NOTE TO PROJECT ARCHTECT: LAUSD INFORMATION TECHNOLOGY DIVISION IS THE ONLY COGNIZANT AUTHORITY FOR CHANGES OR MODIFICATION OF THIS SPECIFICATION. NO CHANGES OR MODIFICATION SHALL BE MADE WITHOUT SPECIFIC WRITTEN AUTHORIZATION OF ITD.

NOTE TO PROJECT ARCHITECT: BOLDED SECTIONS AND TEXT IN BOXES MUST BE REMOVED PRIOR TO ASSEMBLING PROJECT MANUAL.

SECTION 25821

PUBLIC ADDRESS AND INTERCOMMUNICATION SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Principal items of Work in this Section include but are not limited to:

1. Furnish, install and connect a central rack, as indicated on the Drawings, with a fully operational public address (PA) system and Intercommunication system, including all call paging access from the PBX, obtaining DTMF access to individual speakers, zone paging, all calls, other rooms, etc., as allowed by programming. System shall also provide for interfacing with a master clock system for a class change signaling system and Fire Alarm system with override of PA tone signaling capability. An additional separate circuit shall be also required to inhibit all loudspeaker audio outputs when another separate relay contact closure occurs from the Fire Alarm system. This second closure shall also require activation of the muting relay circuits to all autonomous PA systems.

2. Furnish, install and connect all conductors, conduits, and terminal strips necessary to provide for functions and requirements specified, including interface cabling to PABX system, autonomous systems' overrides, the Master Clock system and the Fire Alarm system.

3. Provide all labor, engineering, design, testing, materials, supervision, tools, mounting hardware, cable management, software and components necessary or required to provide a complete operable installation. The system shall be installed in compliance with project documents, applicable codes, and industry

standards to deliver a system that meets standards of quality and functionality.

4. Provide services on Project site including specified connectivity for all administration areas, classrooms, computer and science laboratories, libraries, auditoriums, multipurpose rooms, P.E. areas, quad area other instructional areas, and work areas as indicated in Project Drawings.

5. The classroom phones connected to the intercommunications system shall provide a true 911 connection to a 911 operator without the necessity to dial any extra digits. (98-9-911 is not acceptable).

C. Related Sections:

1. Section 16010: Basic Electrical Requirements.
2. Section 16060: Grounding and Bonding
3. Section 16050: Basic Electrical Materials and Methods.
4. Section 16120: Low Voltage Wiring
5. Section 16445: Panel boards and Signal Terminal Cabinets.
6. Section 16530: Emergency Power Systems.
7. Section 16715: Fire Alarm Systems
8. Section 16730: Clock and Program System.
9. Section 25723: Telecommunication Systems.
10. Section 25822: Autonomous PA Sound System - Multipurpose Rooms.
11. Section 25823: Autonomous PA Sound System - Auditorium.
12. Section 25824: Autonomous PA Sound System in Gymnasium.

D. Acronyms:

DTMF	Dual Tone Multiple Frequency
IC	Intercom
IOR	Inspector of Record
LCD	Liquid Crystal Display
OAR	Owner Authorized Representative
PA	Public Address
PABX	Private Auxiliary Branch Exchange
PBX	Private Branch Exchange
VFD	Vacuum Fluorescent Display

LED	Light Emitting Diode
SLC	Small Learning Community

1.02 SYSTEM REQUIREMENTS

System shall be a combined public address and intercommunication system.

A. Intercommunication System:

1. Communication hardware shall be furnished with the capacity for internal communication between operator and selected classrooms. Calls from classroom telephones shall be enunciated by an alerting tone and shall appear on liquid crystal display (LCD) on an administrative telephone in Main Office. Calls shall be displayed in the order in which they are received and the additional calls stored in memory. The main operator shall be able to answer calls in sequence by depressing one button on administrative phone, or out of sequence by dialing the number of the desired classroom. Calls to classrooms shall be announced by either a tone signal over the classroom speaker or by ringing the staff telephone. In areas where the incoming calls are announced over the speaker, the speaker shall be disconnected when the classroom handset is lifted from its cradle and the conversation shall automatically be transferred to the handset. Predetermination as to whether to ring the telephone or to permit talking over the speaker shall be user selectable when dialing. Signal switching for communication operations shall be accomplished by electronic methods.

2. Direct Dial Telephones: A direct-dial telephone system with electronic switching shall be furnished to accomplish the above description. The system control circuit shall be state-of-the-art design with modular plug-in printed circuit construction and advanced type technical mechanism. The central switching exchange shall utilize standard DTMF signaling for conformance with standard telephone practices.

3. Administrative Telephones: Administrative telephone communication system shall provide the following minimum requirements:

a. Administrative control center shall be a standard push-button dialing telephone complete with solid state pre-tuned tone oscillators identical to those employed by public telephone companies.

b. Central switching exchange shall be of the modular plug-in printed circuit board type, solid state sensing and logic, and

shall also provide two-wire balance transmission complete with dial tone, automatic ringing and busy signal facilities.

c. Central switching exchange shall be furnished with facilities for a minimum of 8 unrestricted, simultaneous, private telephone conversations between:
   (1) Administrative and administrative telephones
   (2) Administrative and staff telephones
   (3) Staff and staff telephones.

d. Capability as provided for direct dialing, private, two-way telephone communication between all locations furnished with administrative telephone and staff telephone shall be provided.

e. Capability as provided for any administrative telephone to transfer a call from another administrative telephone or any staff (classroom) telephones to any other telephone.

f. Capabilities, as provided for the instantaneous distribution of emergency announcements simultaneously to all locations furnished with loudspeakers, by dialing a pre-determined code number.

g. Provisions for restricting access to the emergency announcements to certain administrative telephone. This shall be accomplished by the use of an authorized administrative telephone.

h. Capabilities as provided for the origination of both normal and priority emergency calls from any staff station location shall be provided. Priority emergency calls shall take precedence over normal calls.

i. Facilities as provided for answering calls registered in the readout by pressing a single response button.

j. Provisions for instantaneous distribution of announcements to prescheduled groups of speakers from any location equipped with an administrative telephone.

k. Provide an all-cancel function from an administrative telephone to cancel all classroom annunciated calls.

l. Local diagnostic functions shall be provided to simplify maintenance.

m. The system shall incorporate non-volatile memory for programs, which shall not be affected by the loss of line voltage.

n. Central switch shall be designed to fit in any standard 19” rack-mounting. It shall be possible to remove individual circuit boards from the system for inspection and service without disturbing or disconnecting any exchange wiring

o. DTMF programming: Administrative telephone shall be able to distribute announcements to each individual speaker

or (intercom), zone page a group of speakers, or distribute all-call.

p. Audio level of the telephone intercommunication system shall be attained at sound levels sufficient to override typical ambient school noise levels and to provide for a satisfactory and serviceable system with a minimum of 70 dB isolation between PA and intercommunication signals.

q. Upon notification from the Contractor, the OAR shall contact the Telecommunications Branch of LAUSD to arrange for ordering of necessary additions to the voice system to coincide with the completion of the installation of the PA/Intercom system. Any work to the PBX system will be provided by the Owner to encompass both hardware/software additions and any necessary programming, and is outside of the scope of this specification. The Telecommunications Branch will manage all connections to the PBX voice system. Any vendor working on the telecommunications system must be pre-approved by the Telecommunications Branch prior to any work commencing.

B. Public Address: Public address system reproduction shall provide the following minimum requirements:

1. Reproduction of speech shall be clear, high fidelity and with all frequencies within range of system faithfully reproduced with no detectable noise, hum or distortion. The signal to noise ratio for the frequency range of 30 Hz – 20 kHz shall be a minimum of 90 dB.

2. Reproduction shall be attained at sound levels sufficient to override noise levels typical for schools, to provide a thoroughly satisfactory and serviceable system with a minimum of 30 dB signal-to-noise ratio between public address program and background noise level of 65 – 70 dB.

1.03 SUBMITTALS

A. Provide the following submittals in accordance with Division 01:

1. Material list: Submit a complete material list for the materials and products of this section. Each submittal shall be bound and shall contain an index organized vertically by assembly and item number and horizontally by columns. The first assembly shall be the major head end equipment. The leftmost column shall be the item number; next shall be the description, followed by the

applicable specification section number, followed by the specified item, which is followed by the submitted item. The rightmost column shall be for notes, which shall be used to reference the reason for submitting items other than as specified.

2. Product Data: Include Product Data sheets and/or catalog cut sheets for items listed in index. Data shall be clearly marked and noted to identify specific ranges, model numbers, sizes, and other pertinent data. Items shall be arranged in the same order as the index and if more than one item is indicated, the submitted items shall be highlighted or marked with an arrow. Product Data shall be sufficiently detailed to allow the Architect to review the product and to allow other trades to provide necessary coordination.

3. Contractor shall include in the Product Data list submission, copies of manufacturer certificates that the Contractor is an authorized distributor of the submitted manufacturer's products; and each member of the installation crew has been trained and certified in the installation of those products. Contractor shall submit proof that his/her company has a service organization capable of responding within 24 hours of receipt of written notification and resolution within 1 day.

4. Contractor shall have completed at least 5 projects of equal scope to systems described herein and shall have been in the business of supplying and installing specified type of systems for at least 5 years.

5. Contractor shall provide a letter from the Manufacturer assuring the availability of spare parts common to proposed system for a period no less than 5 years on all components.

B. Shop Drawings: Contractor provided Shop Drawings shall indicate the following :

1. Provide, drawn to scale, details of racks, consoles and cabinets with designations, elevations, dimensions, doors, barriers, mounting details, catalog number of locks, finishes and color. Provide a dimensioned detail of console nameplate including school name, address, and power load. Indicate manufacturer's part numbers for all controls, switches, connectors and indicators. Provide a complete set of drawings of wiring diagram for each rack, instrument wiring and schematic diagrams of circuits of all equipment.

2. Provide detailed drawings as to interfaces with equipment furnished by others including number of wires, termination requirements, input/output voltages, input/output signals and other required coordination items, items including point to point connection details for all devices and equipment,

3. Provide a terminal block layout for the main public address terminal cabinet indicating the locations of terminal blocks for cables from the field, the public address rack, PABX, and as otherwise required. Indicate the typical lay down for each cable type and the number of blocks and space required. Include a front elevation indicating cabinet dimensions, make, location and capacity of equipment, size of gutters, type of mounting, finish, and catalog number of locks. General layout of internal devices, wiring drawings with wire numbers and device connections, vendor cut sheets of devices in enclosure and bill of materials listing description, manufacturer, part number, and quantity of items shall be included. Indicate terminal cabinet layouts for remote terminal cabinets as required.

4. Power load of public address system shall be separately calculated and included with Shop Drawing submittal.

5. Shop drawings shall indicate equipment locations, wiring and schematics, details, panel configurations, sizes and a point-to-point wiring diagram of all circuits. Shop drawings shall indicate interfaces to equipment furnished by others, identifying numbers of wires, termination requirements, input/output voltages, input/output signals and other pertinent details. Responsibility for each end of interfaces shall be noted on shop drawings.

6. Submit Drawings prepared, signed, and sealed by structural engineer licensed in the State of California. Details shall be provided indicating the proposed means of support and attachment of all wall and floor mounted racks. Calculations shall be based on the maximum load rating of the cabinet by the manufacturer in a Zone 4 seismic environment, not the weight at time of occupancy.

7. Provide Shop Drawings, in the same size as the Record Drawings. Shop Drawings shall be prepared in the latest version of AutoCad with 3 – CD-ROM electronic copies submitted along with one set of full sized Shop Drawings.

8. Installation and coordination drawings for items in other sections shall be included with submittal of Shop Drawings. Submit blue line copies and one reproducible copy of installation and coordination drawings.

C. Sample Materials: Contractor shall provide samples of material and equipment as required by the Architect. If samples are requested, they shall be submitted within 10 days from the date of request.

1.04 CODES AND STANDARDS

A. Complete installation shall meet or exceed the latest edition of following standards.

1. EIA/TIA-568: Commercial building telecommunications wiring standard.

2. EIA/TIA-569: Commercial building standard for telecommunications pathways and spaces.

3. EIA/TIA-606: Administration standard for telecommunications infrastructure of commercial buildings.

4. EIA/TIA-607: Commercial building grounding and bonding requirements for telecommunications.

5. CCR Part 2 - California Building Code (CBC)

6. CCR Part 3 - California Electrical Code. (CEC)

7. ANSI, ASTM, UL, NEMA, IEEE and FCC standards as applicable.

8. BICSI Telecommunications Distribution Methods Manual, current edition.

1.05 SYSTEM DESCRIPTION

The Public Address/Intercommunications system shall be comprised of 2 separate inter-operating systems which shall provide redundant means of performing public address functions, telephone and two-way loudspeaker intercommunication. These two systems shall be furnished with totally separate active electronic components. It shall be possible to remove power from all components in one system while retaining full function in the other subsystem. Systems not providing this level of redundancy are not permitted.

A. Public Address and Intercom Switch Bank Based System.

1. An intercom/program distribution control panel with functionally identified push buttons with one set of color coded guidelines and controls for program and public address functions and another set of color coded guide lines and controls for loud speaking intercom functions. It shall be furnished with a red emergency page push button and microphone, “MIC 1,” “MIC 2”, and “AUX” program input selector push buttons, and an “all rooms” program distribution push button. Panel shall include a microphone and microphone amplifier, a program amplifier which may be bypassed

and replaced with a larger external power amplifier, a larger external power amplifier, a twenty (15-20) watt intercom amplifier for use in loud speaking intercom applications, and a monitor amplifier and speaker, with level control.

2. An input expander panel with two groups of four input selector switches. The left group shall serve as input selectors for the "MIC 2" program on the control panel and the right group shall serve as input selectors for the "AUX" program.

3. Three or more switch banks, each with twenty-five (25) three position switches. The switch positions shall be color coded for program and intercom. The switch banks shall be connected to a relay card to allow access to the speakers by the Multi-Com 2000, Rauland Telecenter V or Dukane StarCall subsystems. The signal from the switch banks shall be routed through the normally closed contacts on the relay cards to the speakers. When the red "Emergency All Call" button on the control panel is pressed, relay control voltage to the relay cards shall be removed so that all speakers are connected to the switch banks and the system shall automatically be switched to an Emergency All Call Program The override relay shall also activate to mute all autonomous PA systems.

4. A UPS remote control display panel (available from the manufacturer, approximately 4" X 6" X 1") shall be permanently installed on the front of the PA rack and connected to the UPS with a custom terminated Cat-5 cable and 25 pin to 6 pin adaptor. This remote control display panel will replace the requirement for a relay to activate the UPS during an emergency all-call and replace the UPS "on" light indicator. Two 6 pin RJ-11 male plugs are connected to the Cat-5 cable; one pair of this cable is not connected, and the individual wires are "rolled": pins 1 through 6 on one end are connected to a RJ-11 plug while the wires on the other end of the cable are oriented as pins 6 through 1 and connected to the other male RJ-11 plug. Refer to SD 5.8 for details.

5. As a minimum a two hundred and fifty (250) watt public address amplifier shall be provided to bypass amplifier in the intercom/program distribution control panel. The total wattage load of all the speakers in the system shall be measured to determine if additional two hundred and fifty (250) watts or higher wattage public address amplifiers are needed. The spare wattage capacity for each public address system amplifier shall be a minimum of 33 % of the total wattage load for each amplifier at the time of occupancy.

6. An AM/FM/Cassette Tape player program source shall be connected to the first program selector switch.

7. A 5 CD changer whose output shall be connected to the second program selector switch position.

8. The custom control panel shall be fabricated from a 3½ inch high metal sub-panel on which are mounted, Switch Craft PL series switches for All Call, and for signal and passing tone, and left and right phone jacks for auxiliary inputs and recorded outputs. In addition four automatic override selector switches shall be provided to use with autonomous PA systems. The automatic override selectors shall be readily available for connectivity to autonomous systems, clearly labeled and terminated on a screw terminal block or on a punch block. A single 3" x 17" dress cover plate with engraved designations shall be provided. Engraving shall be white lettering on a black micarta field.

9. Combine networks shall be used to convert stereo auxiliary inputs into mono inputs. Trim pots and attenuation networks shall be provided for each of the 4 inputs to each of the first 2 program channels.

10. Provide 2 remote program inputs on the third and fourth selector switch positions in the input expander panel. The program inputs shall be readily available to connect to existing or future inputs. The program inputs shall be clearly labeled and terminated on a screw terminal block or on a punch block.

11. Provide 3 remote microphones on the first 3 microphone input selector switches in the input expander panel. The microphone inputs shall be ready for connectivity to existing or future remote or local microphones. The microphone inputs shall be clearly labeled and terminated on a screw terminal block or on a punch block.

12. An auxiliary panel microphone receptacle shall be connected to the fourth microphone input selector switch.

13. A handheld microphone shall be installed in the main office at or near the intercom wall display and an administrative telephone shall be installed in the main office, in each SLC and in each Academy in the school site. This microphone shall be "always hot" – depressing the momentary microphone button will connect it directly to the switch bank public address system, permitting an all-call announcement to be performed. The requirement for installing a hand held microphone at the rack is replaced by this device, although duplication is optional.

14. The all page output with contact closure from the PABX shall be connected to the telephone signal and telephone page control inputs on the intercom/program distribution control panel.

15. A momentary push button switch on the auxiliary panel labeled "SIGNAL TONE" shall be connected to the tone input on the intercom program distribution panel. When pressed, it shall transmit a 750 Hz tone over all speakers. This tone shall sound only when the "SIGNAL TONE" button is pressed. It shall be completely independent of the time tones.

16. Program-All distribution through all loudspeakers, outdoor speakers, auditorium system speakers, gymnasium speakers, and multi-purpose room speakers through a relay control. Program-All shall furnish full priority over all switching between amplifier and speakers of central control system, except as specified. Program-All shall obtain signal sources as selected.

17. For each autonomous system, a selector switch on the custom control panel shall be provided to automatically override autonomous system speakers.

18. Automatic class change signaling system shall include manual controls to select program and to do all call. A panel mounted in the P.A. rack shall include at a minimum a selector switch to provide selection of three programs and a separate switch to do all call.. The number of class change signaling systems shall be determined by the number of small learning communities or other academies at the site. The Public Address and Intercommunication system shall be able to support as many class change signaling needed, by providing a custom panel which can provide additional signal zones and tones. The design shall include the use of additional signal generators in order to provide different tone signals and the selection of three programs and a separate switch to do all call for each of the additional Learning Communities or other academies. The class change signaling selector switches shall be wired to the clock program controller for selection of one of three programs for each independent Learning Community or Academy. The selected program shall be distributed over the microprocessor based loud speaking intercom and P.A. system. At school sites where there are no independent Learning Communities or Academies, and a master clock remote input panel zone selector has been installed, typically in the main office, the automatic class change signaling system control on the PA rack shall be bypassed.

    a. In Middle and High schools, the class change signaling system shall be programmed to include dressing and cleanup tones for gymnasiums and shop zones.

b. In Middle and High schools, the master clock will transmit three contact closures from three separate relays per schedule. It is prudent to observe the associated LEDs located on the front panel of the master clock which blink or turn on when the relays are activated. Simultaneous activation of two or three of these relays may cause the external inputs of the public address system to perform erratically. If this simultaneous activation is observed, contact the Owner's OAR for reprogramming of the relays for individual relay activation (the gym dressing tone should occur at a different time from the class change tone). Do not confuse simultaneous activations from relays used for a different time schedule but are adjacent to the first schedule group (e.g. one of the three minimum day schedule relays might activate coincidently at the same time as one of the three regular day schedule relays, but are never connected to the PA system external inputs at the same time.).

B. The other system shall be a microprocessor based, DTMF tone controlled modular loud speaking intercom and public address system. The intercommunication system shall provide communication between classroom telephones, speakers, administrative phones and PABX system and shall operate in conjunction with Public Address equipment. The system shall provide the following features and capabilities:

1. The system shall be available in a rack mounted card cage configuration with a printed circuit backplane or a card shelf with a modular shelf assembly with through plug-in circuit cards. The processor card, speaker control cards, telephone control cards and PBX telephone interface cards shall plug into card connectors on the backplane or into a modular shelf assembly with through plug-in circuit cards.

2. Speaker cards shall be installed in card cages or card shelves. Each speaker or telephone card can control sixteen (16) or twenty-four (24) speaker circuits depending on the system. Provide speaker and telephone cards for each switch bank as needed.

3. DTMF tone capable cards shall be installed in any one-card cage or modular shelf. Each card can control 16 to twenty-four (24) call stations, DTMF telephones or display phones in any combination. Provide one station card for the first switch bank to allow connection of the system control display phone. Provide additional station cards as required if emergency call buttons or phones are required.

4. One relay card or more per switch bank and one or more analog cards are required on switch bank. These relay cards are connected to the printed circuit backplane directly or with ribbon cables. The relays in the relay card allow the system to seize control of speakers and station circuits as required. Control voltage to the relays may be interrupted to drop out all system functions and give the intercom/program control panel and associated equipment priority. The relay card is the only item common to both systems. It contains no active circuitry. Each relay card has provisions for attachment of an external power amplifier if required.

5. A power/program panel shall be provided to supply the manufacturer's specified power for the analog speaker cards, telephone cards and for all other components in the system. The power supply of the DTMF controlled system shall be independent of the switch bank based Public Address and Intercom System. It shall also be provided with a 3 channel auxiliary program input chassis into which 3 modules of various types may be installed. These modules shall include microphone pre-amplifiers; transformer couples line pre-amplifiers, microphone, and telephone paging modules, a multiple tone generator, and a FM tuner module. All three outputs from the auxiliary program input chassis shall be connected to the backplane where their programs may be selected for distribution by the microprocessor-based system.

6. One DTMF based control console administrative telephone with an LCD display shall be installed in the main office in each SLC and in each Academy. It shall be possible to program and control all microprocessor-based equipment with this control console, if this feature is provided by the manufacturer. It shall also be possible to make zone pages and all call pages to assign programs to any or all speakers, to assign individual speakers to time and page zones and to make loud speaking intercom calls.

7. An external 250-watt power amplifier shall be provided for the last switch bank, or of the last 2 switch banks if required.

8. Telephones: System shall be ADA compliant and utilize DTMF based, 2554 type wall mounted or 2500 type desk phones. Wall phones shall be fully modular. System shall automatically transfer an intercom call made to a loudspeaker to the associated intercom telephone when the phone is taken off hook.

9. Emergency Calls: System shall posses an emergency call feature, which may be activated by either one of the three following methods: dialing * * and hanging up, by four or more flash-hooks within a two second interval or lift the phone off the hook and wait for a configured length of time (typically 15 or 30 seconds). Emergency calls shall appear at the top of the answer queue and

shall ring with a distinctive ring cadence on the designated administrative station or wall display unit.

10. Wall Display Unit: System shall be furnished with only one wall display unit, which displays the time and call-in information. Emergency calls take priority and flash "HELP", "E" or display station number. Information shall be displayed on LED, VFD, or LCD segments and shall be accompanied by distinct tones for emergency, normal, and call waiting originations. Tone level shall be adjustable. The information from each of all the telephones installed in the Public Address system shall be displayed on only one wall display installed at the main office. (In some systems the emergency call will not appear until the display phone line is no longer being used).

11. Privacy Feature: System shall have a privacy feature, which renders impossible unannounced monitoring of intercom conversations from the PA/IC rack, administrative telephones or other intercom station.

12. Channels: A minimum of eight channels of intercommunication shall be provided together with the Public Address System.

13. Loop Start Trunk Ports: System shall provide intercom system dial tone for loop start trunk ports from the PABX via Intercom station ports or telephone adapter modules. PABX based DTMF phones shall hear a beep and then receive PA/IC dial tone. It shall be possible to assign various levels of intercom capability to these ports via intercom system programming. These ports shall allow calls from the PABX to individual intercom stations or to access page functions. The Intercom station ports or telephone adapter modules shall have transformer based isolation circuits to protect both PA/IC and PABX from harmful transient signals that may be present in the lines. Each Intercom station port or telephone adapter module shall use optical isolators to detect the 90 volt ring signal from PABX station ports. In middle schools and high schools, a minimum of four loop start trunk ports from the PABX via intercom station ports or telephone adapter modules, shall be connected. Two such circuits shall be connected for primary centers and elementary schools.

14. Interface Modules: System shall be furnished with a telephone interface module to provide up to eight DTMF based telephone ports, which are compatible with 2500 Series, PABX station ports. System shall be provided to allow up to eight simultaneous calls from the intercom system to PABX connected instruments, or to outside lines. These ports shall allow calls from the intercom system to the PABX and shall appear transparent to the PABX. Each port requires one telephone cable pair. Four such circuits

shall be connected to the PABX at time of installation. Circular or linear hunt shall not interfere with PABX to PA/IC interface.

15. Intercoms: System shall provide 2554 or 2500 series telephone in all rooms.

16. Provision shall be furnished to connect up to six separate time zone schedule controllers to the microprocessor-controlled system. When a contact closure is provided by a remote time controller, all speakers assigned to the time zone will sound a passing tone of standard tone and duration.

17. The Public Address System shall be configured in such a way as to prevent any and all tones initiated automatically or manually from the Public Address console and manually from any telephone when the Fire Alarm Control Panel is in alarm. See standard detail SD 5.14 for Fire Alarm Control Panel to Public Address System physical interface requirements. An additional separate circuit shall also be required to inhibit all loudspeaker audio outputs when another separate relay contact closure occurs from the Fire Alarm system. This second closure shall also require activatingactivation of the muting relay circuits to all autonomous PA systems.

18. Central Intercom Switch: Central intercom switch shall fit in standard 19-inch mounting rack. Circuit boards shall be removable from system for inspection and service without disturbing or disconnecting exchange wiring. Units and electronics switches shall be engineered to fit in one 65-inch rack (exchange system and PA system).

1.06 QUALITY ASSURANCE

A. Work shall conform to CCR, Title 24 Part 3, Basic Electrical Regulation and National Electrical Code, latest edition.

B. Only a qualified Contractor holding licenses required by legally constituted authorities having jurisdiction over the work, shall do the work.

C. Persons skilled in trade represented by work, and in accordance with all applicable building codes, shall install system in accordance with best trade practice.

D. Work shall be performed by an Contractor that has completed at least 5 school systems of equal scope to system described herein and shall have been engaged in business of supplying and installing specified type of

systems for at least 5 years. Contractor shall maintain a fully equipped service organization capable of furnishing repair service to equipment

E. The Contractor shall use adequate numbers of skilled workmen who are currently manufacturer certified, thoroughly trained and experienced on the necessary crafts and completely familiar with the specified requirements and methods needed for the proper performance of the work.

F. The Contractor shall coordinate cable runs, and rack equipment locations with the Owner's Authorized Representative during the initial design of the cable installation. Contractor and OAR must agree as to the final location of all devices and the cable plant design.

G. The Contractor shall provide technicians and tools required to participate in Owners Quality Assurance Testing as detailed in Attachment "A" of this specification.

1. Items on check list of Attachment "A" will be examined as a minimum at the Public Address Head End, terminal cabinets, ground vaults and classrooms. Should the examination show deficiencies related to items in the checklist, Owners acceptance testing will be discontinued until corrections have been made. When the Contractor has completed the corrections, a subsequent Quality Assurance test shall be initiated. This procedure is in addition to the system functionality testing required in section 3.03 below.

1.07 WARRANTY

A. Contractor shall warranty that all work executed and materials furnished shall be free from defects in materials and workmanship for a minimum period of 3 years from date of installation acceptance, date of Contract Completion, excluding specific items of work that require a warranty of a greater period as set forth in this Specification. In the event a manufacturer's warranty is longer than 3 years, the manufacturer's warranty shall be the warranty period. Immediately upon receipt of written notice from the Owner, the Contractor shall repair or replace at no expense to the Owner, any defective material or work that may be discovered before final acceptance of work or within warranty period; any material or work damaged thereby; and adjacent material or work that may be displaced in repair or replacement. Examination of or failure to examine work by the Owner shall not relieve Contractor from these obligations.

B. Equipment or materials failure rates of 10% or more during the warranty period:

1. The District shall monitor the performance and reliability of the installed base of Equipment and Materials installed in this

Contract. Any deficiencies or malfunctions will be refered to the Contractor for repairs or equipment replacement.

C. If the District detects a defect within a warranty period as defined here in, it shall notify the Contractor Representative in writing ("Notice of Defect"). The Contractor shall make available and provide the District with the telephone number of a fax machine to receive Notices of Defect. This fax machine shall be available to receive faxes 24 hours per day 7 days per week, including all weekends and holidays

D. Upon receipt of written notice from the District of any failure or defect ("Defect") in any such Equipment or Work, the Contractor shall diligently perform all work necessary to determine the cause thereof, and the time necessary to remedy the Defect, and shall propose in writing to the District how and in what manner it will remedy the Defect. If the District determines that the proposal complies with the terms of the Contract, it shall authorize Contractor to proceed to redesign, repair, or replace the defective or failed Equipment or Work within the agreed time period.

E. In determining the cause of the Defect, the Contractor shall perform such investigations and tests as may be required to determine the cause, and to verify that such redesign, repairs, and replacements comply with the requirements of the Contract Document. All cost associated with such investigation, redesign, repair, replacement, and testing, including, but not limited to, the removal, replacement, and reinstallation of equipment and materials necessary to gain access to defective Equipment, shall be borne by the Contractor. Should the Contractor fail to promptly make the necessary investigations, redesign, repair, replacement, and test, the District may perform or cause to be performed the same at the Contractor's expense.

F. The Contractor will warrant the redesigned, repaired, or replaced Equipment against defective design, materials, and workmanship for the remainder of the warranty period or a period of to (3) years from and after the date of acceptance of the redesigned, repaired or replaced Equipment thereof, whichever occurs later.

G. The Contractor shall be liable for the satisfaction and full performance of the warranties as set forth herein.

H. All warranties hereunder are deemed and acknowledged to explicitly extend to the future performance of the Equipment warranted.

I. The rights and remedies provided for herein are cumulative, and shall not be exclusive and are in addition to any other rights and remedies provided by law, whether in contract or tort, or under this Contract.

J. Contractor is deemed and acknowledged to be a merchant with respect to all components and replacement parts furnished pursuant hereto, and the District is acknowledged not to be a merchant with respect thereto.

K. In the event any Supplier or manufacturer offers any extended warranty not specified herein, Contractor shall state the terms of such warranty or warranties in writing and shall extend the same to the District without additional cost to the District.

L. All warranties and guarantees of Suppliers of any tier and Manufacturers, whether expressed or implied, are deemed to be made for the benefit of the District regardless of whether stated as such, and Contractor shall enforce such warranties and guarantees for the benefit of the District.

M. Contractor shall include a letter signed by a corporate officer, partner, or owner of the contracting company describing their service organization, its capabilities and commitment to servicing the warranty on all work executed and materials furnished.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Public Address Intercommunications system shall be Bogen Multicom 2000, Dukane StarCall, Dukane StarCall Plus or Rauland Telecenter V.

1. A Public Address and Intercommunication system shall not be expanded past the stations or ports capacity stated in the manufacturer's product specifications.

2. The Bogen Multicom 2000 shall be used in sites that do not exceed more than 216 stations (telephone and speaker). As per manufacturer specifications the Bogen Multicom 2000 has a maximum capacity of 240 stations. Any other form of installation or design to provide more station capacity shall not be accepted. The 24 stations not used shall be provided for expansion capacity.

3. The Dukane StarCall Plus shall be used in sites that do not exceed more than 616 stations (telephone and speaker) and the Dukane Star Call in sites that do not require more than 488 stations (telephone and speaker). As per manufacturer specifications the StarCall Plus has a maximum capacity of 640 stations and the StarCall a maximum capacity of 512 stations. Any other form of installation or design to provide more station capacity shall not be accepted. The 24 stations not used shall be provided for expansion capacity.

4. The Telecenter V shall be used in sites that do not exceed more than 488 stations (telephone and speaker). As per manufacturer specifications the Telecenter V has a maximum capacity of 512 stations. Any other form of installation or design to provide more station capacity shall not be accepted. The 24 stations not used shall be provided for expansion capacity.

5. Voice over IP systems or Voice over IP integrated design systems shall not be accepted. Voice over IP designs to increase the station capacity of any public address intercommunications system shall not be accepted.

2.02 SYSTEM EQUIPMENT

The following specifications apply to equipment furnished with the Public Address/Intercommunications System.

A. System Equipment Rack:

1. The equipment rack shall provide a minimum of 77 inches of vertical panel space to accommodate 19-inch panels having 1¼ inch x ½ inch mounting spacing. The rack shall be 22 3/8 inches wide x 18½ inches deep x 81 3/8 inches high, with louvers and knockout openings on the sides and rear. There shall be a rear door having slip-joint hinges for easy removal without the use of tools. The rack shall be constructed of 16-gauge steel. The rack shall be finished in black enamel Cabinet shall be constructed with mounting rails tapped for No. 10-32 screws on EIA spacing front and rear. Cabinet shall be tested and certified to the seismic specifications set forth by NEBS Telcordia Technologies GR-63-CORE. Calculations for seismic bracing shall be based on the maximum load rating of the cabinet by the manufacturer in a Zone 4 seismic environment, not the weight at time of occupancy. Rack shall be UL listed.

B. Central Card Cage/Shelf Assembly:

1. Central Processor Card

Contains the system software that controls system features, functions, connections, audio, data and configuration for the DTMF controlled part of the Public Address and Intercommunication System.

2. Intercom Telephone Cards and/or Speaker Cards:

An intercom telephone card and/or speaker card shall be provided for all PA/IC ports for which intercom telephones are provided or for which intercom access is required.

3. Interface PA/IC to PABX

System shall be equipped to provide eight simultaneous calls from the intercom system to PABX connected instruments, or to outside lines.

4. Interface PABX to PA/IC

Provide Intercom station ports or telephone adapter modules to allow four loop start trunks from PABX to obtain access to intercom system dialing capabilities.

C. Administrative Display Telephone:

1. Telephones shall be designed to work with intercom system, shall utilize DTMF dialing and shall be furnished with the following features:

a. Function keys and display: Telephone shall be furnished with a standard 12-button keypad and LCD display for full alphanumeric menu-driven operation.

b. Telephone shall display station numbers with priority levels for incoming calls. Unique ring tones and flashing message or station number on LCD shall distinguish emergency calls from other calls.

c. Telephone shall provide 2-way, hands-free speaker operation and private handset operation. Handset shall be fully modular with a dynamic receiver and transmitter compatible with adjustable volume handset for the hearing impaired.

D. Intercom Instruments:

1. Wall-mounted: Intercom instrument shall be fully modular Series 2554 telephone instrument with industry standard DTMF keypad and 90 volt, 20 Hz compatible bell ringer. Unit color shall be cocoa brown. Unit shall be mounted with screws through the base; connections shall be provided directly to the network card. The handset cord shall be fully modular.

2. Desk-mounted: Intercom instrument shall be fully modular Series 2500 telephone instrument with industry standard DTMF keypad and 90 volt, 20 Hz bell ringer. Unit color shall be cocoa brown.

3. The bell ringer loudness control for both classroom wall-mounted and classroom desk-mounted sets shall be fixed to the loud position permanently. The loudness control for the ringer shall not be adjustable.

E. Ring Adapter Cards:

1. A ring adapter card shall be provided at all PA/IC ports for which intercom telephones are required. This card shall provide standard 90 volt, 20Hz cycle to the telephone instruments to allow industry standard 2500 Series desk and 2554 Series wall telephones to be furnished.

F. Wall Display Unit:

1. One wall display unit shall be provided and shall display time of day, station number and call priority. Unit shall provide unique ring tones to distinguish emergency calls from non-emergency calls. Emergency calls shall move immediately to the top of the queue and shall be accompanied by flashing "HELP", "E" message or the classroom extension number.

G. Intercom/Program Distribution Control Panel:

1. The intercom/program distribution control panel shall be a Bogen Model MCP35A, Rauland MCZ300 and Dukane Compact 3200 engineered for optimum simplicity of operation, made possible by the use of function-identified push buttons with associated color-coded guidelines, and supported by step by step instructions permanently printed on the front panel.

2. The control panel shall be all solid-state and designated for continuous duty service on line voltages of 120 volts, 60 Hz AC.

3. It shall be furnished with two separate amplifiers. The program amplifiers shall provide a minimum of 35 watts RMS at less than

1% distortion at rated power and bandwidth. The frequency response shall be within + 1, -3dB from 80 Hz to 15 KHz. The intercom amplifier shall be furnished with an output rating of 15 watts RMS; frequency response shall be shaped for maximum intelligibility. Both amplifiers shall provide balanced 25-volt line output.

4. It shall be furnished with inputs for two Lo-Z balanced microphones, one Hi-Z unbalanced auxiliary input, telephone paging accessories and booster amplifier. Terminals shall be provided to activate the time signal feature and Telco page feature.

5. It shall provide all controls necessary for two-way intercom communication with any classrooms, communication with any classroom, distribution of general announcements or program material to any or all classrooms, and transmission of emergency announcement to all classrooms. Provisions shall be included to permit emergency paging from a remote telephone, or microphone, which shall capture system priority and override all functions except for the emergency page feature.

6. Screwdriver-adjustable, rear-panel mounted controls shall be provided to adjust the input gain of the program sources, Telco page line, talk and listen functions. Internal controls shall be provided to adjust the emergency page volume, supervisory tone volume, time tone and to enable or disable the supervisory tone phantom power to microphone inputs. Facilities aural (monitor speaker) and visual (LED) monitoring of program material shall be provided.

7. The Master Control Panel shall mount on a standard 19 inch equipment rack. All program channel guidelines shall be distinctly colored. The emergency page push button shall be red.

H. Switch Bank

1. The Room Selector Panel shall be a switch bank with 25 selector switches capable of connecting up to 25 speaker-equipped locations to a Program, off, or Intercom channel. The unit shall provide 25 lever-action three-position four-pole selector switches with positive detents and tone annunciator. One rack unit space separation shall be provided in between room selector panels as they are installed on rack. A manufacturer-built, protruding blank or vent panel (one or more per rack) may be substituted for the flat blank solid (or vent) panel (protrusion is approximately two inches). These protruding panels provide protection to the switch banks located immediately above and below such panels.

2. Switch positions shall be legibly identified as Program A, off, and Intercom C, each with a color-coded guideline in accordance with the operating method provided in installed control center.

3. The individual switches shall be designed for maximum reliability and a life expectancy of over 250,000 operations. Switches, which have a lower life expectancy, are not permitted. Switch handles held in place by friction are not permitted. Switches shall be self-wiping with precious metal contact surfaces.

4. The annunciator system shall provide for automatic call cancellation, and shall operate on less than 15 VDC to eliminate any shock hazard. Annunciator systems, which do not provide automatic, call cancellation, or which use holding relays or other mechanical devices, are not permitted.

5. The room selector panel shall provide for the ready accommodation of add-on TZMA Time Zone Module and/or Call-In Module. The room selector panel shall be designed for mounting in standard 19 inch equipment racks.

6. Room selector switches shall be connected and designated beginning on left and progressing to right in orderly sequence as follows: (Check with the IOR before making final connection for coordination of room connections).

Switch Order	Designation
a.	Main Office
b.	Principal
c.	Vice-Principal
d.	Physician
e.	Nurse
f.	Conference Room
g.	Library
h.	Auditorium
i.	Classrooms in numerical order (by buildings) as painted on door to room
j.	Spares
k.	Custodian
l.	PE yard and outside (on separate bus)
m.	Lunch area
n.	Other outside area
o.	Auditorium-Autonomous System
p.	Auditorium Speakers
q.	Gymnasium-Autonomous System

r. Gymnasium-Speakers

I. Relay Module

1. One relay module shall be furnished for each telephone Card and/or Speaker Card. Each relay module shall have the station ports needed for connection with system stations. Physical connection of each shall be via plug-on connectors. Sealed, sub-miniatures relays shall be provided to connect each station to the program or intercom amplifier. Facilities shall be provided to accommodate relay driver circuitry, for the control of external functions. Each relay module shall be furnished with facilities to interconnect a booster amplifier.

2. Each module shall be connected to the card cage or card shelf, and the appropriate station and speaker cards via the cable assembly.

3. The relay module shall plug into a switch bank selector panel, which shall provide Public Address programming and intercom channel capability to the station ports.

4. The DTMF system functions shall have priority over Public Address and Intercom Switch Bank Based system functions; however, provision shall be provided to configure the intercom/program distribution control panel emergency page function for priority over all other system functions.

J. Input Expander Panel

1. The input expander panel shall provide eight additional balanced or unbalanced inputs to the Bogen Model MCP35A, Rauland MCZ300 or Dukane Compact 3200 Master Control Panel. It shall be possible to interconnect multiple expander panels to further increase system-input capacity.

2. Each expander panel shall provide two banks of four inputs, plus selector switches. Each bank shall connect to a separate Lo-Z MIC or Hi-Z AUX input on the Control Panel. Provisions shall be provided to connect banks together to allow eight inputs to feed into one MCP35A, Rauland MCZ300 or Dukane Compact 3200 input.

3. Each bank shall include a fifth input to replace the input on the MCP35A, Rauland MCZ300 or Dukane Compact 3200 into which the expander panel is connected. This input shall be accessed when all selector switches of a bank are in the out (OFF) position.

4. When a selector switch is pressed, it shall override the higher-numbered selector switched for that bank; switch 3 shall override switch 4, switch 2 shall override switches 3 and 4, and switch 1 shall override switches 2, 3, and 4.

5. Vertical centerline headers shall be furnished to connect microphones and auxiliary equipment to the panel. A tabular strip shall be provided on the front panel, which may be used to identify the particular input sources.

6. The panel shall be designed for installation in standard equipment racks, and shall occupy one rack space. It shall be finished to match associated school system panels. Dimensions shall be 1-¾ inch H x 19”W x 3 inch D.

K. AM-FM Tuner and Cassette Tape Player.

1. The auxiliary program source shall be an integrated auto-reversing cassette tape player and an AM/FM-stereo tuner with built-in 5-watt stereo amplifier.

2. The program source shall feature electronic quartz-locked PLL tuning with manual tuning control and auto-seek control. The auto seek control shall automatically ascend or descend the frequency scale next to the strong frequency. It shall be possible to preprogram up to 5 bands (FMI, FM2, FM3, AM1, AM2) with up to 6 station each. A preset scan control shall be provided to scroll and select from available presets.

3. The cassette tape playback system shall be an automatically reversing, dual-capstan drive type, with wow and flutter limited to 0.35%. The frequency response shall be 50Hz to 8KHZ, with signal-to-noise ratio at 52dB. The FM tuner section shall have 5V sensitivity, signal-to-noise ratio at 50dB and frequency range form 87.5 to 108MHZ.

4. The following controls shall be provided: BAL-ON/VOL, TUNE-TREBLE/BASS, EJECT, PROG (fast forward and rewind) SEEK, ASPS (auto seek/preset scan), BND (band), and 6 pushbuttons for preset functions. An LCD digital readout shall be provided to show selected frequency and band.

5. The program source shall operate on 120 volts AC. Program source shall have integrated power supply. Remote transformer powered program source shall not be accepted. It shall incorporate a low-level, low-impedance output, which shall be capable of driving the auxiliary input (AUX) of a public address amplifier. It shall be possible to drive a pair of loudspeakers directly utilizing the internal 5-watt stereo amplifier.

6. The program source shall be rack mountable in standard 19" equipment rack.

L. CD Player/Changer

Rotary CD Player/Changer shall be a 5 disc complete with IR remote control. Features shall include full random play, single or multiple track repeat, change discs while playing, index access via remote control, audible cue and review, full programming and program editing, automatic music search, full feature IR remote control, AMX and Creston compatible, removable 3U rack mount handles. Unit shall be furnished with the following technical features:

1. Frequency response: 20-20KHZ

2. Over sampling: 8X

3. Conversion: Dual 16Bit

4. Signal to noise ratio: Greater than 100dB

5. Channel Separation: Greater than 85dB

6. THD: Less than 0.04% at 1KV

7. Wow and flutter: Below measurable limits

8. Output impedance: 1K ohm

9. Dynamic Range: Greater than 90dB

M. Power Amplifier

1. The Power amplifier shall be a solid-state amplifier with transformer isolated output for 25V and 70.7V systems. Direct coupled amplifiers shall not be accepted.

2. The amplifier shall provide an audio output of 250 watts rms continuous. Total harmonic distortion shall be less than 0.5% at the 250-watt rating over frequency range of 20 to 20,000Hz. The rated output shall be obtained with and input that is not greater than 500m V(rms). Hum and noise shall be at least 90dB below rated output. The frequency response, when measured at full rated output, shall be flat within $\pm$1 DB, 20 to 20,000Hz.

3. The amplifier shall provide either balanced or unbalanced constant-voltage outputs of 25 volts and 70 volts, plus 4 and 8 ohm

balanced or unbalanced outputs. Output regulation shall be within 2dB from no load to full load.

4. The amplifier shall provide an input of 50,000 ohms unbalanced high impedance or 600 ohms balanced/unbalanced low impedance, or line bridging with optional accessory plug-in transformers. Overall gain shall be adjustable by means of a single level control located on the rear panel. An internal low-cut filter (-10dB @ 100Hz) shall also be provided. The front of the amplifier shall contain an illuminated power on/off LED.

5. The amplifier shall incorporate electronic shutdown circuitry, which shall activate whenever and overload or short occurs on the output of the amplifier. A front panel overload shutdown LED shall illuminate to indicate the discontinuance of power output once the cause of the shutdown condition had been removed.

6. The amplifier shall operate from a 120VAC, 60Hz source and shall consume 60watts or less at idle and 520 watts full rated output or a minimum 50% efficiency.

7. The amplifier shall be furnished with thermostatic control to prevent operation at excessive ambient temperatures. The amplifier also shall include electronic overload limiting and short-circuit protection and shall be properly fused and rated for continuous operation.

8. The standard amplifier shall be finished in black and furnished with an EIA 19-inch front panel suitable for rack mounting.

2.03 ANTENNA AND GROUNDING

A. Antenna and Accessories:

1. FM Antenna: Furnish and install a Blonder Tongue BTY-2-FM, or equal, all-direction FM dipole antenna on roof at indicated location. Lead-in cable shall be 75-ohm weatherproof coaxial type, equipped with necessary weatherproof matching transformer at each end. Cable shall be Belden 8241, or equal. Provide a weatherproof surge protector, PolyPhaser Model 096-0617P-A, or equal with # 6 AWG grounding conductor to a grounding electrode. The grounding conductor shall be bonded to the mast and surge protector

2. AM Antenna: Furnish and install a whip type AM antenna. Antenna shall be insulated from ground. Guy AM antenna whip from mast with an insulated standoff. If signal strength is not adequate from such an antenna, provide and install a 30'-0" length of hard drawn #12 copper wire between new roof antenna masts.

Lead-in wire shall be 75 ohm coaxial cable, Belden 8241, or equal, furnished with necessary matching transformers at each end. Provide a weatherproof surge protector, PolyPhaser Model 096-0617P-A, or equal with # 6 AWG grounding conductor to a grounding electrode. The grounding conductor shall be bonded to the mast and surge protector.

3. Provide and install an AM/FM antenna coupler in outdoor housing mounted on antenna mast.

4. Provide and install an antenna mast on roof of administration building or as indicated on Drawings. Mast shall be 1-1/4" galvanized steel and shall be secured to roof joists with steel straps specifically manufactured for installation.

5. Provide and install 3/4" antenna conduit from PA console to antenna. Provide and install a weather head, roof flashing.

B. Grounding:

1. Wiring enclosures, terminal cabinets, outlets, frames of cabinet racks and other enclosures shall be grounded in accordance with requirements of California Electrical Code and as specified.

2. Chassis of amplifiers, power supplies, and other electronic power equipment shall be grounded by bonding to control cabinet.

3. Housing and grips of all microphone and conductive housings and other equipment shall be grounded by means of grounding wire or shield in cord or cable furnished for equipment connections.

4. Circuits shall be grounded as recommended by manufacturer of equipment to which they are connected unless otherwise specified.

5. Furnish, install and bond a #6 AWG, green grounding wire from the main public address terminal cabinet to console equipment rack main terminal. Frame of console and all circuit wiring requiring grounding shall be grounded to ground system at equipment rack main terminal. All loudspeaker circuits and communication circuits shall operate balanced to ground.

2.04 SPEAKERS AND ACCESSORIES

A. Loudspeakers:

1. Each loudspeaker mechanism shall be mounted in flush back-box or surface baffle as indicated on Drawings and as specified.

2. Frequency response of loudspeakers shall be considered to be frequency response of speaker together with its associated line transformer. Power rating of each speaker shall be its capacity to reproduce, with satisfactory frequency response and performance, at rating level specified. Adjust power delivered to each speaker, as necessary, to insure a satisfactory sound level, with reproduction of good quality, in each of locations where speakers are installed.

3. Speaker mechanism shall be 8" diameter, cone type radiating element, 9,500 gauss per square inch Alnico 5 magnet, and moving coil type. Cone shall be seamless. Sensitivity shall be a minimum of 94 dB SPL/meter at 1 watt. Power handling capacity shall be a minimum of 15 watts RMS. Magnet shall have a minimum weight of 10 oz.. Nominal frequency response shall be 80 to 8,000 Hz. Speakers shall be Quam 8C10PAOT, or equal, unless otherwise specified.

4. Loudspeaker Volume Controls: Loudspeaker volume controls shall be "L-Pad" attenuators of suitable impedance or autotransformer attenuators with 10 steps (and off). "T-Pad" and/or potentiometerpotentiometers shall not be accepted as a loudspeaker volume control. Furnish, install and connect volume controls on loudspeakers located in areas other than classrooms. For wall-mounted baffles, install control within baffle with shaft extending through bottom. For ceiling-mounted speakers, install volume control on wall in a convenient location. Provide shaft with round knob and dial-plate to indicate position of setting. Loudspeaker volume controls shall be installed only where indicated on Drawings.

B. Impedance Marching:

1. Speakers: Each loudspeaker shall be provided with a line transformer having taps as necessary for proper matching and proportioning power to speaker. Frequency response of each transformer shall be within 3dB from 70 to 10,000 Hz. Minimum power handling capacity of each transformer shall be a minimum of 2.5 watts. Transformers shall be Triad S-79Z, or equal.

2. Line:

Each line-matching transformer shall be furnished with similar frequency response as speaker transformer, and be shielded and equal to TC-LS-34.

a. Speaker line impedances shall be selected as necessary to limit distortion to a minimum. Line loss to any speaker operating at normal input shall not exceed 1 dB. Speaker matching transformer shall be connected to provide a satisfactory division of power among speakers. Sum of

power distributed to all speakers connected to any one-power amplifier shall not exceed 66% of amplifier power output rating specified herein.

b. All impedance and signal level matching is required.

C. Types of Speakers:

1. Type "A" Flush Mounted Speakers:

a. Speaker baffle shall be a vandal-proof, round, flush-mount Quam model BR8VP, or equal. It shall be constructed of #14 gauge carbon steel with a tensile strength of at least 55,000 psi. Finish shall be white baked powdered epoxy, virtually scratch and mar resistant. Baffle shall incorporate a sub-plate fabricated from heavy-gauge steel that shall provide an interlocking lattice grid pattern to protect speaker from tampering and vandalism. Protective sub-plate shall be acoustically transparent. Sub-plate and speaker shall be secured by means of casehardened square-shanked carriage bolts. Baffle shall mount in a Quam ERD-8NS backbox by means of tamper-proof hardware provided.

b. Backbox shall be a Quam ERD-8NS, or equal, recessed round enclosure designed to accommodate 8" speaker/baffle assemblies. It shall be made of one-piece #22 gauge drawn steel with a rust-inhibiting coating, and an interior treated with a fire-retardant resonance damping material. Bottom inside of backbox shall have affixed a 9" pad of 3/8" thick acoustic foam to provide additional resonance and vibration control. Four combination conduit knockouts 1/2" and 3/4" shall be deeply scored, but not through, to preserve leak-free integrity of enclosure in air plenum installation. These combination knockouts shall be spaced 90 degrees apart.

c. Provide spanner type tamperproof screws to secure grille to backbox.

2. Type "B" Surface-Mounted Speakers:

a. Type "B" surface-mounted speakers shall be a Quam VP2, or equal. Speaker shall be quality 8" type, complete with a 25V/70V line matching transformer tapped at 1/2, 1, and 2 watts. Speaker frequency response shall be 50 to 15,000 Hz, with an axial sensitivity of 96dB/meter with one watt input. Power rating shall be 15 watts. The speaker shall incorporate a 10 oz. ceramic magnet; the voice coil shall be 3/4" in diameter and shall have an impedance of 8 ohms.

b. Speaker/transformer assembly shall be mounted in a wall-mount, sloped baffle constructed of special heavy-gauge cold-rolled steel which shall be virtually impervious to direct blows: steel back mounting plate shall be pre-punched to fit any standard outlet box and shall be so designed as to make it practically impossible to gain access to speaker. Type 6-32 tamperproof machine screws shall be used to attach baffle to steel mounting plate. Mounting plate shall be installed so that baffle is perfectly level.

c. Entire assembly shall measure 13-3/4" high, 10-7/16" wide, 5-3/4" maximum depth, and 4-3/8" minimum depth. Baffle shall be finished in semi-gloss white epoxy. Complete hardware shall be provided with speaker assembly.

3. Horn Loudspeakers:

a. Type "C" Horn Loudspeakers: Horn loudspeakers shall be weatherproof vandal-proof type. Speakers shall be Atlas model APF15T with Soundolier VP410S baffle and VPA-APF adaptor, or equal. Furnish and install weatherproof cover plates with plastic bushed holes in plates to admit waterproof cable to speaker in drip loops. Each horn speaker assembly shall be mounted in a vandal-proof steel enclosure. Submit a drawing of assembly to the Architect for review. Type "C" horn loudspeakers shall be furnished for outdoor areas such as lunch shelters, arcades, walkways, etc.

b. Type "C1" Horn Loudspeakers: Horn Loudspeakers shall be weatherproof and vandal-proof types. Speakers shall be Atlas Model APC-30, or equal. Furnish and install weatherproof cover plates with plastic bushed holes in plates to admit weatherproof cable to speaker in drip loops. Each speaker assembly shall be mounted in a vandal-proof steel enclosure. An optional access door may be provided if secured with fasteners that require a tool to remove, or secured with a Cat-60 padlock. The access door, if provided, shall be large enough to remove the horn driver, change taps, adjust the tilt of the horn, or remove and test the cabling. Submit a drawing of assembly to the Architect for review. Type "C1" horn loudspeakers shall be furnished for large outdoor areas such as playgrounds, physical education fields, athletic fields, etc.

2.05 ELECTRONIC RECEPTACLES

A. Microphone receptacles shall be Cannon XLR/SLR Series, or equal. Receptacles shall be furnished with mounting brackets for floor boxes, Sierra, or equal, .040" stainless steel plates, unless noted otherwise on Drawings. Each plate shall be engraved with its receptacle function in 3/16" high letters filled with black paint. Receptacles shall conform to following:

Type	Description	Model
"A"	Single Microphone male	LR-3-14, on a one-gang plate receptacle wall mounting
"B"	Single microphone male	LR-3-14N, with a CA015-0094-000, receptacle floor mounting yoke.

2.06 CONDUCTOR/CABLES

A. Cable for overriding Autonomous PA system shall be one twisted pair, #18 conductor; West Penn #CL2 293, or equal. For outdoor and underground applications, West Penn Wire Corp. # AQ 293 shall be furnished. This stranded wire shall not terminate on 66 or 110 blocks. Install and use screw terminal strips adjacent to the punch blocks.

B. Cables for microphone and other input sources and speakers shall comprise one twisted pair of #22 gauge solid copper conductors; polyethylene shielded with an aluminum foil-mylar shield, a #22 gauge stranded tinned copper drain wire and polyvinyl jacket. Cable shall be West Penn Wire Corp. CL2 290, or equal. For outdoor and underground applications, West Penn Wire Corp. # AQC 291 shall be furnished.

C. Two-pair #22 gauge, fully annealed copper wire. One twisted pair (black and red) conductors shall be shielded and the other twisted pair (green and white) shall be unshielded. Both pairs shall be under one jacket. This cable is to be provided for combination telephone and public address Work. Furnish shielded pair for speaker lines. Mohawk #1772, West Penn CL2 #355, or equal. For outdoor and underground applications, West Penn Wire Corp. # AQC 355 shall be furnished.

D. Jumper wire or cross connect wire shall consist of solid copper conductors, insulated with polyvinyl chloride and color coded, #22 gauge, Brand-Rex, or equal.

E. Cable for types C and C-1 speakers shall be West Penn CL2, AQ or AQC, as required, 289, 290, 291, 292, 293, 294, 295 or 296. Cable provided shall be selected based on calculation of the cable gauge required to

produce no more than a 1 dB drop in voltage at the load, given the load at which the speaker is tapped and the distance the cable is run. At the main PA termination field or at any other termination field, do not use the 66 punch blocks for any stranded wire. Install and use screw terminal blocks adjacent to the 66 blocks or remove one of the 66 blocks if adequate room is not otherwise available for these screw terminal blocks.

F. Interface cable from clock controller to the Public Address rack shall provide a minimum of twelve AWG 20 insulated conductors. Cable shall be West Penn 265, West Penn 283, or equal. For exterior or underground applications, provide West Penn AQ224 two conductor AWG 18 cables, or equal. Termination shall be inside the master clock and inside the PA rack only for a continuous cabling run. Label clock connections where cable terminates inside of rack.

G. Cables between the P.A. rack and P.A. terminal cabinet for connection of switch bank positions to field circuit shall be Two-pair #22 gauge, fully annealed copper wire. One twisted pair (black and red) conductors shall be shielded and the other twisted pair (green and white) shall be unshielded. Both pairs shall be under one jacket. Mohawk #1772 or West Penn CL2 #355.

2.07 TERMINAL BLOCKS AND CABINETS

A. Terminal blocks shall be solderless push-on (#20 to 22 gauge solid) with integral fanning strip. Solderless push-on type blocks shall be Siemon Company 66-Series. All terminals for connections to all external circuits shall be properly labeled. All 66B blocks shall be mounted directly to terminal location without use of mounting legs. All 66M blocks shall be mounted on 89B mounting spacers. Install the required terminal blocks as necessary within each cabinet.

B. Terminal blocks shall be installed on back of cabinets only, not on sides. All incoming cables shall be terminated on outside pins of terminal blocks and all outgoing cables shall be terminated on second pin from buttside edge. This method shall be provided at all satellite terminal locations. At all main or cross-connect terminal locations all incoming or outgoing cables shall be terminated on outside pins, but with jumper wires terminated on other points. Do not install grouped station cables other than 25, 50, 75 and 100 pairs of telephone cables under terminal blocks.

C. Auxiliary cabinets shall be securely floor or wall-mounted, in a position that will not block removable panel or swing open doors needed for normal system expansion or service. All doors shall be lockable with a door-mounted lock.

2.08 KEYS AND LOCKS

A. Provide keys and locks for all cabinets and equipment; locks shall be keyed to a Corbin #60 key, for access to operate equipment and Corbin #70 key, for access to service equipment.

2.09 PORTABLE EQUIPMENT

A. Furnish and deliver to the OAR, one auxiliary console microphone with coiled cord and press-to-talk switch.

B. Portable equipment shall remain in individual boxes and be delivered to the OAR.

2.010 LOADS ON EQUIPMENT AND COMPONENTES

A. All equipment and component parts shall carry continuously, without undue heating or change in rated value, loads connected thereto and rated output loads where such are specified. All equipment shall be properly fused. All components and parts shall be designed for continuous operation.

B. Operating voltages on capacitors shall not exceed 60% of their rated working voltages.

C. Operating wattages to be dissipated by resistors shall not exceed 25% of their ratings.

PART 3 - EXECUTION AND INSTALLATION

3.01 INSTALLATION

A. Install equipment as specified, as indicated on Shop Drawings, and as required. Installation shall be in accordance with manufacturers' instructions and applicable codes. Installation shall be in accordance with manufacturers' instructions and applicable codes.

B. Systems that are re-designed with the intention to increase station or port capacity of systems shall not be accepted.

C. Systems not installed as manufacturer instructions shall not be accepted.

3.02 RELATED SYSTEM OR SUB-COMPONENT INSTALLATION

A. Public Address system installation

1. Rack Equipment Installation: All equipment within each rack shall be logically arranged for accessibility of convenient maintenance. Equipment shall be mounted on shelves or panels and shall be securely attached. Allow 20% expansion in the form of empty rack units at time of occupancy. All empty rack unit spaces shall be covered with factory made plates of the same manufacture as the cabinet.

2. Amplifiers, power supplies and other heavy devices shall be mounted on steel shelves made by manufacturer of console and cabinet racks and shall be attached to cabinet by means of rack mount brackets. Heavy devices shall be mounted in the lowest practical space in the rack. Cabinet, console, and panel faces, including drawers shall be the same color. Punch blocks, screw terminals and ancillary equipment shall be installed on metal rack panels mounted on rear rails. Cables to such panels shall be dressed only from the right side of the rack, as viewed from the rear. The cable bundle must be dressed so as to allow the panel to be swung out for service.

3. Wiring within console and cabinets shall be installed to conform to standard engineering practice, and shall be terminated on terminal strips having a terminal for each required external connection. Wiring shall be cabled, laced and securely fastened in place so that no weight is imposed on any equipment, control switches, or terminals. All wires shall be contiguous between console and cabinets. Splices are permitted only at cross connect points where terminated on punch blocks.

4. Wires carrying audio power shall be shielded. Input and output circuits and terminal strips shall be installed to provide separation necessary for proper operation. Wires shall be identified by number and chart.

5. Cable charts shall be bound to rear cabinet door of PA/IC cabinet, MPATC or backboard, terminal cabinets and service manuals inside transparent plastic envelopes. The information in these charts shall include cable's switch selector position number, designated switch bank, EZ label number from switch bank to main cross connection, EZ label number from main cross connection to end device, speaker wattage, telephone extension number, punch block locations and end device location (classroom number, office, hallway, exterior wall etc).

6. PA/IC cable terminations and connections on 66 Series blocks at terminal cabinets, backboards and MPATC shall be installed from top to bottom in office and classroom logical numerical order and shall maintain the same numbering system throughout the site. It shall follow the orderly sequence used for switchbanks room selector switches.

7. Conductor shields for each system shall be grounded at one location only. Grounding shall be provided within console and cabinet racks. There shall be no metallic connection between

systems. Conduits for system and 120 volt AC system shall be bonded together at console and all cabinet racks.

8. 120 volt AC supply conductors shall be terminated directly on disconnect switches specified and in a recognized raceway.

9. A minimum of 24 spare stations or ports shall be provided for system expansion capacity, even if this requires installation of a second card cage and all ancillary equipment. All the required equipment and connectivity shall be provided to allow for this 24 stations spare capacity regardless of the stations provided at the time of occupancy. The 24 spare stations shall be readily available for connectivity to classrooms, offices or specified location. The 24 station shall be clearly labeled and terminated on a punch block in the main public address terminal cabinet

10. A minimum of 25 spare communication cables shall be provided between the P.A. rack and the main PA terminal cabinet. 25 communications cables shall be connected to the respective telephone card, speaker card, relay module, ring module and switch bank. The 25 spare ports shall be active and ready for connectivity now or for future expansion. These 25 spare communication cables are for connection of switch bank positions to field circuits and are in addition to override, remote input, and other miscellaneous cables required for the P. A. rack.

11. At the main PA cabinet these cables, along with the other miscellaneous cables shall be neatly dressed and secured to the backboard. At the backboard they shall be routed around the exterior of the backboard so as to assure the availability of at least six feet of spare cable, terminated, bundled, secured and routed by the most direct path.

12. At the PA rack the cable bundle shall be neatly dressed and secured to the back mounting rails of the PA rack. If the conduits enter from the top of the rack, route the bundle down the left side of the rack as viewed from the rear, across the bottom of the rack and up the right side. Cables shall be broken out from the right hand side, dressed, secured, and routed to their termination point. If cables enter from the bottom, route them up the left side, over at the top and down the right side for breakout, dress and termination.

B. Telephone interface system installation

1. Install, program and connect 4 circuits to the PABX system. Upon notification from the Contractor, the OAR shall contact the Telecommunications Branch to arrange for ordering of necessary

additions to the voice system to coincide with the completion of the installation of the PA/Intercom system. Label circuits with tag at the punch block, and inside the PA rack.

2. The work provided by the Owner will encompass both hardware/software additions and any necessary programming.

3. The Telecommunications Branch will manage all connections to the PBX voice system from the 66 block located under the PBX to the 110 block also located under the PBX. The contractor is responsible for the cabling, conduit, and connections from this 66 block (ports on block typically labeled by the Telecom Branch) to the main PA termination field 66 blocks.

4. Any Contractor working on the telecommunications system must be pre-approved by the Telecommunications Branch prior to start of construction.

C. Telephone access installation for incoming call:

1. Provide, install and connect 4 ports for High and Middle schools and 2 access ports for Elementary schools and primary Centers to allow loop start trunks from the PABX to obtain access to intercom system dialing and function capabilities. These circuits shall be used only to interface PABX to PA/IC.

2. Clearly label all cabling for PBX connected telephone ports with a tag inside rack and on the punch blocks.

D. Administrative display telephones

1. Unless otherwise shown on Contract Drawings, provide, program, install and connect a minimum of one administrative telephone in the Main Office, in each SLC and in each Academy.

2. Connect the administrative telephones in sequential order starting on the first circuit of the first switch bank relay card.

3. Wall Display Unit: Install unit in the main office unless indicated otherwise on Contract Drawings, in accordance with manufacturers instructions. For Bogen PA systems, verify and change if necessary, the ring voltage for the display tip and ring pair by moving the voltage selection shorting plug to 12v on the ringer card inside the PA rack. This associated ringer card station port is typically port number one, and shared with the main display phone (they ring together, both were designed to operate off of a 12v ring signal and act erradic if provided a 90v ring signal. To be precise, Bogen delivers a 60v ring signal or the 12v square wave).

E. Intercom instruments

1. Wall-mounted: Install where indicated modular wall plate.

2. Desk mounted: Install and connect where indicated and specified.

F. Special programming requirement

1. Privacy

a. The system shall be configured to prohibit the initiation of a two way conversation from any telephone or speaker to any speaker connected to the system without the presence of a supervisory, or privacy tone. This requirement extends to calls from the office to any classroom, from a classroom to any other classroom and from any classroom to any office. The tone shall annunciate at the initiation of the call and a minimum of every 15 seconds thereafter. The tone shall have sufficient volume to alert the occupant of a classroom with typical ambient sound that a two-way communications path has been initiated.

G. Terminal cabinet installation

1. Lines and cables within cabinets and on main terminal backboards shall be carefully dressed with cable ties. Cables shall be formed into bundles from their emergence from conduits and shall make a 360-degree wrap around the inside of the cabinet or the exterior edge of the backboard. Cables shall be formed into a rectangular configuration and secured to the backboard. Each cable shall be properly enumerated in numerical order with commercial wire markers and shall maintain the same number throughout the site. Wire markers shall be uniformly located within one inch of the end of the cable jacket and the numbers shall be immediately visible.

2. Conductors shall be color-coded and individual cables shall be rung out, and tagged with code markers such as W.H. Brady Co. or E-Z Code wire markers. Each cable index strip shall be typed and installed on terminal cabinet door. Each index strip shall be covered with Zellerbach # R125, or equal, typed on "as-built" drawings.

3. Terminations and connections throughout system shall be on Siemon # 66 series blocks, except at equipment that requires removal for servicing and for terminating stranded type cable. Connections to such equipment and cables shall be screw-terminal type or plug-in type. Wires connected to screw-terminal blocks shall use spade lug type terminal connectors for attachment. 110

terminating blocks shall not be accepted as a replacement for 66 series terminating blocks. Cables shall be identified as to buildings and rooms served, and terminated in all terminal cabinets and backboards.

4. Cables from Telco interface blocks shall terminate on left side of 66 M1-50 blocks, with jumpers leaving from right side-bridge with Siemon Co. sneak current protector units.

5. Cables to public address system console or amplifier inputs shall terminate on 66 M1-50 blocks.

6. Cables from public address console or amplifier outputs shall terminate on 66M1-50 blocks; provide blocks for required number of switches.

7. Cables to PABX switch (trunk inputs) shall terminate on 66 M1-50 blocks, if only PABX system is included in this Contract.

8. Cables to PABX switch (extension, console, night bells, etc.) shall be terminated on 66 M1-50 blocks. Provide blocks and cables for maximum possible system configuration, if only PABX system is included in this Contract.

9. Cables to satellite terminal locations and or classrooms shall be terminated on 66 M1-50 blocks. Provide blocks as required, plus 2 vertical rows of 89B spacers for future expansion, at main cross-connect locations only.

10. Cables from auxiliary equipment shall be terminated on 66 M1-50 blocks. Provide blocks as required, plus space for a future block.

11. Feeding cables at remote cross-connect locations shall be terminated on 66 M1-50 blocks for jumpering.

12. Blocks shall be mounted in vertical rows only. Cable with lowest number shall be terminated on upper left side, with next cable in numerical order just below first cable and so on. When left side of first row of blocks is full, next cable in numerical order shall be terminated on the upper right side of first row of blocks, and so on.

13. Do not pass grouped cables in area that is to be used for jumpering. Cables shall enter blocks from top or bottom only, and shall not be in same area as jumper wires.

14. Cable distribution rings for jumper wires shall be Dracon Industries #10910-00, or equal.

15. Cable distribution rings for inside wiring cable and distribution cable shall be Dracon Industries #10941-000, 10942-000 or 1094-000, size as required.

H. Conduit

1. No more than 6 feet of flexible conduit shall be used in any conduit run.

a. Flexible conduit shall not be used in concealed or inaccessible areas such as interstitial wall spaces or hard lid ceilings.

b. Where flexible conduit is used, the conduit fill shall be de-rated by one trade size.

c. Flex shall not be used from MPATC or backboard to the PA/IC rack.

2. Pull boxes shall not be used in place of conduit bends unless site conditions do not allow the use of conduits with data sweeps. If pull boxes are proposed, it must be approved by the Owner.

3. Where not required elsewhere in District Specification or Code, pull boxes shall be sized per the BICSI TDMM current Edition, Chapter 5, Table 5.13.

3.03 OWNERS QUALITY ASSURANCE CERTIFICATIONS AND TESTING

A. Provide all instruments for testing and demonstrate, in presence of the Owner, that all circuits and wiring test free of shorts and grounds.

B. Provide test and reception gear to test for specified performance of active equipment.

C. Furnish all labor, instruments, appliances, equipment, and materials necessary to demonstrate to the Owner the installation performs as required and specified.

D. Before Substantial Completion, submit test results and related documents to the IOR.

E. The Owner reserves the right to perform independent tests of equipment furnished, to determine whether or not equipment complies with requirements specified, and to proceed in accordance with the Contract Documents.

3.04 PROJECT RECORD DOCUMENTS

A. As-Built Documentation

1. Provide 3 Blue line copies size E (30" X 42") of Project site and building plans, indicating location of equipment, conduit, cable routing, ground vaults terminal cabinets, pull boxes and other installation information.

2. Provide 3 CDs of the system CPU programming and configuration.

3. Provide two copies of the record Drawings in DWG format prepared using the most recent version of AutoCAD on a labeled CD-ROM for use on a Windows platform.

a. LAUSD utilizes layers as a key tool in controlling visibility of drawing elements and to provide consistent information between drawings, yet provide control over what is seen on each sheet. Public Address wiring shall be shown on a separate layer, labeled as "Public Address" that uses both building floor plans and conduit supporting structure layers below. The use of any version control blocks or company logos shall be on a layer separate from the premise wiring as-built drawings.

b. All AutoCAD files (software copies) supplied shall be multi-layer drawings with the following layers as a minimum:

(1) Layer 1 shall contain title blocks only.

(2) Layer 2 shall contain building or site plan backgrounds only.

(3) Layer 3 shall contain devices, cabling and other system components.

4. Floor plans indicating all devices, terminal cabinets and cross connect locations, conduit runs, ground vaults, wire types, cable routing of all cables, both underground and in each building with conduit fill and count, and as-built coding used on each cable.

a. Drawings shall include block diagrams indicating all items and their point-to-point connections in a manner following floor and site plan layout. Drawings shall also include as-built single line diagram, cable site plot plan and floor plans indicating all cables, both underground and in each building with conduit, and as-built coding used on each cable.

b. Floor plans shall indicate all devices, terminal cabinets and cross connect locations, conduit runs, ground vaults, wire types, cable routing of all cables, both underground and in

each building with conduit fill and count, and as-built coding used on each cable

B. Operating and Servicing Manuals, Record Drawings:

1. Deliver three copies of operating and servicing manual. Each complete manual shall be bound in three ring binders and all data shall be typewritten or drafted.

a. Each manual shall include a page with Project site and Project name, date of Substantial Completion, Contractor name, address, telephone, and fax numbers.

b. Each manual shall contain a letter, signed by an officer of the company indicating the beginning and ending date of any warranties described in subsection 1.07 of this specification and shall describe the companies' commitment to service the warranty during the terms specified.

c. Each manual shall include all instructions necessary for proper operation and servicing of system and shall include:

(1) A single line diagram of the system indicating all items and their point-to-point connections in a manner following floor and site plan layout.

(2) A complete 2 wire diagram of all connections made between components inside the system console.

(3) A wiring destination schedule for each circuit leaving console and each rack.

(4) All custom fabricated circuits, components and connections not detailed in the manufacturer's manuals shall have wiring diagrams detailing to component level, the manner in which the circuits are connected. Provide details of input/output voltages and input/output signal levels.

(5) A schematic diagram of each amplifier and other components, transistor complements and replacement part numbers.

d. Each manual shall also include as-built single line diagram, cable site plot plan and floor plans indicating all cables, both underground and in each building with conduit, and as-built coding used on each cable. Drawings Size A (8-1/2 inches x 11 inches) and size B (11 inches x 17 inches) shall be bound into the manual. Larger drawings shall be folded and inserted into transparent envelopes bound into

the manual. Programming forms of each system shall be submitted with complete information.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.07 OWNER ORIENTATION

A. Before Substantial Completion, provide an eight (8) hour Owner instruction period to designated Owner personnel. Contact OAR first, if assistance is needed in scheduling an appropriate time, location, or list of attendees for this training.

B. Instruction shall be based on manufacturers written operating instructions covering those features of interest to the Owner and applicable to the Work. Instruction shall include the following:

1. Making normal calls from intercom telephone to other intercom telephones or to the intercom administrative station. Revisit office staff preferred method for clarity and understanding of function and methodology.

2. Answering normal calls from intercom telephones.

3. Transferring loudspeaker intercom calls from the speaker to the intercom phone.

4. Answering normal or emergency calls from the intercom administrative station.

5. Returning calls shown in the administrative station display queue.

6. Answering calls shown on the wall display from PABX phones (remote answer feature).

7. Answering calls ringing at a secondary station from admin phone or assigned intercom phone.

8. Placing calls from PABX phones to intercom station.

9. Placing calls from intercom stations to PABX phones.

10. Placing calls from intercom telephone to the public switched telephone network (PSTN).

11. Making intercom calls from PA/IC rack to classrooms.

12. Show how to set the passing bell schedules if selector switch is located on PA rack but might have been replaced by a remote selector in the main office.

13. Making an emergency all call from the rack, program all call, zone all call and individual announcement from the the admin telephone and PABX telephone, and all-call from the hand held microphone located in the main office. Explain that emergency all-call from rack activates the hearing assistance system. Also explain where these hear assistance systems and the autonomous systems are located.

14. Show distribution of radio/cassette player and CD player programs. and from which web sites the instructions can be downloaded.

15. Provide copies of manufacturer user's manual to training staff and explain all users' manual functions described. Provide 3 quick user's functions reference guides in a plastic laminated form. The training shall include hands on equipment.

C. After Substantial Completion, and before contract completion, provide two (2) additional one (1) hour "refresher" instruction sessions at times agreed upon by the Owner.

ATTACHMENT "A"

PUBLIC ADDRESS AND INTERCOMMUNICATIONS SYSTEM
OWNERS QUALITY ASSURANCE

Site Location Code/Name _____

Network Engineer _____ IOR _____

PM Recommendation _____ Electrical _____

Owner is to examine the following items based on the criteria defined in sections 25821 (Public Address System) and section 25750 (Intercommunication System). Owner is to examine 100% of rack contents. Other items not included in main rack will be tested at 10% rate. If deficiencies are noted, the system will be failed. Owner will consider continuing testing at a 20% rate to determine the integrity of the system.

PA System Check List	**YES**	**NO**	**N/A**	**Pass/Fail**
Is all equipment installed as indicated in as-built?	☐	☐	☐	
Does workmanship installation follow industry standards and specifications?	☐	☐	☐	
Are terminations at consol and terminal cabinet done the following specifications?	☐	☐	☐	
TERMINAL CABINETS AND CROSS-CONNECT TO BE INSTALLED INDOORS.	☐	☐	☐	
Use punch blocks to terminate field cable (66 blocks).	☐	☐	☐	
Is cabling in terminal cabinets and console loomed and helically wrapped?	☐	☐	☐	
Are shields grounded at one end only?	☐	☐	☐	
Are all terminations at console and terminal cabinets, including identifiable page and 911 lines labeled properly?	☐	☐	☐	
Does cable number match list posted?	☐	☐	☐	
Are cables marked clearly and indelibly?	☐	☐	☐	
Are all charts posted at console and terminal cabinets?	☐	☐	☐	
Are all inside and outside speakers installed as specified?	☐	☐	☐	
Are all jumpers or cross-connect wires neatly loomed through cable distribution rings and separated field feeding cables?	☐	☐	☐	
Are all cables in UG (under-ground) vaults racked as	☐	☐	☐	

specified?				
Is all classroom equipment (phone, speaker and raceway) installed as specified?	☐	☐	☐	
If equipped, has the wall display in main office been installed?	☐	☐	☐	
Verify physical interface with master clock.	☐	☐	☐	
Verify physical connection and labeling of PBX to PA/IC.	☐	☐	☐	
Contractor to provide the system program downloadable to laptop or disk and examine.	☐	☐	☐	
Main System Functionality	**YES**	**NO**	**N/A**	**Pass/Fail**
Do an all call with radio or other sound source and check for clarity and sound level in the following areas.	☐	☐	☐	
Perimeter areas farthest away from system.	☐	☐	☐	
A percentage of classrooms.	☐	☐	☐	
Do gyms and auditoriums have equipment (speakers and phones) attached to main PA.	☐	☐	☐	
Verify emergency all call.	☐	☐	☐	
Verify each group all call (zone paging).	☐	☐	☐	
Verify single classroom announcement.	☐	☐	☐	
Verify volume controls are working.	☐	☐	☐	
Verify acceptable level of loudness and clarity for outside, inside, and hallway speakers.	☐	☐	☐	
Manually test passing tones, verify specific tones for gyms.	☐	☐	☐	
Are all automatic PA system tones defeated when the Fire Alarm system is in alarm? (first fire alarm relay)	☐	☐	☐	
Are all manual tones from the main PA console defeated when the Fire Alarm system is in alarm? (also first relay)	☐	☐	☐	
Are all loudspeaker audio sources defeated when the Fire Alarm system is in alarm? (second fire alarm relay)	☐	☐	☐	
Intercommunication Systems	**YES**	**NO**	**N/A**	**Pass/Fail**
Does classroom phone have dial tone when picked up?	☐	☐	☐	
Make call to main office, and check for clarity and sound level.	☐	☐	☐	
Receive call from main office, and check for clarity and	☐	☐	☐	

sound levels.				
Receive room PA announcement and passing tone from main office, checking for clarity and sound level in both instances.	☐	☐	☐	
Verify code to access the PBX and make the connection to a station. Repeat for a total of four times to test all lines.	☐	☐	☐	
Verify emergency triple hook flash to main office.	☐	☐	☐	
Verify hands free communication to main office and check for clarity and sound level.	☐	☐	☐	
Demonstrate that the supervisory tone is present during all calls placed from PBX, System administrative and Intercom staff phones to any speaker on the system.	☐	☐	☐	
PBX System	**YES**	**NO**	**N/A**	**Pass/Fail**
Verify PBX station transfer to IC system.	☐	☐	☐	
Verify paging from PBX. Test 4X (MS, HS) 2X (EL)	☐	☐	☐	
Verify true 911 access from all classrooms by sample testing several rooms. Contact with 911 operator shall not require dialing any extra digits (98-9-911 is not acceptable)	☐	☐	☐	

END OF SECTION