browser access to the system specifically for a teacher. The Teacher screen shall provide information specific to the room that the teacher is assigned to. That information shall consist of, but not limited to, the next scheduled event for the

- room (Bell, Announcement, etc.), Audio/Visual Controls for their classroom technology, Teacher Name, Room Number, an Intercom Call button, and an Emergency call button.
21. The system shall have the ability to carry IP Communications to the edge of the classroom Audio/visual Systems. It shall be able to control connected A/V Devices, provided that those devices are controllable by RS-232
 22. The system shall provide 2-way handsfree communication in each classroom.
 23. System Classroom and Common Zone network interfaces shall be capable of utilizing standard Cat 6/6a infrastructure for installation from the Telecommunications Closets only to the classroom and/or zone, thus allowing for only one type of wiring infrastructure within the school. Distribution of all voice signaling shall utilize a shared or dedicated network. Systems that require homerun, dedicated, 18 gauge shielded wiring shall not be acceptable.
 24. The system shall provide a flexible and robust event engine. In addition to pre-programmed events and actions, the event engine shall be capable of accepting Java-based programming to accomplish advanced integrations and functions.
 25. The system shall automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions shall be preprogrammed and require no user intervention. The system shall provide redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
 26. The system shall provide the ability for the school to upload their own recorded files for both Bell Tones, and Notifications
 27. The system shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone within the facility or outside the facility to any other location within the facility or district.
 28. IP-enabled two-way voice communication shall be available from any provided telephone or administrative console through any speaker in the system. This shall allow hands-free communication to any classroom or any individual loudspeaker unit. A pre-announce tone shall sound immediately before the intercom path is opened.
 29. The system shall provide for a complete personal alert function for each teacher. The alert functionality shall be an integrated part of the administrative head end software and shall not require any separate application or hardware to support this functionality.
 30. The teacher personal alert functionality shall be integrated into the classroom microphones and the teacher web screen.
 31. The system shall be capable of displaying on the map the location of the alert in the case of a microphone that is within range of its paired receiver, or from the teacher's web access screen. The system shall also be capable of approximately locating the location of the alert in the case of a microphone that is not in range of its paired receiver. A system, either the microphone system, or the administrative system that is not capable of receiving an alert from a microphone that is not within range of its paired receiver shall not be considered.
 32. Upon alert, the system shall have the ability to provide notification on the dedicated console at the front office, or on any other computer which is currently logged into the administrative interface and has the appropriate credentials. The system shall provide both

an audible tone, and a change on the screen that clearly indicates that an emergency alert has been received.

33. Upon alert, the system shall also be capable of sending e-mail and SMS Text messages to the designated school personnel. These alerts shall include a web link to the administrative console.
 34. If cameras are installed in the classrooms, the system shall be capable of showing a live video from the classroom that received an alert. This shall only be shown in the case of an alert where the microphone is within range of its paired receiver.
 35. The system shall have the ability to acknowledge the receipt of the alert by changing the indicators on the classroom microphone receiver in the room where the alert was received from. In the case of an alert received from a microphone not in range of its paired receiver, no acknowledge shall be sent.
 36. The system shall have the capability of maintaining a record of all alerts that are received and provide appropriate school personnel the capability to enter information about the alert, which shall be maintained in the systems database. That information shall also be made available to appropriate school personnel in the form of a report that shows all alerts that have occurred, their date, time, and the end alert information.
 37. The system shall support digital message displays that provide visual feedback in the form of scrolling messages via an LCD or LED display all controlled from the network.
 38. The system shall allow for integration into classroom audio system including teacher microphone as required by design. This includes integration to ensure that system notifications, pages and intercom calls take priority over classroom audio sources.
- B. Intercom Paging System Network Intercom Interface:
1. Shall allow users to install intercom paging systems spanning multiple building or facilities connected through a VLAN.
 2. Network Requirements:
 - a. 100/1000 Ethernet switch port configured on a dedicated VLAN.
- C. Intercom Paging System Power:
1. All Network interfaces used in the classroom and for the common zones shall be powered via PoE (Power over Ethernet) from the district provided network switches.
 - a. PoE switches and network cabling from MDF (Main Distribution Frame) and IDF (Intermediate Distribution Frame) to devices provided by others.
 2. All network switches shall include an uninterruptable power source to provide adequate runtime. In the event the school has a generator the UPS systems shall hold the switches long enough until generator power can be provided. Customer to provide all necessary UPS for network switches.
- D. Intercom Paging System Administrative Console:
1. The administrative console shall be customizable, flexible and provide full access to the intercom paging system.
 2. Console shall be micro-computer based running a Linux OS and run in a Kiosk mode locking the user into the intercom screen.

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3. The supplier is required to provide a dedicated touch screen console for the front office, with a minimum size of 22" Diagonally. The Console shall not require the district to provide any additional hardware, software or licensing. The Console shall also provide a boom microphone attached via USB to the console for paging/intercom use.
4. Administrative access to the system shall be browser based and shall also be capable of being any administrative computer.
5. Functionality to provide full access to all features such as all call, paging groups, emergency tones, control music, WAV file distribution, test rooms, crisis mode, schedules, etc...

E. SAFE SYSTEM & NETWORK PAGING INTERFACE - Audio Enhancement, MS-300

1. Provide a Network Interface with performance as follows:
 - a. Full-Duplex, Hands Free communications on Intercom Call
 - b. Amplifier powered only by the PoE power source for emergency paging applications
 - c. Mounting Bracket as required
 - d. Connections – The following connections shall be available:
 - i. Line Output for connecting to auxiliary amplifiers
 - ii. 2 External I/O Connections – Terminal Block
 1. Ability to support relay output for interface into other systems.
 - iii. RJ45 for PoE Network Connection
 - iv. Serial interface for connecting to other equipment or SAFE Compatible equipment.
 - e. 1 speaker connection
 - i. The system shall provide a speaker connection which is powered exclusively by the PoE power from the network
 - ii. Can power up to 2 speakers per device.
 - f. Network Connection
 - i. The system shall have a network connection with PoE power.
 - ii. PoE shall be present on the system in order to provide power for the amplifier during a power emergency
 - g. Integrated Network Based Communications
 - i. The System shall support the following protocols:
 1. Directed UDP (User Datagram Protocol)
 2. Unicast Audio
 3. Multicast Audio
 4. SIP
 5. TCP Control
 - h. Integrated Serial Tunnel over TCP
 - i. The system shall have integrated SIP communications and be able to communication bi-directionally with any VoIP communications system that follows the standard SIP protocols.
 - j. The system shall also have the ability to operate with multi-cast IP messages as well.
 2. Serial Gateway for Control via the network

F. Analog Intercom System Cabling:

1. West Penn
2. Belden

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3. General Cable
4. Mohawk
5. Accepted substitute

G. Intercom Paging System Volume control:

1. Volume control shall be capable of controlling the volume of up to one hundred-fifty (150) 1-way speakers.
2. Volume control shall be mounted on a brushed stainless-steel single gang wall plate with the plate being embossed with a dial scale of "0 through 10."
3. Volume control shall be equipped with a skirted black knob with white position indicator.
4. Volume control shall include a stainless-steel mounting box and hardware.

H. Intercom Paging System Ceiling Speaker.

1. Ceiling Speaker Specifications

- a. Lay-in ceiling speaker shall consist of a white 13.5" grill, a speaker and integral back box or equivalent ceiling speaker with appropriate backbox, grille and tile bridge.
- b. Integrated 25/70/100V Transformer with tap settings accessible without disassembling speaker from 1.25W to 15W or 8Ohm bypass.
- c. The speaker shall be capable of handling minimum 50 watts continuous power.
- d. Sound pressure level at 1 meter on axis with a 1 Watt input shall be 96 dB.
- e. The frequency response shall be 86 Hz to 16 kHz.
- f. The baffle shall be constructed with a single piece of perforated steel with a white baked on acrylic enamel finish.
- g. Shall support seismic cabling from 3 points.
- h. The back box shall meet or exceeds UL 2043 for installation in a plenum space
- i. Basis of Design Audio Enhancement SP-0300.

I. Intercom Paging System Surface Wall Speaker:

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1. Wall speaker shall consist of a speaker, volume settings and sloped baffle.
 2. The speaker, housing and hardware shall be electrically and acoustically matched for a frequency response of 60 Hz to 12 kHz.
 3. The speaker shall be 8" (20.32 cm) in diameter and have a ceramic magnet weighing 5 ounces.
 4. The voice coil shall be .75" (1.91 cm) in diameter.
 5. Voice coil impedance shall be 45 ohm.
 6. Operating temperature shall be -20 to + 55 °C (-4 to + 131 °F).
 7. The baffle shall be constructed of gray painted steel with a black cloth grille.
 8. Maximum dimensions of the housing shall be 10.13" (25.73 cm) H x 12.31" (31.27 cm) W x 4.63" (11.75 cm) D.
- J. Intercom Paging System Paging Horn:
1. The paging horn shall be a weather-resistant, high efficiency reentrant type horn speaker.
 2. The paging horn shall be equipped with an amplifier and externally accessible volume control.
 3. The paging horn shall include an adjustable swivel base.
 4. The frequency response shall be 275 Hz to 14 kHz.
 5. Dispersion shall be 90° horizontal and 90° vertical.
 6. Sound pressure level shall be 121 dB measured at 4 feet (1.22 m) on axis with an input to the amplifier module being -10 dBm at 1 kHz.
 7. Distortion shall be less than 2.0% at rated output of 15 watts RMS.
 8. Input impedance shall be 600 ohms nominal.
 9. The amplifier shall operate on a -24 Vdc nominal, positive ground power supply.
 10. Operating current shall be 900 mA at -24Vdc
 11. Operating temperature shall be -20 to 55 °C (-4 to 131 °F).
- K. Intercom Paging System Volume Control
1. The volume control must support a rotary selector switch with 11 positions.
 2. Volume control shall be white in color and be sized to fit a decora style plate.
 3. Inputs on control shall support incoming 25/70V signal on both the + and – with outgoing signal on + and -. Support for up to 12 AWG Wire.
 4. 25W RMS
 5. Basis of Design EPIC-V70v
- L. Classroom Sound Reinforcement System:
1. Audio Enhancement – Optimum System
 2. A classroom sound reinforcement system shall be installed in all areas of the building as shown on the drawings and as listed in the specifications.
 3. Classroom sound reinforcement system shall be fully interfaced to the intercom paging system.
 4. The output of the intercom paging system shall directly interface to the classroom sound reinforcement system.
 5. The sound reinforcement system shall be capable of integration with the facility intercom/paging system. All sound reinforcement systems shall allow the facility intercom/paging system to directly mute them. The Receiver Module shall have the capability to sense a paging signal from the facility communications system. When a

page has been sensed, the classroom sound system shall mute local audio to facilitate hearing the facility page.

6. This integration shall give positive control when interfaced to the classroom sound reinforcement system within the system as to cut off or duck all sources within the classroom when an intercom or page announcement is made from anywhere within the school.
7. The classroom sound reinforcement speakers shall be used as the intercom paging system speakers.
8. The intercom paging system speakers shall be connected to receive audio from any of the in-room sources and receive audio from the intercom paging system.
9. The classroom sound reinforcement system shall be mounted in a wall mount enclosure, specifically designed which allows the microphone receiver to remain visible through the door of the enclosure
10. The DECT (Digital Enhanced Cordless Telecommunications) based microphone receiver shall be capable of being mounted directly to the enclosure and connecting to the amplifier utilizing Cat. 6/6a cable.
11. Each microphone input shall have a carrier detect indicator to verify the input is active.
12. The classroom sound reinforcement system shall have a secondary line level output to connect to self-amplified speakers or other audio equipment if needed.
13. The classroom sound reinforcement system shall have an emergency cut-off input that when interfaced to the fire alarm relay contact output shall silence all audio devices within the room in the event of a fire as to help lower the overall decibels levels to help the students and staff hear the audible fire alarm tones / instructions within that room.
14. The classroom sound reinforcement system shall be capable with interfacing to future classroom cameras to capture lesson video and audio together on one recording.
15. The Wireless Microphone shall be capable of adjusting the volume of external audio sources that are connected to the Main Control Unit. The Wireless Microphone shall be powered by a single rechargeable LiON (Lithium-ion) battery which can be charged inside the microphone via a standard USB cable. The Wireless Microphone shall be able to operate for up to a typical eight (8) hour workday on a single charge.
16. Each classroom sound reinforcement system shall include but not limited to the following components:
 - a. DECT Based receiver
 - b. Amplifier & Network Interface
 - c. One wireless microphone with rechargeable LiON batteries
 - d. Four ceiling speakers
 - i. CS12 – Round Ceiling
 - ii. FS17 – Drop in 1' X 2'

M. Classroom Sound Amplification System (CSAS) EQUIPMENT:

AMPLIFIER - Audio Enhancement MS-500 Amplifier/Network Interface:

1. Provide a fully PoE Powered Receiver/Amplifier with ability to provide functions described above with performance as follows:
 - a. Audio Power: 30 watts RMS mains powered amplifier
 - b. 92% Efficient Class D Amplifier
 - c. 1% percent THD across full frequency range of amplifier
 - d. Frequency Response: 20 Hz to 20 kHz
 - e. Power Requirements: PoE 802.3af/at 25.5W Maximum
 - f. Signal-to-noise: >89dB
 - g. Integrated mounting tabs
 - h. Thermal and short circuited protected
 2. Controls:
 - a. The primary control of the system shall be done through the teacher microphone.
 - b. The following functions shall be available via USB connection for setup during installation:
 - i. Input Control for multi-media sources and mixed IR source
 - ii. Equalizer Controls
 - iii. Discreet Output volume controls for each input
 - c. RS-232 Control
 - i. Provide RS-232 control of the amplifier, and an additional RS-232 port which provides pass through control of a downstream device such as a projector
 - ii. RS-232 processor shall be capable of differentiating between commands destined for the amplifier, and responding to those commands, and commands intended for the downstream and passing those commands through to the secondary RS-232 port
 - iii. Command pass through shall be bi-directional
 - d. Connections – The following connections shall be available:
 - i. Four (4) Multi-Media inputs
 - ii. Dedicated Line output – for Assistive Listening Device Connection
 - iii. Color Coded Connection
 - iv. 8P8C RJ45 Connection for Intercom Paging Wall plate
 - v. Support for Touch Based Wall Controller on Remote Port
 - vi. General Purpose I/O Output on 8P8C RJ45
- N. DECT Technology RF Receiver – Audio Enhancement SRC-14
1. The Receiver shall utilize DECT technology. DECT is a radio technology for voice applications. DECT is ideal for the classroom because the use of both frequency and time domain is ideally suited to smaller areas with a large number of users. In each classroom, it will be an independent system, with all necessary electronics to support the receiving & pairing functionality mounted on the wall near the amplifier or in the ceiling. The receiver will be connected to the amplifier through a universal twisted pair

cable, using balanced audio connections. Power for the receiver shall be provided through the same cable as the balanced audio connections.

2. The receiver shall provide the following functionality. These features shall be included on board the receiver, and not require any external support to perform these functions.
 - a. Three Channel DECT based reception
 - b. The receiver shall provide both a low and high-power mode selectable via a DIP (Dual In-line Package) switch
 - c. Pairing Button for Linking microphone to the receiver
 - d. External contacts to allow for a remote pairing button
 - e. Stereo Auxiliary Input
 - f. Auxiliary Line Level Output – Un-Balanced
 - g. Remote control of both microphone channels, and the auxiliary input from the teacher microphone
 - h. Public address system mute terminals – This is a contact closure connection when closed, it mutes the audio output from the receiver
 - i. Advanced Feedback Blocker
 - i. The system shall have the ability to actively control feedback. This shall be done via an analog circuit that provides up to five active filters to control specific frequencies,
 - ii. The Feedback Blocker shall also have the ability to lower the overall of the system by up to 6dB, during a user error situation where the overall system gain is manually turned up too high
 - iii. The Feedback Blocker system shall automatically remove the filtering upon resolution of the user-initiated error condition
 - iv. The Feedback Blocker shall be of an analog design – in order to avoid the detrimental effects of digital sampling, only analog systems shall be considered in order to implement this feature.
 - j. Audio Output
 - i. The system shall have the ability to provide both three (3) independent audio signals (Ch 1, Ch 2, and Aux) or with the change of a DIP switch, provide a mixed signal
 - ii. The system shall provide an audible tone when the remote volume control on the teacher microphone is used. It will also provide a low & high output level, and an on/off selection via a DIP switch setting
 - iii. The system shall have the capability of attenuating its output level by -10 dB with a DIP switch setting
 - b. Emergency Alert Contacts
 - i. The system shall provide a trigger signal when the teacher presses and holds a button on her transmitter for more than two (2) seconds.
 - ii. The system shall be capable of providing a visual indication of three (3) red LED's when the teacher initiates a trigger signal
 - iii. The system shall also be capable of receiving a trigger acknowledgement signal back from an external source, and altering the visual indicator from three (3) red LED's to two (2) Green and one

- (1) red LED
 - c. Recording Contacts
 - i. The system shall provide for a secondary notification that can be used for future applications such as signaling an NDVR (Network Digital Video Recorder) to start a recording
 - d. Control System Integration
 - i. The system shall have on board the capability of being controlled via RS-232 protocol.
 - ii. The system shall also have the capability of broadcasting RS-232 commands when the teacher presses the up/down volume controls on their microphone
 - e. Power Requirements: 24Vdc, Power Supplied from the amplifier.
 - f. Operating Frequency – 1.9 GHz Band
 - g. Receiver Type: DECT
 - h. Mounting Bracket as required
 - i. The receiver shall be capable of being mounted on the ceiling or a wall
 - ii. Bracket shall provide mounting to standard electrical boxes
 - iii. Controls: System shall have available the following controls
 - 1. Channel 1 Volume Control – Fully controllable from the teacher microphone remotely through the DECT system
 - 2. Channel 2 Volume Control – Fully controllable from the teacher microphone remotely through the DECT system
 - 3. Auxiliary Input Volume Control – Fully controllable from the teacher microphone remotely through the DECT system
 - 4. Alert Controls on Teacher Microphone – Two (2) buttons on the sides of the microphone
 - 5. Recording Control on Teacher Microphone – One (1) button on the front of the microphone
- O. Teacher Body Pack Transmitter Audio Enhancement STD-14
- 1. Provide a body pack transmitter with performance as follows:
 - a. Operating frequency – 1.9 GHz - DECT
 - b. Audio distortion: <1.0% (± 40 kHz deviation @ 1kHz)
 - c. Integrated microphone
 - d. Internal charger circuit
 - e. Micro USB Charging Port – shall be capable of being charged from a standard USB port – including a port on a computer
 - f. Power button functionality
 - g. Power on – turns the microphone on when microphone is off and button is pressed
 - h. Mute – mutes the microphone when pressed and released once microphone is turned on
 - i. Power Off – push and hold to turn power off
 - 2. Additional Function (F) Button Features
 - a. SAFE Alert Functionality – Provides security alert when the two (2) buttons on the sides of the microphone are pressed and held for more than two (2) seconds
 - b. Recording Functionality – Provides simple logic signal when the REC button is pressed

- on the face of the microphone which activates terminals on the receiver
- 3. External Inputs
 - a. Provide an input for an external microphone
 - b. Provide an input for a stereo auxiliary input (Mixed to Mono in microphone)
- 4. Microphone Element – The teacher microphone shall utilize a 10mm microphone element to insure optimum frequency response and maximum pickup of teacher’s voice.
- 5. Power 1 - LiON Long Life Battery (Systems using two (2) batteries will not be considered)
 - a. Battery style shall be common between handheld microphone and teacher transmitter. Systems that use different batteries in the handheld vs teacher microphone shall not be considered.
- 6. Provide remote volume control for the system from the teacher’s transmitter
 - a. Volume control via the wireless microphone system to allow the teachers to remotely adjust their own volume level.
 - b. Volume control for the other channel from the teacher’s microphone
 - c. Volume control for the auxiliary inputs from the teacher’s microphone
 - d. Side Alert Buttons – Provide remote control functionality that allows for enabling additional multi-use functions from the teacher microphone.
 - e. REC Button – Provide a button on the face of the microphone that can be used for multiple purposes
- P. Classroom Intercom Call Button WPA-504/502
 - 1. Reference technology floor plans for device locations
 - 2. Single gang decora style call button white in color
 - 3. Black button for intercom call
 - 4. 8P8C (RJ45) connection
 - 5. Matching white decora style face plate
 - 6. WPA-502 includes red emergency button for alerting
- Q. Ceiling Enclosure specifications OPTIONAL
 - 1. Provide a ceiling enclosure that is sized appropriately for the equipment being installed in each classroom
 - 2. Ceiling enclosure shall be plenum rated and UL Listed
 - 3. Overall dimensions shall be to fit in a standard drop tile ceiling.
 - 4. Enclosure shall support power and data as necessary for equipment.
 - 5. Cover of enclosure shall support mounting of Audio Enhancement XD Receiver, WPA-501 Microphone, and EduCam360 and be lockable.
 - 6. Enclosure shall be pre-assembled with equipment by the manufacture
- R. Wall Mount Enclosure OPTIONAL
 - 1. Provide a ceiling enclosure that is sized appropriate and specific to house the Audio Enhancement amplifier, Audio Enhancement XD Receiver, AVConnect Receiver and WPA-502/504 Wall Plate. Audio Enhancement receiver shall be seen from the front of the enclosure with accessible buttons.
 - 2. Enclosure shall be wall mountable and support enclosing a single gang 120V electrical outlet.
 - 3. Enclosure shall have a swinging door and a cam or key lock.
 - 4. Enclosure shall be white in color.

- S. HDBaseT HDMI extender Wall Plate specifications (Audio Enhancement AVConnect Kit) OPTIONAL
 - a. HDMI: 3D, Deep Color
 - b. HDMI Extender Distance: Up to 30m/100ft with
 - c. Cat5e UTP. Use Cat6 STP (shielded) if extending 30m/100ft – 70m/230ft. Plenum Rated
 - d. Provide USB connection from transmitter at teacher workstation to receiver for passing HID information to interactive technology
 - e. Provide an audio line output at the teachers work-station – audio line output shall provide all classroom program material and classroom microphone audio from the amplifier to allow connection of personal assistive listening devices
 - f. Input/Output: HDMI Type A female connector
 - g. Digital video: Up to 1080p @ 60Hz/50Hz
 - h. PC Resolution: Up to 1920x1200 WUXGA
 - i. HDCP (High-bandwidth Digital Content Protection) Compliant
 - j. HDBaseT Class B Compliant
 - k. EDID (Extended Display Identification Data) Support
 - l. Provide for an additional VGA (Video Graphics Array) plus 3.5mm audio connection. Connection can be integrated with HDBaseT wall plate extender
 - m. resolution: Up to UXGA (1600x1200)
 - n. HDMI, VGA, USB and Audio Return shall all be transmitted over a single CAT 6 cable
- T. Classroom Intercom, Emergency Alert & A/V Touch Panel Control – Audio Enhancement – Capacitive Touch Control Module (ITC1-M) OPTIONAL
 - a. For all locations where an MS-500 Classroom Amplifier/Network Interface is specified.
 - b. Coordinate with electrical contractor to make sure a double gang electrical box is available – or use an acceptable double gang mounting ring
 - c. Provide a simple, standardized control interface for projectors, monitors, display devices, or other AV devices in a compact double-gang form factor. A CUSTOMIZABLE INTERFACE which will allow for a variety of configurations including full color graphical representations of equipment and buttons as well as multi-page capability.
 - d. Package Type: Double-Gang Back Lit Capacitive Touch Screen
 - e. Dimensions: 4.5" (L) x 4.5" (W) x 1.25" (D)
 - f. Display: 3.5" Capacitive Touch Display
 - g. Weight: 6.4 oz
 - h. Power Supply: 24Vdc – Powered from GL-300 Amplifier (External Power Supply Not acceptable)
 - i. Communications: bi-directional RS232
- U. Speaker Station Volume Controls
 - 1. Single gang decora style call button white in color
 - 2. 8P8C (RJ45) connection
 - 3. Output to speaker shall be adjustable from zero to maximum output from amplifier
 - 4. Knob shall have graduated indications with a designated (off mode)
 - 5. Install speaker volume controls in the office and staff only areas

6. Volume control not allowed in the student occupied areas.

2.3 SYSTEM RACEWAY AND MOUNTING BOXES

- A. Install all raceway necessary to provide specified equipment function and per print sheets as under the provisions of Sections 26 05 33, 26 05 13, 26 27 16, 26 05 53, and 27 60 00.
 1. Conduit fill shall not exceed 40%.
 2. Provide a pull string in all intercom home run conduits.
- B. Install an underground pull box every 400', splices not allowed underground.
- C. Install all wiring throughout the intercommunications system in conduit raceway.
- D. Install a 24" x 24" x 6" minimum size cabinet with painted wood backboard and screw type terminal strips in point of entry room to each building.
 1. All cabinets shall have a minimum of 24" of excess wire.
 2. All wiring shall terminate through the terminal strips, one wire per connector screw.
 3. Cabinet shall have a hinged latchable cover.
- E. Label the conduit at each terminal cabinet as to its destination.
 1. Labeling shall be inside the cabinet in which the conduit terminates.
 2. Label building number, direction, interior or exterior.
- F. Permanently label all Intercom system terminal boxes, as (Intercom System).
- G. Paint all intercom system junction box covers blue and install a blue round self-adhesive dot on the ceiling tile grid below all intercom junction boxes.
- H. Recess the wall speaker back-boxes shall be flush mounted, with recessed baffles having a baked semi-gloss white enamel finish.
- I. Call-Origination switch enclosures and speaker volume control-boxes shall be flush single gang boxes, 42" AFF mounted vertically in locations as depicted on the drawings.
 1. Do not install in tack boards or chalkboards.
- J. Ceiling speakers for areas with hard ceiling: Ceiling speaker station back boxes shall be recessed with T-bar bridge bracing to prevent ceiling tile sag.
 1. Provide recessed trim ring baffles finished with white enamel.
- K. Exterior wall speakers:
 1. Recessed square protective rust proofed back boxes and a white square recessed aluminum alloy, vandal proof grill with tamper proof hardware.
 2. Locate as high as possible, minimum of 8'-2" AFF.
- L. Clean inside the terminal cabinets and other enclosures of wire cuts and other installation debris.

2.4 CIRCUITING GUIDELINES and INTERCOMMUNICATION SYSTEM WIRING AND CABLE

- A. All wiring shall be Cat. 6/6a for connections to speakers, call switches, etc... for future migration to a complete IP (Internet Protocol) based intercom paging system. Cabling from the MDF or IDF to each classroom enclosure shall be provided by others. A patch cable, providing connectivity from the work outlet faceplate to the MS-500 shall be provided by others to the AV contractor for connection to the network.
- B. Each classroom / education space to have a dedicated network connection to the intercom paging system head-end to provide 2-way communications from the integrated paging system console as well as the district IP based phone system.
- C. Each office / administrative space to have 2-way communications from the paging system and be capable to being addressed from the building telephone system handset.

- D. Media center, cafeteria and gymnasium to have 2-way communications from the paging system and be capable of being addressed from the building telephone system handset
- E. Each corridor / common space / exterior space, restrooms, and playfields to have 1-way communications from the paging system and be capable of being addressed from the building telephone system.
- F. All wiring shall be in accordance with the Manufacturers specifications and certified for performance.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify field measurements are as shown on drawings and as instructed by manufacturer.
- C. Verify that required utilities are available, in proper location, and ready for use.
- D. Verify and coordinate mounting height and exact locations of all mounting boxes with architectural details, furniture layout, and elevations prior to installation.
- E. Beginning of installation means installer accepts conditions.

3.2 INSTALLATION

- A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturers wiring diagrams and these specifications. The contractor shall furnish all conduits, cable tray, surface raceway, wiring, outlet boxes, junction boxes, cabinets etc... as well as all required miscellaneous materials and labor necessary for the complete installation of the cable support / pathway system.
- B. Wiring may be in conduits or opened wired in cable tray or "J" hooks above accessible suspended lay-in ceilings. Wiring in walls or exposed on walls shall be enclosed in EMT conduit, see section 26 60 00 for open wiring requirements.
- C. Equipment: Equipment shall be neatly and firmly mounted plumb and square with adjacent surfaces with fasteners recommended by the product manufacturer.
- D. All equipment shall be mounted with sufficient clearance for observation, servicing, testing and accessible from either the floor or ladder. If any device is installed in a location that is deemed inaccessible by the Owner and or Architect / Engineer, it will be moved to an accessible location by the contractor at no additional cost to the Owner.
- E. It shall be the responsibility of the contractor to wire and connect ancillary devices to this system as listed in this specification section.
- F. Additions or alterations:
 - 1. Where additions to or alterations in existing schools involve new wire in existing raceways, remove all the wire in the existing raceways and do not reuse.
 - 2. Pull new wire in for both new and existing circuits.
- G. All cabling and devices shall be labeled with type written labels. Device labels and cable labels shall match the labeling information that is documented on the as-built drawings. Contractor to coordinate labeling schemes and labeling requirements with A/E prior to commencing with final labeling. Labeling system shall be by Brady or Panduit.
- H. Install protective wire cages around the intercom station speakers located in the gymnasium and locker rooms and as further noted on the print sheets.
- I. Program the system for All Page as well as Zone Pages for the Cafeteria, Media Center, and Auditorium speakers to be able to disconnect the speakers from these areas as needed.
- J. The corridor and hallway speakers shall be on separate circuits/zones from speakers on the exterior of the buildings.

- K. Any circuits leaving the building to the outside shall be protected by the appropriate transient protection devices as required by the manufacturer to avoid damage to the system if transient surges are inducted on to these circuits (i.e., lightning strikes).
 - L. Intercom system and Public Address system (section 27 51 16) shall not share speakers.
 - M. All junction boxes shall be clearly marked and labeled for easy identification. Flexible connectors shall be used for all devices mounted in suspended lay-in ceiling panels. All conduits, outlet boxes, junction boxes and panels shall be securely installed and anchored with appropriate fittings and connectors to insure positive grounding throughout the entire system.
- 3.3 FIELD QUALITY CONTROL
- A. Perform the field inspection and testing under provisions of Section 01 40 00 and 01 45 00.
 - B. Perform operational test on completed installation to verify proper operation.
 - C. Replace equipment, components, and wiring to eliminate audible noise, clicks, pops, or hum when system is in standby or operation.
- 3.4 MANUFACTURER'S FIELD SERVICES
- A. Prepare and start systems under provisions of Section 01 60 00 and 01 75 00.
 - B. Make final connections to units.
 - C. Perform field inspection and testing.
 - D. Demonstrate system operation.
- 3.5 ADJUSTING
- A. Adjust work under provisions of Section 01 75 00.
 - B. Adjust controls and configuration switches for operation as indicated.
- 3.6 DEMONSTRATION
- A. Provide systems demonstration and instructions under provisions of Section 01 75 00.
 - B. Employ manufacturer's field representative to demonstrate system operation to Owner's personnel.
 - C. Conduct walking tour of Project and describe function, operation, and maintenance of each component as well as proof testing of each component.
 - D. Use submitted operation and maintenance manual as reference during demonstration and training.
- 3.7 DEMONSTRATION AND TRAINING
- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
 - 1. Provide competent, factory authorized personnel to instruct the operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.
 - 2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
 - B. Provide demonstration and training for all types of intercom systems installed in this project.

END OF SECTION