

**SECTION 27 51 23
INTERCOM SYSTEMS
(EXISTING 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 a central equipment cabinet, microprocessor control unit, power supply, zone hardware cards, Administrative Control Stations (ACS), amplifiers, 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. ACS-to-remote loudspeaker station
 - 2. ACS-to-ACS
 - 3. Remote speaker equipped with call-in device to ACS
 - 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. Any equipment that is taken "off the shelf" that is not listed as a latest/current model number at the time of installation shall not be acceptable.

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.
 - 1. Deliver all cards and pertinent information on the intercom system to the FS Intercom Shop upon substantial completion.
- D. Contractor shall provide one spare phone and display unit per system.

1.8 QUALIFICATIONS

- A. Manufacturer
 - 1. Company specializing in manufacturing the products specified in this Section with minimum 5-years 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 experience.
- C. Installer: A company specializing in installing the products specified in this Section with minimum 5-years 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 trouble shooting to the School District maintenance Department Electronic Technicians.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Bogan: Multicom 2000
- B. Dukane: Carehawk System
- C. Rauland-Borg: Telecenter ICS
- D. Substitutions: Under provisions of Section 01 60 00

2.2 GENERAL REQUIREMENTS:

- A. Provide a Modular Administrative Intercommunication System, utilizing advanced microprocessor design with user programmable functions and memory.
- B. The system shall consist of a central equipment cabinet, microprocessor control unit, power supply, administrative control stations (ACS), zone cards, call-in switches, station loudspeaker assemblies, staff telephone and all associated material, hardware and wiring as required.
 - 1. Interconnect this equipment to provide an operating system, which meets the specified requirements.

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- C. The system shall provide a minimum of eight simultaneous open voice speech paths between ACS and station loudspeakers and four staff telephoned paths.
 - 1. The speech channels shall be true multiple, simultaneous, unrestricted, amplified voice channels requiring no automatic queue or call stacking to access the intercom amplifier.
 - 2. Systems not providing true multiple, simultaneous, unrestricted amplified voice channels or systems offering multi-speech paths, which are restrictive to, less than two simultaneous conversations per 16-line group, shall be unacceptable.
- D. The system shall permit user selection of 4, 5, and 6-digit dialing.
 - 1. Assign an architectural or ID number to communicate with its assigned ACS at each remote station or call-initiating device.
 - 2. Each remote station shall have the capability for up to two separate and distinct call-in devices.
 - a. A call-in device is a momentary contact closure device either manually operated or automatically triggered to place a call.
 - 3. The system software shall allow each of the two call-in devices to announce at different ACS.
 - 4. The system shall have the ability of assigning a priority level to each of the call-in devices.
 - 5. The 'architectural' or ID number and priority level assignment is user programmable.
 - 6. Seven priorities are available, and each shall have a unique alpha designator.
 - 7. The priorities for each call position are normal, handset, security, fire call, emergency call, call cancel, and remote program sheet.
- E. Each remote station location shall have the capacity for both a loudspeaker and a handset.
 - 1. The handset shall provide for full duplex telephony type communications, V.O.X operation acceptable.
 - 2. The system shall not require any additional memory address locations or ID numbers for the staff handset associated with any given remote station.
 - 3. The system shall automatically toggle to the duplex mode of communications when a remote handset is lifted during a call in progress.
- F. The system shall allow pre-selected coverage of calls from remote station to ACS on a remote station basis.
 - 1. A remote station shall be able to report to multiple administrative control stations (ACS) simultaneously.
 - 2. If an ACS is unattended, the user may forward its assigned station coverage to an attended ACS.
 - 3. This provides overlapping or distinct coverage of remote stations ACS.
 - 4. Systems not allowing complete flexibility of remote station coverage shall be unacceptable.
- G. Call-in from a call switch, staff telephone or other device shall display ID number and call priority in the "Time/Current Call" window of the ACS not in use and sound a tone.
 - 1. Normal calls announce with a slower audio tone repetition rate than higher priority calls, and each priority call shall be distinguishable by its own alpha designation.
 - 2. The call-in tone shall be user defeat able by ascending priority for each ACS.
 - 3. Upon answering, the ID number remains in the display of the answering ACS.
 - 4. ACS not in use will display the correct time in 12-hour or 24-hour format.
 - 5. Additional calls not answered will appear in the three- "Call Waiting" windows.
 - 6. Calls shall be stacked in the order placed and by priority.
 - 7. An indicator shall illuminate to show the operator that additional calls beyond the 3-displayed are waiting; a call scan feature shall allow these calls to be toggled and reviewed in groups of three.
- H. The system shall be capable of providing a supervisory tone to remote station speakers.
 - 1. The tone signal will indicate the ACS is monitoring the speaker.

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- I. Answering a call shall be by either depressing the "Push to Talk" button or by removing the handset from the cradle of the ACS.
 - 1. Systems not incorporating single button response to answer calls shall not be acceptable.
 - 2. A user programmable "Calls Cancel" feature shall allow the ACS to cancel all pending normal calls under its control while leaving the high priority level calls in the system.
- J. The system shall have a feature allowing a calling station be placed in "HOLD" status, freeing the ACS to perform other functions.
 - 1. It shall be possible to "CONFERENCE" remote staff handsets and ACS together for room-to-room communications.
- K. The system shall provide Zone Page or All Page to a pre-selected group of remote stations or to the entire facility.
 - 1. Provide for the assigning remote stations to more than one zone.
 - 2. Provide user programmable pre-selective access to Zone and All Page functions to prevent unauthorized paging.
- L. The system shall provide for both a time signal and a call announce tone with a built-in tone generator.
 - 1. The time signal "tone" and its duration shall be user programmable.
 - 2. Provide for a user definable pre-alert tone signal at the remote station speaker when called by an ACS.
 - 3. Provide for user access at the ACS for sounding selected tones (single chime, repetitive chime, steady tone, hi-lo, alarm, wail and warble) on a zonal or All Page basis for use as emergency or other alarm signals.
- M. The system shall include a built-in master clock to display time of day at the ACS, to provide 255 discrete time events for eight zones and to provide correction of all digital clocks and synchronous secondary clocks using appropriate adapters.
 - 1. Provide control points for controlling external devices.
 - 2. Have the capability to configure time events to any one of eight schedules.
 - 3. Provide an editing routine in the system to permit the user to change and edit time events, zones, and schedules without having to reprogram the entire sequence.
 - 4. The time display protected by built in lithium battery source or advanced battery technology equivalent or better than Lithium to automatically correct ACS displays upon restoration of power, caused by AC power failure.
- N. Equipped with a scan mode at the ACS permitting the operator to review the room assignments of each of the program channels, the call-in coverage of rooms assigned to his/her ACS, and which of the other ACS are forwarding their calls to this ACS.
- O. Protect the user programmable memory by a manufacturer-supplied battery with life expectancy of at least 10-years.
- P. The system shall provide 16 watts audio power for normal 1-way and 2-way communications and shall be capable of adding an external amplifier for additional audio power for Zone and All-Call paging.
- Q. The system shall provide ports to allow the following:
 - 1. Diagnostics via any standard computer terminal
 - 2. Modem interface
- R. Provide up to two channels of program.
 - 1. Capability to initiate program distribution by the ACS to an individual remote station, by groups, or to all remote stations.
 - 2. Calls will have priority over programs.

- S. Each room shall be a separate zone.
- T. Intercom equipment shall have a capacity of no less than 350 room stations in one central unit for high school.
 - 1. High Schools shall have an upgraded motherboard for the Community School office area.
- U. Intercom equipment shall have a capacity of no less than 240 room stations in one central unit for middle school or elementary school.
 - 1. Middle Schools shall have an upgraded motherboard for the Community School office area.
- V. Intercom system installed shall have room stations capacity for the project at the time of completion and 20 percent spare room stations.
 - 1. For example, if project requires 200 room stations at the time of completion, the intercom equipment installed shall be able to provide 240 room stations.
 - 2. 30-spare room stations shall be designated for future expansion and 10-spare room stations shall be designated as maintenance stations and terminated in the console.
 - 3. Provide every component (card cages, power supply, etc.) necessary for this 20% spare room stations at the time of project completion.
 - 4. Owner does not have to add any component at a future date to utilize this 20% spare capacity.

2.3 ADMINISTRATIVE CONTROL STATION

- A. The Administrative Control Station (ACS).
 - 1. Provide total of four for Elementary Schools, and seven for Middle and High Schools.
- B. For voice intercom the, ACS shall be equipped with a handset, dial pad, speaker, microphone, and a TALK/LISTEN button.
 - 1. Each ACS shall be equipped with a built-in 16-watt intercom amplifier, which allows for independent open voice audio between the ACS and a remote speaker station.
 - 2. The system shall provide true, multiple, simultaneous, unrestricted amplified voice channels requiring no automatic queue or call stacking to access the intercom amplifier.
- C. The ACS shall be equipped with a one-line TIME/CURRENT CALL display window which shall show the assigned number of the first call waiting, and when no calls are in the system, it shall display the time of day in 12 or 24-hour format.
 - 1. The display window shall also function as a "COMMAND" display for visual indication of operating status and function entry.
 - 2. Provide a three-line CALL WAITING display-to-display calls waiting to be answered, in time placement sequence and by call-in priority status.
 - 3. The displays shall also be used for status indication of "Data Modification" parameters and "Diagnostics" used during system programming.
 - 4. An indicator shall illuminate to show that additional calls (calls beyond the three displayed) are waiting, and a SCAN function shall allow the waiting calls to be reviewed in groups of three.
 - 5. The ACS shall have the ability to store up to 128 calls in the calls waiting stack.
- D. The ACS shall be equipped with a solid-state sounder for audible annunciation of incoming calls.
 - 1. This sounder shall sound at different rates depending on the priority level of the current call.
 - 2. The sounder shall be user definable on a priority level basis so that the ACS provides only visual annunciation if required.
- E. An ACS shall have the ability to forward its call-in coverage to another ACS.
 - 1. An indication shall be shown in the CURRENT CALL display of the ACS Forwarding Coverage to indicate such, and the ACS to which the Coverage Forwarded to shall have an indication in its CALL WAITING window to indicate that the calls are being forwarded to it.

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2. When in the Forward Coverage mode, an ACS shall still visibly annunciate incoming calls, and it is usable to make and answer calls or other assigned functions without undoing the forwarding function.
- F. The ACS shall contain a sealed membrane control panel with tactile feel type buttons for functional control and user programming.
 1. The membrane panel shall be of a one-piece assembly with a plug-in cable harness for modularity.
 2. The control panel shall contain buttons for each of the functions as described within.
- G. ZERO through NINE, STAR (*), and POUND (#) shall be used for dialing the remote stations, outside phone lines, and to access the Forward and Unforward of ACS coverage.
- H. The TALK/LISTEN button, when depressed, shall answer the current call via the ACS built-in speaker and microphone.
 1. Subsequent pressing and releasing of the button shall control the direction of the communication path.
 2. This prompt shall indicate to the operator that the handset must be used to answer the call.
 3. The handset, when lifted from the cradle, shall automatically answer the current call, in lieu of using the TALK/LISTEN button.
 4. Built-in voice operated switching shall eliminate the need to use the TALK/LISTEN button when in this mode.
 5. Placing the handset back in the cradle shall automatically cancel the call.
 6. With the handset off hook, flashing the hook switch or pressing the CANCEL button shall cancel the current call in progress and automatically answer the next call in the CALLS WAITING stack.
- I. A user programmable "Call Cancel" feature allows the ACS to cancel all pending normal calls under its control while leaving the higher priority level calls in the calls waiting stack.
- J. Provide a SET TIME EVENT button for manually sounding the time signal for each zone.
 1. The system shall provide eight distinct Time Zones with unrestricted assignment of any remote speaker station to any time zone(s).
- K. Provide ALL PAGE and ZONE PAGE buttons for paging all stations or a zone respectively.
 1. Both the All Page and Zone Page functions shall be user able as to restrict access only to assigned ACS.
 2. Eight paging zones shall be available with unrestricted assignment of a speaker station to any or all-paging zones.
- L. Provide a SELECT PROGRAM button for selection and distribution of one or two program channels to remote stations.
 1. The program channels shall be distributed via the ACS to a room or rooms, paging zones, or all rooms and a SCAN function shall be available on the ACS to review the remote stations (rooms) selected to each of the program channels in groups of three.
- M. Provide a HOLD button to place an internal or external call on a hold status, freeing the ACS operator to perform other functions.
 1. A CONFERENCE button shall allow for conference or for transferring inside or outside calls to other ACS or staff telephones.
- N. A SCAN mode shall be provided to permit the ACS operator to review room assignments of each of the program channels, call-in coverage of rooms assigned to his/her ACS, and which of the other ACS (if there is more than one) are forwarding their calls to this ACS.
- O. The ACS shall be equipped with a built-in tone generator, which provides for both time signal tone and user accessible (optional) tones (single chime, repetitive chime, steady tone, hi-lo, alarm, wail and warble) for use as manually activated emergency or other signals.

- P. An ACS within the system (designated #100) shall have the ability to enter the Data Modification mode for user accessible data input and system programming.
 - 1. A "security code" number shall be required to enter this mode.
 - 2. When the ACS has accessed the Data Mod mode, the display windows shall be for providing prompts and other information for programming the system.
 - 3. The CANCEL shall be for returning the ACS to the normal operating mode.
 - Q. Provide circuitry to interface the system to outside telephone lines.
 - 1. CO/PABX access and functions available to intercom system shall be user configurable, and it shall be possible to interface with up to eight Central Office (CO) or PABX lines per 12A2080 Central Equipment.
 - 2. Provide a TELEPHONE button to activate the 7A1100E to access a PABX or CO telephone line for incoming or outgoing calls.
 - 3. The intercom equipment installer shall coordinate with the other trades and the District Project Coordinator to provide telephone line/outlet at the intercom consol.
 - 4. The ACS shall function with standard DTMF dialing when in this mode and display the digits of the phone number being dialed across the CURRENT CALL display window.
 - 5. Special "custom calling" features (accessed by the # or * button), as provided by the telephone company of the PABX system, shall be accessible by the ACS if such features are enabled by the host phone system.
 - 6. Incoming CO or PABX calls shall be annunciated in the calls waiting window with the word "PHONE" displayed.
 - R. Provide the ACS with a 7', multiple conductor cable for power, data, and audio signals.
 - 1. This cable shall be equipped with a multipin connector for ease in installation and maintenance.
 - 2. Provide the handset with a standard modular type 10' coil cord.
 - S. Fabricate the ACS handset and housing from Cycolac KJW34010-MNE fire retardant material.
 - 1. Seal all button marking and nomenclature under a transparent, protective overlay.
 - 2. An integral Pull-Out Operating Guide card shall be part of the housing.
 - 3. This guide shall contain basic functional operating instructions.
- 2.4 CENTRAL EQUIPMENT RACK
- A. The central equipment rack shall contain the following equipment but not-limited-to.
 - 1. Central Equipment Panel - Panel shall be of the microprocessor-based type, with sound and communications capabilities and self-diagnostic ability.
 - a. The panel shall be rack mounted and shall provide two program channels and one intercom channel.
 - 2. DC Regulated Power Supply.
 - 3. Power Amplifiers shall be minimum 250 watts for Elementary schools, 500 watts for middle and high schools.
 - a. Install all power amplifiers in the bottom of the console unit.
 - 4. Backup Batteries:
 - a. Backup batteries providing 24 VDC with 90-minute capacity shall be included.
 - b. Upon failure of normal power, system shall automatically transfer to battery source.
 - 5. Equipment Rack:
 - a. Equipment rack shall be side panels.
 - b. Provide adequate number of zone cards to meet specifications plus 20% spare speaker and call-in points.
 - c. Provide rack with rollers or caster wheels.
 - i) All console units shall have rotating castors.

2.5 AM-FM TUNER / CD PLAYER

- A. Mount the AM-FM tuner and CD player in equipment rack.
- B. Provide AM/FM, omni-directional antenna and necessary mounting mast and tripod. Antennas shall be individually lightning protected.
 - 1. FM antenna shall be Antenna craft #FMT series.
 - 2. Mount antenna on roof near sound rack and provide necessary conduit for antenna cable.
 - 3. Provide antenna cable per manufacturer's requirements.
 - 4. Provide pitch pocket for conduit penetrating roof.

2.6 CALL ORIGINATION SWITCHES

- A. Description: Recessed mounting plate; stainless steel plate with momentary push-button switch (labeled "press to call") self-wiping switch contacts with precious metal surfaces, must provide for originating both normal and emergency calls.
- B. Specifications:
 - 1. Mounting plate: 4½" high, 2¾" wide
 - 2. Mounting holes 3-9/32" spacing
 - 3. Depth required: 1¾" minimum
 - 4. Finish Stainless steel
 - 5. Terminations: Screw terminals
- C. Provide combination call-in switch and volume control devices in all offices, teacher planning rooms, clinic, administrative spaces, and conference rooms.
- D. In a space where an ACS provided, provide volume control for speakers in this space.
- E. Door call bells not allowed to terminate in the main intercom console.
 - 1. Door call bells are part of independent two-station AIPHONE systems.
- F. Mounting height of the call switch shall be per ADA.

2.7 ROOM SPEAKERS

- A. Description: Assembly; speaker with matching transformer; speaker to be permanent magnet cone-type with viscous-damped cone; speaker shall be equipped with dual winding line matching transformer.
- B. Speaker Specifications:
 - 1. Nominal Size: Maximum size 8" With a 12" grill
 - 2. Frequency range: 60 HZ to 12,000 HZ
 - 3. Power rating: Normal 7 watts, Peak 10 watts
 - 4. Voice coil impedance: 8 ohms
 - 5. Axial sensitivity: 95 DB at 4' with one-watt input
 - 6. Depth: 2.75"
- C. Line matching transformer Specifications:
 - 1. Type: 25V/70V line
 - 2. Capacity: 2 watts
 - 3. Primary taps: 0.5w, 1w, and 2w
 - 4. Secondary impedance: 8 ohms
- D. Outside speakers: Multi-tap 2 through 15-watt mini-horn mounted inside of recessed enclosure specified.
- E. Drop-in ceiling speakers for areas with ceiling tiles: 70V/25V, 5-watt transformer (5, 2, 1, 0.5, 0.25 watt) taps.
 - 1. 1' x 2' perforated grille over the entire speaker front, Bogen CSD 1x2 or approved equal.
- F. Do not place wall speakers back to back on a sharing wall.

1. All wall speakers on a sharing wall shall have sound dampening material behind each speaker.
- 2.8 SPEAKER STATION VOLUME CONTROLS
- A. Description: L-pad volume attenuator, which presents constant impedance to the source (match manufacturer specs).
 - B. Output to speaker shall be adjustable from zero to maximum output from amplifier.
 - C. Knob shall have graduated indications with a designated (off mode).
 - D. Install speaker volume controls in the office and staff only areas.
 1. Volume control not allowed in the student occupied areas.
- 2.9 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. Install a maximum of one multi-pair cable (27 pair or 12 pair) in a 2" conduit.
 2. Install a maximum of two multi-pair cables (27 pair or 12 pair) in a 3" or 4" conduit.
 3. For two pair cables in a home run, conduit fill shall not exceed 40%.
 4. Provide a pull string in all intercom home run conduits.
 - B. Install an underground pull box every 250', 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 including the console 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 latch able cover.
 - E. Install a 48" x 48" x 6" minimum size cabinet for elementary school and middle school and a 72" x 72" x 6" for high school with painted wood backboard and punch down blocks flush in wall, behind the sound-rack.
 1. All cabinets including the console shall have a minimum of 24" of excess wire.
 2. All cabinets shall have a hinged type cabinet door.
 3. All system field wiring shall terminate through telephone punch down blocks in this cabinet.
 4. Install surge suppression devices on the telephone punch down blocks.
 - F. 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.
 - G. Permanently label all Intercom system terminal boxes, as (Intercom System).
 - H. 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.
 - I. Recess the wall speaker back-boxes 10-11/16" square x 5" deep; flush mounted, with recessed baffles having a baked semi-gloss white enamel finish.
 - J. 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.
 - K. Ceiling speakers for areas with hard ceiling: Ceiling speaker station back boxes shall be recessed 10³/₈" cylindrical, 5" deep and T-bar bridge bracing to prevent ceiling tile sag.
 1. Provide recessed trim ring baffles finished with white enamel.
 - L. Exterior wall speakers:
 1. Provide recessed 9-9/16" square protective rust proofed back boxes and a 10³/₄" square white square recessed aluminum alloy, vandal proof grill with tamper proof hardware.
 2. Locate as high as possible, minimum of 8'-2" AFF.

- M. Provide FM antenna stub out with weather head through administrative roof and raceway to the main intercom cabinet.
 - 1. Stub-up shall be sufficient to mount the antenna.
 - N. Clean inside the terminal cabinets and other enclosures of wire cuts and other installation debris.
- 2.10 INTERCOMMUNICATION SYSTEM WIRING AND CABLE
- A. Intercom, rack power, branch circuits: Building wire as specified in Section 26 05 13 120-volt individual circuit on emergency power.
 - B. Speaker station cable: #22 AWG stranded with Aluminum polyester foil shield with drain wire.
 - 1. Gray PVC jacket
 - 2. 4 conductors (2 - unshielded and 2 - shielded) Color Code Primaries- 1 Black 2 Red 3 White 4 Green.
 - 3. Use one cable per speaker selector station.
 - 4. Multiple speaker groups increase wire gauge to #18 AWG stranded.
 - 5. Use black and red to speaker, green and white to call button.
 - C. Microphone cable shall be whole braid shielded #20 AWG 2 conductor polyethylene, black and clear coloring.
 - D. Install a grounding conductor between the main terminal cabinet and all building entry, terminal cabinets bonded to each terminal box and from respective building entry, terminal cabinets to each external speaker back box.
 - 1. A driven Equipment Ground shall be located within 10 feet of the intercom console.
 - 2. Ground wire shall terminate on the metal console as well as on the grounding terminal block.
 - 3. #12 AWG stranded THHN/THWN green.
 - E. Identify wiring on each of the cables at all terminal strip locations and at the control console switch bank connector plugs, as to room # identification, use FISH Numbers.
 - 1. Apply the label on each cable at both sides of the terminal strips.
 - F. Provide 12 spare cables (4conductors) at each intercom system, terminal cabinet supplied from the main terminal cabinet.
 - 1. These 12 spare cables will provide speaker and call-in button for 12 future classrooms.
 - 2. If utilizing multi-wire cable to provide spares, then 12 spare cables mean 48 single wires (4 wires for each speaker and call button).
 - G. Place 8 exterior speakers and eight interior corridor speakers on a separate cable, switch, and label accordingly.
 - H. Cable installed below grade shall be listed for wet location; West Penn # AQC 434 (12-pair), West Penn # AQC 357 (2-pair), Belden # 1060A (24-pair), and Belden #1061A (36-pair) are approved.
 - I. Terminate all spare wires in all cabinets including the ACS and identified as such.
 - 1. There shall be 24" of spare cable in each cabinet, including the ACS.
 - J. Do not use solid wire from the intercom console to the punch down block; a factory cable with plug in is acceptable.
 - K. Do not splice intercom cable from intercom main terminal cabinet to buildings intercom terminal cabinets.
 - 1. Intercom cable splices are not allowed from buildings terminal cabinets to intercom devices.
 - 2. Cables serving multiple devices such as corridor speakers can be spliced at the speakers, but not between the speakers.

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. Install all components in the sound console and interconnect the control system and all peripherals in accordance with manufacturer's instructions.
- B. Speaker Cable: Run a separate speaker cable to each speaker or group of speakers as shown from the central console.
- C. Equipment: Equipment shall be neatly and firmly mounted plumb and square with adjacent surfaces with fasteners recommended by the product manufacturer.
- D. Wiring connections:
 - 1. At terminal strips, make with solder less connector appropriate for the wiring gauge and terminal screw.
 - 2. Make speaker cable connections at console with factory manufactured switch bank connectors.
- E. Controls and switches:
 - 1. Label controls and switches on the console, including inputs and selector switches as to function, on/off, area, etc.
 - 2. Labeling of the selector switches at the main console shall be typewritten and in consecutive numerical order using the schoolroom numbers.
- 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. Low voltage wiring: Make wiring between console and junction box of sufficient length to enable moving the console away from wall with 6' clearance between back of console and junction box and tie with tie wraps in a professional manner.
- 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. Connect interior speakers to the 1/2-watt tap, and the exterior speakers, gymnasium and cafeteria speakers to the 2-watt tap.
 - 1. Adjust and re-tap as necessary to provide normal audio coverage for the room acoustics.
- K. The corridor and hallway speakers shall be on separate circuits from speakers on the exterior of the buildings.
- L. Do not install more than eight corridor/hallway and exterior speakers on any speaker circuit.
- M. Intercom system and Public Address system (section 27 51 16) shall not share speakers.

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.

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- 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