SECTION 16771

INTEGRATED TELECOMMUNICATIONS/TIME/AUDIO/MEDIA SYSTEM

*********[NOTES TO SPECIFIER] *********

RULES OF THUMB FOR SELECTING SYSTEM TO BE USED

Bogen MC2K (Wall mount)
- Small to medium schools to 120 classrooms
- With any mixture of phones, call buttons, speaker or telemedia in the classroom.
- Where budget is an issue
- Where dial up program distribution from any administrative phone is required.

MC2KR
- Small to large sized campus (240 classrooms with option for 1200 plus interface).
- With any mixture of phones, call buttons, speaker or telemedia in the classroom.
- Where dial up program distribution from any administrative phone is required.
- Any of the 240 ports can be an administrative port

2223/2233MC2KR (Life Safety Emergency Intercoms)
- Small to large campus (240 classrooms with option for 1200 plus interface).
- Where classrooms have phones.
- When media retrieval is requested.
- When requested to specify building phone system.
- When life safety intercom features are required

PART 1 - GENERAL

1.01 GENERAL

A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.

B. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the **Bogen Communications, Inc**. the specifying authority must approve any alternate system.

Bidders wishing to submit alternate equipment shall submit to the specifying authority, at least 15 days prior to bid opening, the equipment proposed to provide a precise functional equivalent system to meet specifications. Bidder shall provide adequate information prior to bid date such as specification sheets, working drawings, shop drawings, and a demonstration of the system. The bidder shall also provide the FCC registration number of the proposed system. Alternate supplier-contractor must also provide a list to include six installations of the identical system proposed which have been in operation for a period of two years.

Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system at the contractor’s expense.

1.02 SCOPE OF WORK

A. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating school communications system including but not limited to:

1. Two-way communication between any administrative phone and any classroom speaker.
2. Call initiation switches.
3. Classroom telephones.
4. Public automated building exchange system.
5. Interface to PBX / VoIP System

B. Telephone service with public utilities shall be arranged by the owner, in conjunction with the equipment supplier. Equipment supplier shall generate a one-page document that will provide the Owner with information concerning number of outside lines (minimum of 8), number of digital sets request for bell schedule and architectural room numbers.

1.03 SUBMITTALS

A. Specification Sheets shall be submitted on all items including cable types.

B. Submit outline drawing of system control cabinet showing relative position of all major components.

C. Submit wiring diagrams showing typical connections for all equipment.

D. Submit a certificate of completion of installation and service training from the system manufacturer.

1.04 SERVICE AND MAINTENANCE

A. The contractor shall provide a one-year warranty of the installed system against defects in material and workmanship. All labor and materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on the date of acceptance by the owner/engineer.

B. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.

C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

1.05 QUALITY ASSURANCE

A. All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

B. The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least three years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.

C. The contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his facility the necessary spare parts in the proper

proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

1.06 SINGLE SOURCE RESPONSIBILITY

A. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and experience in the industry. The supplying contractor shall have attended the manufacturer's installation and service school. A certificate of this training shall be provided with the contractor's submittal.

1.07 SAFETY/COMPLIANCE TESTING

A. The communications system shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as D.S.& G. and be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, including N.E.C. Section 800-51 (i), under direction of a qualified and factory approved distributor, to the approval of the owner.

B. The system is to be designed and configured for maximum ease of service and repair. All major components of the system shall be designed as a standard component of one type of card cage. All internal connections of the system shall be with factory-keyed plugs designed for fault-free connection. The printed circuit card of the card cage shall be silk screened to indicate the location of each connection.

1.08 IN-SERVICE TRAINING

A. The contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. Operators Manuals and Users Guides shall be provided at the time of this training.

1.09 WIRING

A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts.

B. All communication system wiring shall be labeled at both ends of the cable. All labeling to be based on the room numbers as indicated in the architectural graphics package.

1.10 PROTECTION

A. The contractor shall provide all necessary transient protection on the AC power feed and on all station, lines leaving or entering the building.

B. The contractor shall note in his system drawings, the type and location of these protection devices as well as all wiring information. Such devices are not to be installed above the ceiling.

PART 2 - EQUIPMENT SPECIFICATION

2.01 COMPONENTS

A. CONSOLE

1. Rack-mounted equipment shall be Bogen Model TCPER

   a. Rack-TCPER42/TCPER61/TCPER70-42"/60"77" High

2. MCRMP

   a. Rack-mounting panel. Includes the following components:

      MC512B - Power Supply (1 per system)
      MC2626B - Power Supply (1 for up to 120 stations, 2 for more than 120 stations)
      MCAPI2 - Audio Program Module Interface Assembly (1 per system)

3. MCRMF

   a. Rack mounting mainframe (1 per 120 stations). Includes built-in ventilation fans and the following circuit cards:

      MCPCA3 - Processor card (1 per system)
      MCACC - Analog card (1 per 24 stations)
      MCSC - Station card (1 per 24 stations)
      MCJCA - Ribbon cable assembly (interconnects 2 MCRMF)

4. MCRM

   a. Relay module (1 per 24 stations). Mounts to:

      MCRRP - Stand-alone configuration
      SBA225 - Series 2223 configuration

5. MCRCA

   a. Ribbon cable assembly

6. Program Sources

   a. DST1 - AM/FM Tuner Digital Stereo Tuner
   b. PMD-526C - Audio Source Player
   c. UHT8011 Wireless Handheld Microphone System
   d. UBP8011 Body-Pack w/Lavaliere Microphone System

7. Power Amplifiers

   a. BPA60-60 watt
   b. HTA-125A-125 watt
   c. HTA-250A-250 watt
   d. PV250 Power Vector Mixer Amp
   e. As required

8. Optional Equipment

   a. MCTC-Telephone access card

2.02 PERIPHERAL DEVICES

A. ADMINISTRATIVE DISPLAY PHONE MCDS4

Administrative display phones shall be Bogen Model MCDS4. The administrative telephone display panel shows the time of day and day of week, the current time signaling schedule, and the station numbers and call-in priority of staff stations that have called that particular administrative station. A 2-key response is used to scroll the display, and answer or erase normal and urgent calls. Depending upon the system access level, an administrative station can use display menus to activate zone pages, alarm signals and external functions, as well as select program sources and distribute or cancel a program to any or all speakers or zones.

Administrative stations have the option of dialing either the loudspeaker or phone at each station location. An automatic switch from phone-to-intercom to phone-to-phone communication is made when the staff handset is lifted.

A built-in program clock, with battery back up, is included to automatically control class change or other signals. The clock may be synchronized with a master clock. 1024 events may be programmed into the system's eight time signaling schedules.

B. ENHANCED STAFF STATIONS

Room phones shall be Bogen Model MCESS/MCWESS. Enhanced staff stations can dial administrative stations, initiate emergency calls, and enable or disable the reception of program material at their location. Depending upon the level of system access, enhanced staff stations can dial other staff stations, perform all-call, zone pages, and conference call and call transfer. Provide as shown on the plans.

Staff stations can be assigned to initiate calls at three levels; normal/emergency, urgent/emergency, and emergency. Emergency calls ring the administrative phone with a special tone and will interrupt a non-emergency call in progress. An integral emergency announce feature (no external amplifier necessary) gets prompt attention when needed by routing unanswered emergency calls to a designated emergency station. Emergency calls continue to ring until answered.

2.03 SPEAKERS

1. Classroom speakers and grilles (ceiling mounted) shall be
   A. Bogen: CSD2X2U
   b. Bogen: ModelS86T725PG8W Mounted in a RE84 enclosure, TB8 tile bridge.

2. Classroom speakers (wall mounted) shall be
   A. Bogen Model MB8TSQ & MB8TSL
   B. Bogen: S4T and S5T
   C. Bogen: WBS8T725.

D. Wiring shall be done per manufacturer's recommendation, West Penn #357. All terminal connections to be on barrier strips. All cables to be labeled by room.

E. Outdoor speaker/horns shall be
   A. Bogen FMH15T Flange-Mounted Reentrant Horn Loudspeaker, Mounted in a BBSM6 Surface-Mount Enclosure or BBFM6 Flush-Mount Enclosure, SGHD8 Grille, FMHAR8 Adapter Ring.
   B. Bogen SPT-15A Horn Speakers.

F. Supply U.P.S. unit for stand-by power during power failures.

2.04 ACCEPTABLE MANUFACTURERS

A. The equipment model numbers specified herein are that of the Bogen Communications, Inc., Mahwah, New Jersey.

The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to ensure that the proposed product meets or exceeds every standard set forth in these specifications.

The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

2.05 INTERCOM AND PUBLIC ADDRESS OPERATION

A. The communication system shall be a Bogen Multicom 2000 and shall provide a comprehensive communication network between administrative and staff locations. The central processor and switching unit shall be of the modular plug-in printed circuit board type, using HMOS microprocessor and TTL logic and HCMOS memory and sensing. HCMOS circuitry shall be protected with transient suppression devices on all inputs and outputs. Non-volatile EPROM shall store permanent memory and non-volatile EEPROM shall store field-programmable memory. System, which uses a battery to maintain system configuration information, shall not be acceptable.

The system shall provide no less than the following features and functions:

1. Telephonic communication, complete with DTMF signaling, dial tone, ringing and busy signals, and data display on administrative stations, shall use two wires (one is ground). Systems, which use more than two wires for communication, tones and data display shall not be acceptable.

2. Amplified-voice communication with loudspeakers shall use a shielded audio pair (shield can be used as one of the two required conductors for phone or call-in switch).

3. The system shall be available in the following configurations:

   a. **MC2K** Wall-mounted in a custom enclosure. Station capacity shall be from 24 to 120 stations in increments of 24.
   b. **MC2KR** Rack-mounted. Station capacity shall be from 24 to 240 stations in increments of 24 with and option for 1200 plus interfaced stations. All telephone stations shall have the ability to support displays.
   c. **2223MC2KR** Rack-mounted and integrated with Bogen Multi-Graphic Series 2223 equipment. In this configuration, Multicom 2000 system station capacity shall be expandable up to 240 stations and 240 telephonic stations in increments of 24 with and option for 1200 plus interfaced stations. All telephone stations shall have the ability to support displays. The Multi-Graphic system equipment provides the following: life safety redundant intercom and paging functions, Note the systems operate independently if one was to fail the other provides intercom for student safety. Additional Multi-Graphic functions, and

unlimited Multi-Graphic-only station capacity. It shall be possible, by use of a separate call-in switch, to annunciate only to the Multi-Graphic portion of the system without using additional station ports within the Multicom 2000 system.

4. The system shall consist of ANY COMBINATION OF staff, enhanced staff, and administrative stations (minimum of one administrative telephone required per system).

   a. Staff stations shall consist of wall- or ceiling-mounted loudspeakers with call-in switches or handsets.

   b. Enhanced staff stations shall consist of DTMF dialing 2500 style telephone sets.

   c. Administrative stations shall consist of DTMF dialing telephone sets with a four line by 16-character LCD display panel. They shall be equipped with a standard 12 key push button dialing keypad. Phones utilizing membrane-type keypads, or requiring special function keys to perform common functions, or requiring external LCD displays shall not be accepted as an equal. Optionally, a loudspeaker may be connected at each administrative station location.

   d. Enhanced staff and administrative stations shall have the option of including a loudspeaker.

      All types of stations shall utilize the same type of field wiring. Future station alterations to require only station type change, not field wiring or system head-end alterations. All field wiring and system head-end equipment shall support any type of station, at the time of installation. All contractor proposals shall reflect this capacity. Failure to submit and bid this project in this manner will be deemed as being in direct conflict of these specifications and will be rejected.

      There shall be no limit to the number of administrative display stations within the total capacity of the system (e.g. a 240 station will support 240 administrative display stations).

      It shall be possible at any time to change the type of station at any location without equipment or wiring changes. Systems that limit the quantity of each station type or require future additional equipment and/or system expansion to provide additional administrative telephones shall not be accepted as an equal.

5. The system shall be a global switching system, providing eight (8) unrestricted simultaneous private telephone paths. The system shall also be capable of providing up to eight (8) simultaneous amplified-voice intercom paths. One amplified intercom path shall automatically be provided with each increment of 24 stations of system capacity. All hardware, etc., required to achieve the maximum number of amplified-voice intercom channels for this system shall be included in this submittal. Amplified-voice intercom channels shall provide voice-activated switching. Systems requiring the use of a push-to-talk switch on administrative or enhanced staff telephones shall not be acceptable. There shall be an automatic level control for return speech during amplified-voice communications. The intercom amplifier shall also provide control over the switch sensitivity and

delay times of the VOX circuitry.

6. It is of utmost importance that emergency calls from staff stations receive prompt attention. It therefore, is important that there be an alternate destination in case the call does not get answered at the primary location. To this end:

   a. Staff generated Emergency calls shall be treated as the highest system priority. Therefore, all Emergency calls shall annunciate at the top of the call queue of their respective administrative telephone(s). Should that emergency call go unanswered for 15 seconds, the call should re-route to an alternate speaker station then prompt the caller to make a verbal call for help. During the transfer, the original administrative telephone shall continue to ring the distinctive Emergency ring. Should the Emergency transfer to station have an associated administrative telephone, it too shall ring the distinctive Emergency ring.
   b. The Emergency transfer to station shall be field programmable.
   c. Should the original administrative telephone be engaged in a non-emergency conversation, its conversation shall be automatically terminated, indicated with an alert tone, and then reconnected to the station that generated the Emergency call.
   d. Should the administrative telephone be engaged in an Emergency conversation, successive emergency calls shall log into the call queue as well as transfer to the emergency transfer station for their verbal call for help. Upon termination of the initial emergency conversation, the next one shall immediately ring the administrative telephone.
   e. Systems failing to transfer unanswered Emergency calls or failing to immediately connect to the administrative telephone shall not be deemed as equal.

7. There shall be a system-wide emergency all-call feature. The emergency all-call shall be accessed by dialing "911" from designated administrative phones or by the activation of an external contact closure which shall give the third audio program input emergency status. The Emergency "911" all-call function shall have the highest system priority and shall override all other loudspeaker related functions including time tone distribution.

   Considering that emergencies are to be treated with the highest level of concern, systems in which the Emergency-All-Call page from an administrative telephone is not the highest priority shall not be deemed as equal.

   Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access emergency functions.

   The emergency all-call shall capture complete system priority, shall be transmitted over all speakers. It shall also activate an external relay, which can be used to automatically override other systems.

   Systems without emergency all-call, or systems with all-call that cannot be activated by external means, or which do not capture complete system priority or activate an external relay, shall not be acceptable.

8. There shall be at least four built-in dedicated emergency alarm tones. Each may be accessed by dialing the number from designated administrative telephones. These emergency tones should be separate from the time tones. Systems using

external alarm generators or having less than four emergency alarm tones shall not be acceptable.

Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access emergency alarm tones.

9. There shall be four (4) external-function relay driver outputs, accessible from designated administrative telephones by dialing a four-digit number. These outputs remain set until accessed and reset later. The user shall have the ability to review the status of each relay driver. A plain English menu, prompting the user through the fields without requiring the user to remember any dialing sequences shall support this feature. Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be deemed equal. There shall be 240 low voltage security contact relays for use with magnetic locks, motion detectors, cameras or any low voltage device. Systems without relay driver outputs for control of external functions shall not be acceptable.

   Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access external relay functions.

10. There shall be a program-material interface included, which shall accept up to three (3) Bogen D-Series program modules. Systems requiring an external program source interface shall not be acceptable.

11. There shall be an outside line feature. The circuitry shall interface with the station ports of an external telephone system and shall provide facilities for up to sixteen (16) incoming lines which shall be designated by the user to ring "day" and "night" enhanced staff or administrative stations. Where an administrative station is designated to receive outside line calls, the phone shall ring with a unique tone and the outside line number shall appear on the display panel. The option shall also provide the ability to make outside line calls from enhanced staff or administrative stations. This ability shall be programmable for each phone and there shall be three (3) access levels: no access, restricted access (local calls only), or unrestricted access (local and long-distance calls). This feature shall be capable of supporting DIL, DISA and a password protected DISA function.

    Security is of the utmost concern. Multicom 2000 offers a password DISA feature that shall be accessible only from authorized Police, Fire, Emergency personal or an off-premise security office, which monitors the facilities security system. It shall function as follows: Upon confirmation of the password DISA number, the system shall allow security personnel to dial access any station and monitor the activity without the preannounce and the privacy tones. This will then allow the security office to determine exactly what actions need to be taken.

12. The system shall provide for field-programmable three/four-digit architectural station numbers.

13. An architectural-number/station-number cross-reference shall be field-accessible to facilitate service.

14. There shall be an automatic level control for return speech during amplified-voice

communications.

15. Each station loudspeaker shall be assignable to any one, any combination, or all of eight (8) Administrative page zones or any of 240 hardwired zones.

16. Each station loudspeaker shall be assignable to any one, any combination, or all, of eight (8) time-signaling zones. Systems with less that eight (8) time-signaling zones shall not be acceptable.

    NOTE: Systems, which use the same eight zones as both page zones and time zones, shall not be acceptable.

17. THERE SHALL BE EIGHT (8) TIME-SIGNALLING SCHEDULES WITH A TOTAL OF 1024 USER-PROGRAMMED EVENTS and an option for 280 schedules and 3000 timed events. Each event shall sound one of eight (8) user-selected tones or any dedicated wave file (Fire, Tornado, and Emergency evacuation). It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized administrative telephone. Systems, which do not provide eight (8) time-signaling schedules or a choice of eight (8) time tones, shall not be acceptable.

18. An internal program clock (with battery back up) shall be included, allowing a total of 1024 user-programmed events. It shall be possible to synchronize the program clock with an external master clock. Systems, which do not provide an internal program clock not meeting these specifications, shall provide an external program clock that does. This external program clock shall then synchronize daily with the system clock to ensure that all time displays are the same.

    a. There shall be eight (8) time signaling schedules and an option for 280 schedules. It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized administrative telephone.
    b. Each event shall be able to be directed to any one or more of the eight (8) time-signaling zones.
    c. Each of the eight (8) time zones shall have a programmable "tone duration" unique unto itself. For example: the gymnasium shall receive a time tone for ten (10) seconds while the rest of the facility receives a tone for five (5) seconds.
    d. Each event shall sound one (1) of eight (8) user-selected tones. Each event may utilize a different time tone. It shall be utilized to send the gymnasium, shop classes, and pool (if necessary), a separate time tone to indicate "clean up". Minutes later the entire facility can then receive the same time tone to indicate class change.
    e. Each of the eight (8) distinct time tone signals or any dedicated wave file (Fire, Tornado, and Emergency evacuation) may be manually activated by selected administrative telephones. These tone signals shall remain active as long as the telephone remains off-hook, or until canceled from the keypad.

       Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter the next digit. In this way, the user shall not be required to memorize complicated key sequences in order to access manual time-tone functions.

       Systems that do not provide at least eight (8) time signaling schedules or do not provide automatic activation of schedules shall not be acceptable.

19. There shall be a zone-page/all-page feature that is accessible by selected enhanced staff and administrative stations.

    a. There shall be automatic muting of the loudspeaker in the area where a page is originating.

    b. There shall be a pre-announce tone signal at any loudspeaker selected for voice paging.

    c. Upon picking up the receiver and dialing "#", a menu shall appear on the display prompting the user to enter the next digit. In this way, the user shall not be required to memorize complicated key sequences in order to access paging functions.

20. There shall be a voice-intercom feature that is accessible by selected enhanced staff stations and all administrative stations.

    a. There shall be a periodic privacy tone signal at any loudspeaker selected for amplified-voice communication.
    b. There shall be a pre-announce tone signal at any loudspeaker selected for voice-intercom communication.
    c. Privacy and pre-announce tone signals shall be capable of being disabled during system initialization.
    d. There shall be an automatic switchover to private telephone communication should the person at the loudspeaker pick up his handset.

       Upon picking up the receiver and dialing the first digit of the number of the station to be called, that number shall appear on the display along with a loudspeaker symbol, prompting the user to enter the next digits. There shall be no confusion as to the type of conversation that is to be established.

21. There shall be a telephonic communication feature, which is accessible by all enhanced staff and administrative stations.

    There shall be an audible ring signal announcing that a call has been placed to that station.

    Upon picking up the receiver and dialing "*", a telephone symbol shall appear on the display, prompting the user to enter the number of the station to be called. There shall be no confusion as to the type of conversation that is to be established.

22. There shall be an automatic disconnect of staff handsets left off-hook to prevent them from tying up communications channels. The station shall receive a busy signal and shall automatically disconnect after 45 seconds. Systems shall also be capable of doing off hook emergency call in.

23. There shall be an automatic disconnect of administrative and enhanced staff stations to prevent them from tying up communications channels. When a station goes off-hook and does not initiate a call within ten seconds, the station shall receive a busy signal and shall automatically disconnect after 45 more seconds.

24. Staff and enhanced staff stations may be programmed to ring an administrative telephone during day hours and another administrative telephone during night hours. Day and night hours shall be user-programmable. Assignment of staff stations shall not be restricted to any particular administrative station. Systems that limit the number and assignment of staff call-in to particular administrative station or groups of administrative stations shall not be acceptable.

25. Each staff station shall be programmable for three levels of call-in, as follows:

    Level 1 - Normal/Emergency
    Level 2 - Urgent/Emergency
    Level 3 - Emergency

    a. Staff stations programmed for access level 1 or 2 shall be able to initiate an emergency call by repeated flashing of the hook switch or repeated pressing of the call-in switch. Systems, which require additional switches and/or conductors to initiate an emergency call, shall not be acceptable.
    b. Emergency calls from staff stations shall interrupt a non-emergency call in progress at the designated administrative phone. The administrator shall receive a warning tone and be connected to the emergency caller. The disconnected party shall receive a busy signal. Systems which do not provide emergency call interrupt shall not be acceptable.

    c. It shall be possible to connect a single push emergency call-in switch to any staff or enhanced staff station, without effecting normal station operation.

26. Calls from staff stations shall be logged into queue for the designated administrative telephones.

    Administrative phones shall ring for a period of 45 seconds when they receive a call, and then stop ringing.

    a. Each queue shall first be sorted according to call priority (emergency calls, then urgent calls, and then normal calls). Calls are sorted within each priority level on a first-in first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems, which do not sort calls according to priority and order received, shall not be acceptable. 1) The display shall simultaneously show up to four calls pending. Additional calls, beyond four (4), shall be indicated by an arrow pointing down thus prompting the user that additional calls are waiting.
    b. It shall be possible to answer any incoming call simply by picking up the handset while it is ringing. It shall not be necessary to hit any buttons to answer a call.

27. Enhanced staff stations shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his handset.

28. Enhanced staff stations shall be able to make a normal call to any administrative telephone by dialing the number. Enhanced staff stations shall also be able to initiate an emergency call by flashing the hook switch. Emergency calls shall ring the designated day/night administrative station and then their speaker will be connected to the emergency station if not answered within a predetermined time

period. The system shall provide for selected administrators to have a PIN Number. By dialing the PIN at any system telephone, the administrator shall have access to emergency paging regardless of the restrictions on the phone he is currently using.

29. Administrative stations shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired stations. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his handset.

30. Administrative stations shall be equipped with a 4-line by 16-character alphanumeric display panel.

    a. The display shall normally show the time-of-day and day of week, the current time signaling schedule, and the numbers of up to four stations calling in along with the call-in status of each station (normal, urgent, emergency). When dialing from the administrative phone, the display shall indicate the station number and type of station (loudspeaker or handset) being dialed.
    b. The display shall also provide user-friendly menu selections to assist the operator when paging and distributing program material. Displays shall be in English with internationally recognized symbols for maximum ease of use. Systems, which require the operator to memorize long lists of operating symbols or control codes, shall not be acceptable.

31. Administrative stations shall be programmable for three levels of system access, as follows:

    a. Level 7 - Shall permit dialing any station in the system, turn program material on/off at their location, scroll, erase and auto-dial call-waiting queue, make conference calls and transfer calls, call forward to other administrative stations, make all-zone pages and emergency all-zone pages, have access to outside lines and be designated to receive outside line calls.
    b. Level 8 - Capabilities of the Level 7 station plus select and distribute/cancel program material to and combination of stations, paging zones, or all zones; set/reset alarm/external functions and zone page.
    c. Level 9 - Capabilities of Level 8 station plus bump or join a conversation in progress, manually initiate time tones and have access to system and station programming functions (when accompanied by a valid password).

32. Program selection, and its distribution or cancellation shall be accomplished from a designated administrative telephone, with the assistance of the menu display system. Distribution and cancellation shall be to any one, or combination of speakers, or any zone(s), or all zones. It shall be possible to provide three program channels at the same time.

33. It shall be possible, via an administrative telephone, to manually initiate any of eight (8) tones or any dedicated wave file (Fire, Tornado, and Emergency evacuation). The tones shall be separate and distinctly different from the emergency tones. The tone selected shall continue to sound until it is canceled, or until the administrative phone is placed back on-hook.

34. Each administrative telephone shall maintain a unique queue of all stations calling that particular phone.

35. System programming shall be from an administrative telephone with Level 9 access. All system programming data shall be stored in nonvolatile memory. A valid password shall be required to gain access to the following programmable functions:

36. System initialization shall be accomplished from an administrative telephone with Level 9 access. All system initialization data shall be stored in nonvolatile memory. A password (separate from the password necessary for system programming) shall be required to gain access to the following system initialization parameters:

37. Station Initialization shall be accomplished from an administrative phone with Level 9 access. All station initialization data shall be stored in nonvolatile memory. A password (separate from the password necessary for system programming) shall be required to gain access to the following station initialization parameters:

    a. The system shall be capable of being interfaced with either an on-site or off-site window-based programming and diagnostics computer direct via, RS232 null modem cable for system diagnostics. It shall be possible to change the baud rate of the system.

    b. Diagnostics shall also be built into the administrative telephones and accessible only by authorized personnel. Diagnostics shall indicate passes and failures of system memory, system clock, all audio busses, tone generators, DTMF generators and decoders and the integrity of the field wiring.

    c. The diagnostics feature shall be completely menu driven. It shall be possible to individually select the test and card, or all to run diagnostics on. This shall be a standard feature of the system and supplied at the time of installation. It shall be accessible only by authorized stations and personnel.

    d. Systems not capable of supporting both the Administrative Phone and any computer interface for programming and diagnostics, nor supportive of built-in diagnostics for the end user shall not be deemed as equal.

2.06 CLOCK SYSTEM

1. Master Control Unit: Microprocessor based unit with solid-state switching circuits, program control and clock controls.

The master clock shall be microprocessor based and programmable via a 16-button pad waterproof, 20 character X 2 row LCD display, and 0.56 inch LED display. The master clock shall include frequency stability of 5 ppm and aging of 5 ppm per year. The master clock shall have a frequency tuning circuit to allow for time base corrections with changes in temperature. The master clock shall also provide field enable/disable daylight savings time. The programmable master clock shall be capable of storing, in a non-volatile memory, and controlling up to 800 events (3,000 as option), each set with precise second resolution. Special programs shall be readily programmed for up to 255 different schedules and holidays, and 50 scheduling changes can be set in advance. The master clock shall be capable of controlling two different clock systems simultaneously, in addition to RS485 input and output and two wire output for controlling Bogen RS485 and Bogen digital communication analog clocks. The master clock shall have a ten-year battery backup for timekeeping, an RS232 computer interface port, and an input port to interface with other systems and WWVB/GPS interface

capability.

Operating Voltage:	110/24 VAC, 60 Hz
Time Base:	Crystal Control
Frequency aging:	5 ppm/year
Frequency stability:	5 ppm/year
Standby time keeping:	10 years
Program retention:	Non-volatile/unlimited
Auxiliary circuits:	4 standard up to 12 maximum
Contact rating:	8 amps, 220 volt
2 circuits selectable clock system	RS485 and digital communication output
Interfaces:	RS232, G.P.S./WWVB, Interface with other systems, RS485 input
Mounting:	Surface/semi-flush or rack
Signal duration:	2 programmable signals per Circuit, 1-3
600	seconds or on/off
Operation:	2 menu levels, technician and end-user
Size:	EIA 19" Rack Mountable in racks as specified
Options:	Up to 12 auxiliary outputs
	3000 event capability

2. Clocks: Analog synchronous clocks, with minute and second hands.

   The secondary clock shall be a Bogen BCAM series clock with field-selectable correction protocols. It shall be designed to be used in either a 2-wire or 3-wire system with Bogen 2000 or 3000 series Master Clock systems that can regulate it by Bogen digital communication protocol. Upon receipt of the digital signal, the clock shall immediately self-correct. When a loss of the communication signal is detected, the clock shall move the second hand once every two seconds in two-second increments. The secondary clock shall also accept sync-wire communication protocols with hourly and daily correction. The secondary clock shall have a microprocessor-based movement and shall be capable of being used as a stand-alone clock. The clock shall have a low-profile/semi-flush smooth surface metal case. The crystal shall be shatterproof polycarbonate with no visible molding marks. Glass is unacceptable. The clock shall have black hour and minute hands and a red second hand. The clock shall have U.L., cUL. and F.C.C. compliances.

Time base:	60 Hz(three wire system)
Power input:	85 –135 VAC/60Hz
	7 – 28 VAC/60Hz
Power Consumption:	15mA @ 110 VAC
	20mA @ 24 VAC
Correction:	10 mA (current consumption)
Display:	12 hour format – hour, minute, and second hand
Color:	Standard Black
Clock Size:	16" diameter, 1.6" depth
Case:	Shallow profile smooth surface metal case
Crystal:	Shatter-proof, side molded Polycarbonate crystal
Compliance:	UL, cUL, listed and FCC approved

3. Clocks: Digital clock minimum, 4 inch high LED unit

   The clock shall be 4.0" in height with a full 4.0" high efficiency red LED numeral display (optional 2.5" when specified per plans). The clock shall operate as an RS485 digital secondary clock or as

a Digital Communication 2-wire secondary clock with 12/24-hour display format and two levels of adjustable brightness and shall feature immediate correction for time changes. The clock shall have messaging capabilities including “BELL” and “FirE”. When input is lost, the colon of the clock display shall flash. The clock bezel shall be anti-glare red with a smooth surface. No external screws or studs shall be visible on the bezel or clock housing. The clock shall have UL, cUL and FCC compliances.

Display size:	4.0” high characters
Display color:	Super bright Red
Visibility:	250 feet – 4.0” clock
Bezel color:	Anti – glare red
Bezel size:	13.74” x 7.5” in 4.0” clock
Input voltage:	85 VAC – 135 VAC in 110 volt 14 VAC – 28 VAC in 24 volt 13 VDC – 28VDC in 24 volt
Current consumption (typ) At maximum brightness	190mA @ 24 VAC 140mA @ 24 VDC 45mA @ 110 VAC
Signal input:	RS485 or Digital Communication 2 – wire system
Signal output:	RS485
Display format:	12/24 hours. Alternating time/date
Brightness:	3 level programmable
Mounting:	Flush, wall, and double face
Weight:	2.2lbs – 4.0” clock
Compliance:	UL, cUL, listed and FCC approved

Note: In applications where device has two facings (e.g. hallways, corridors) contractor is to configure clock so as double face mount to allow viewing from either direction

2.07 **SOUND REINFORCEMENT SYSTEM**

1. General Conditions and Requirements, Special Provisions, and applicable portions of Division I of the general contract are hereby made a part of this Section.

2. Architectural, structural, mechanical, electrical, and other applicable documents and drawings are considered a part of the Sound Reinforcement systems (hereafter referred to as Sound Systems) documents in so far as they apply as if referred to in full.

SCOPE OF THE WORK

1. These Specifications, together with the related drawings and General Conditions of the contract, comprise the requirements for the Sound Systems for the project.

2. Furnish, deliver, erect, install and connect completely all of the material and appliances described herein and, in the Drawings, and supply all other incidental material and appliances, tools, transportation, etc., required to make the work complete, and to leave the systems in first class operating condition, excluding those items listed.

3. Perform all assembly of equipment, wiring and inter-connection and soldering of wires to jacks, devices, terminals or equipment, using technical employees only, who are experienced in the installation of low voltage sound/intercom equipment and its inter-connection. Coordinate final utility rough-in locations with actual equipment furnished.

4. Verify dimensions and conditions at the job site prior to installation, and perform installation in

accordance with these Specifications, manufacturers' recommendations and all applicable code requirements.

QUALITY ASSURANCE

1. The intent of these Specifications is to describe and provide for a complete Sound Reinforcement System of high professional quality and reliability. Professional performance standards by the Sound Systems Contractor (hereafter referred to as Contractor) and the equipment will be required.

2. Electro Acoustic Simulation for Engineers (EASE 3.0 or 4.0) For an additional negotiated fee or consideration, a predictive analysis of the room acoustics and the performance of the speaker systems within the room may be arranged with the sound system contractor.

SUBSTITUTIONS

1. Many items are listed in the Specifications by the manufacturer's type or model number, without a detailed performance specification, and may not include the phrase "or approved equal". Where this is the case, no substitutions will be accepted, without a written request from the Contractor and the written consent of the owner architect/engineer.

2. Where the phrase "or approved equal" appears, the item specified shall set a standard of quality and performance, based on the published specifications of the manufacturer and on the actual performance as known by the Contractor.

   Requests for substitution, when forwarded by the Contractor to the owner engineer/architect are understood to mean that the Contractor represents that he has personally investigated the proposed substitute product and determined that it is equal to or superior in all respects to that specified, that the same guarantee will be provided for the substitution as for the specified product, and that the Contractor will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

   Substitutions will not be considered if they are indicated or implied in Shop Drawing submissions without previous formal request, or, for their implementation, they require a substantial revision of the Contract Documents in order to accommodate their use. Space allocations and utility rough-ins have been designed based on equipment items named by manufacturer and model number. If any equipment not so named is offered which differs substantially in dimension or configuration from the named equipment, provide scaled shop drawings showing that the substitute can be installed in the space available without interfering with other trades or with access for operation and maintenance in the completed project. The Contractor shall coordinate utility rough- in locations with actual equipment furnished. Where substitute equipment requiring different arrangement or connections from those indicated in the drawings is accepted by the owner, architect/engineer, install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications, making all necessary incidental changes without increasing the Contract amount. All requests for substitutions shall be submitted at least two weeks before the bid opening date. Substitutions shall be requested in writing only.

INSTALLER QUALIFICATIONS:

1. The lead installation technician shall have 3 years experience installing professional quality low voltage sound/intercom systems similar in size and scope to this specification. The contractor shall designate one person to act as the project manager having total responsibility for communications and project technical integrity. This project manager shall have a minimum of Five (5) years experience in project management of similar projects of this size and scope.

2. The work performed under this Section shall be performed by a Low voltage systems Contractor,

normally engaged in the business of sound reinforcement / intercom systems installation.

3. Subcontracting of the installation of this project may be approved by written request to the Architect/engineer/owner submitted at least two weeks before the scheduled start of the installation. In all cases the qualifications of the sub-contracting firm shall meet or exceed those as stated in section (a).

   The contractor shall be required to supply a project manager to oversee the subcontractor's adherence to all specifications. The total responsibility for professional, to exact specification, installation shall remain with the contractor and his project manager.

COOPERATION AND COORDINATION

1. Cooperate and coordinate as required with the other contractors who are responsible for work not included in this section.

2. Provide any and all information as required or requested by the Owner, Architect, or General Contractor for this work to be completed to the satisfaction of the Owner, and in the best interests of the Project. Such assistance or information shall be transmitted in writing to the requesting party in all cases. All written. Correspondence shall be copied to the owner.

GUARANTEE AND WARRANTY

1. Guarantee all parts, labor, and workmanship furnished under this contract for the minimum period of twelve months from the date of substantial completion, or first formal use by the Owner, whichever is last to occur.

   During the warranty period, report to the site and repair or replace any defective materials or workmanship without cost to the Owner. Non-emergency Warranty service shall be rendered within 24 hours after request by the Owner. Emergency service shall be provided within 8 hours of request by owner. Equivalent replacement equipment shall be temporarily provided when immediate on-site repairs cannot be made. Where warranties on individual pieces of equipment exceed twelve months, the guarantee period shall be extended to the warranty period of the items.

2. After completion of the work the Contractor shall submit a Certificate of Warranty, stating commence and expiration dates and conditions of the warranty, for signature of both participating parties. Incremental warranties for completed portions of the work may be negotiated at the discretion of the Owner, if delays occur beyond the control of the Contractor.

SHOP DRAWINGS AND SUBMITTALS

1. Completely detailed shop drawings shall be prepared prior to the procurement of equipment or commencement of work. Equipment lists, data sheets, etc. shall be 8-1/2" x 11" size, properly bound into a single or multiple volume. Within 45 days after the notice to proceed, submit to the Architect, six (6) identical copies of the following for approval:

2. A complete equipment list, with manufacturers' names, model numbers, and quantities of each item.

3. Manufacturers' data sheets on all equipment items; Equipment rack layouts showing all rack mounted equipment items Floor plans, prepared at a scale of not less than 1/8"=1'-0", showing loudspeaker locations and orientation, wall plates, and all other related device locations;

4. Proposed constructions details for all custom fabricated items, including interface panels, patch panels, and wall plates. These details shall show dimensions, materials, finishes and color

selection.

5. Comprehensive system schematics, showing detailed connections to all equipment. Riser diagrams showing conduit requirements with pull boxes, outlet boxes, part numbers of cable types used, and number of circuits in each conduit.

6. Electrical power requirements for head-end and ancillary equipment. Include diagrams for any remote control of electrical power, in sufficient detail to coordinate with Division 16. Certain other submittals as noted elsewhere in this specification, and as may be required for various equipment items prior to construction, fabrication, or finishing of that item.

7. All final documentation shall be submitted and approved before final acceptance by the Owner will be granted. Within 45 days after completion of the work, deliver to the Architect, (4) identical copies of the following:

8. Complete as-installed equipment list, listed by room, with manufacturers' names, model numbers, serial numbers, and quantities of each item;

9. Complete and correct system schematic, showing detailed connections.

10. Step by-step operation of the system and preventive maintenance procedures. This manual shall include descriptions of the system components and their relationship to system function. This manual shall be bound separately and labeled appropriately

RELATED WORK BY OTHERS

1. All conduits with pull cords, all electrical pull boxes, grounding rods and all outlet boxes (except for floor pockets and the flush mounted ceiling loudspeaker enclosures described later in this Section) shall be furnished and installed under the electrical section of Division 16. Coordinate as necessary for proper installation. All conduit systems shall be insulated from the equipment racks using non-metallic bushings or raceways.

2. All 120V AC power conductors and conduits associated with power circuits to all equipment locations shall be furnished and installed under the electrical section of Division 16. The 120V AC power to the equipment racks shall be terminated inside the racks to Sound Contractor-supplied Plug mold isolated ground plug strips or isolated ground quad convenience outlets. All conduit systems shall be insulated from the equipment racks using non-metallic bushings or raceways.

3. An insulated 4 AWG THW stranded copper ground wire from each equipment rack to a dedicated driven ground rod within the building shall be furnished and installed under the electrical section of Division 16.

GENERAL

1. All equipment items shall be new and unused.

2. The following sections specifically list the acceptable equipment types and items for this project. Where quantities are not noted, they may be obtained from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity or better quality shall be furnished.

WIRE & CABLE

1. All wire and cables shall be new and unused. All wire and cable shall be enclosed in conduit unless otherwise noted. Wire not installed in equipment racks, not portable, or not installed in conduit shall meet all applicable codes.

2. Constant voltage (70-volt) speaker cable: West Penn stranded 16A WG twisted pair or approved equal.

3. Voice coil speaker cable: Low Frequency -Stranded 12AWG THHN, Mid Frequency Stranded 12AWG THHN, High Frequency 14AWG THHN or approved equal for all homeruns.

4. Microphone-level audio cable (installed in conduit, not portable): Belden 8451 stranded 20A WG twisted pair with foil shield or approved equal.

5. Line-level audio cable and all inter-rack audio cable: Belden 8451 twisted pair with foil shield or stranded 20A WG or approved equal

Portable microphone cables: Bogen MAC series black flexible cable or approved equal. Portable monitor speaker cables: Bogen MAC series black flexible cable or approved equal

6. Other equipment control cables shall be stranded wire, appropriately shielded, of gauge and number of conductors required by the manufacturer for proper operation of the system or equipment item furnished.

7. Wire and cable for all other devices shall be supplied in accordance with the recommendations of the device manufacturer and the National Electrical Code.

8. Furnish insulated 12A WG THW stranded copper wire connecting the mixing console sheet metal and the auxiliary equipment rack to the main equipment rack sheet metal and terminate at each end to bare metal. The primary 4A WG ground buss cable will be installed under Division 16. Multiple racks shall be securely bolted together. Terminate all ground cables at each end to bare metal using approved connectors and clamps.

JACKS, CONNECTORS, AND WALL PLATES

All plate-mounted connectors shall be ground-insulated from the plates on which they are mounted. For non-standard and custom panels, connectors shall be installed on 1/8" thick anodized brushed aluminum panels. Nomenclature shall be shown on the panel with 1/8" block letters. All other jacks shall be installed on standard brushed stainless-steel finish plates with 1/8" block letters. All microphone jack locations shall be numbered consecutively, starting from one (1). Unless otherwise specified, all jacks and connectors for the sound systems shall be as follows:

1. Microphone and line-level input jacks: Switchcraft / Neutrix 3-pin female XLR connectors or approved equal.

2. Audio output jacks: Switchcraft / Neutrix 3-pin male XLR connectors or approved equal.

3. Cable-end audio connectors: Switchcraft / Neutrix 3-pin XLR connectors or approved equal.

4. Furnish and install the required number of jacks and connectors as indicated on the drawings.

EQUIPMENT RACKS

1. Furnish equipment racks for use in housing the equalizers, power amplifiers and ancillary devices necessary to the operation of the system.

   Each equipment rack shall include a locking front and back door, side panels, and top and bottom panels unless otherwise noted.

   Heat-producing components, such as power amplifiers, shall be mounted with one 1-3/4 " vent

panel installed between units. Fill all other unused portions of rack front sections with matching blank panels.

Power distribution within the main equipment racks shall be supplied via rack-mounted switched power strips Plug mold isolated ground plug strips with surge suppression, noise filter, and front-panel on-off switch. Furnish Three (3) keys for each type of equipment rack lock installed.

Install the required number of units, of enough size to accommodate the equipment specified, at the locations indicated in the drawings.

2. Mixing position Equipment Rack

3. Remote Amplifier Rack

ACCEPTABLE MANUFACTURERS

Bogen
Lowell

LOUDSPEAKERS

The speakers shall be mounted at the positions and angles indicated on the drawings. Suspend each component with aircraft quality steel cable, in such a way as to facilitate angle adjustments. Secure any loose hardware to prevent vibration and rattling. Suspension hardware shall be designed for a safety factor of at least five. Loudspeakers wired for 25 or 70V lines shall be used for voice and paging reinforcement throughout the facility. A direct input from the School Intercom Communications system shall be capable of muting and overriding the program source material for emergency all call pages. Each speaker home run shall have its cable run to the equipment racks without splices. Connect as indicated in the drawings.

1. Two-way or Three-way loudspeaker enclosures and subwoofers sufficient in driver complement to provide an even distribution of high bandwidth sound with no more than +- 3dB variance of SPL throughout the listening area. FOH Speakers must be processor based with factory set EQ, phase forward limiting, Linear-phase crossover and active crossover sub woofer outputs. Each speaker may be passive or bi-amplified with a minimum of 12 hang points.

2. Delay (rear fill) loudspeakers (If Required) mounted just before the critical distance measurement of the Front of House loudspeakers and in accordance with the drawings and mounting/aiming instructions on the Design drawings and written instructions. Speakers must be processor based with factory set EQ, phase forward limiting, Linear-phase crossover and active crossover sub woofer outputs. Delay lines shall be used on all delay rear fill speakers over 60ft from the FOH speakers

3. Short front fill loudspeakers (If Required) shall be used as necessary to provide coverage of the very front seating when the main front of house speakers vertical pattern is too narrow to cover these seats. Speakers must be processor based with factory set EQ, phase forward limiting, Linear-phase crossover and active crossover sub woofer outputs. Each speaker may be passive or bi-amplified with a minimum of 12 hang points.

4. Ceiling mounted loudspeakers may be used in under balcony, low ceiling cafetoriums, and auxiliary spaces, which serve as overflow areas. Surface mount 4 Watt, Hanging Pendant style, or High-Fidelity Flush mounted two Way 2-32Watt 6.5” high impedance taps and 16 ohm low impedance taps shall be required. In the case of flush mounted 6.5” speakers an 11” sealed back can, Ferro fluid cooled, dual bass vent ported speaker assembly shall be required.

5. Monitor Loudspeakers 12” Two-way loudspeaker two position floor mount portable. Each Monitor

speaker with differing mix signals shall have a dedicated amplifier and a DSP based processor or 31 Band Graphic Equalizer. Provide 25' monitor cables with appropriate connectors.

ACCEPTABLE MANUFACTURERS

Apogee Sound AFI, ALA series
Bogen/S4/S4T, S5/S5T, SM4T, HFCS, ORBIT OPS1, and OCS1
Bogen Core 12 X 4 DSP

POWER AMPLIFIERS

Furnish and install power amplifiers for use in amplifying audio signals for distribution to the loudspeakers.

1. Each power amplifier shall have an input connector, which is either a screw-type barrier strip or XLR type. Output connectors shall be either barrier strip, or Neutrik Speakon. Other types of connectors shall not be accepted.

2. All power amplifiers shall have input level controls. Amplifier loads shall not be below the rated operational use guidelines. Amplifier available power shall be 35-50% or more of the rated speaker/speakers continuous power handling specification at its nominal impedance rating. ALL APOGEE AMPLIFIER CHANNELS SHALL BE ACTIVE PROCESSED WITH SPECIFIC APOGEE SOUND SERIES PROCESSORS.

3. Install one 1-3/4" vent panel between each power amplifier and any other rack mounted component or as recommended by the Manufacturer. Rear rack mount supports shall be required. Sequential power up shall be required for systems with 3 or more amplifiers with remote relay control optional. Install the units in the remote amplifier rack and connect as indicated in the drawings.

ACCEPTABLE MANUFACTURERS

Apogee Sound CA series amplifiers
Bogen M-Class, Power Vector, or Black Max Amplifiers

AUDIO MIXING CONSOLE FOH

1. A professional quality rack mountable or console mixing desk shall be provided to accommodate the required number of inputs and output signal sources as shown in the drawings. Small 8 channel mixers shall have compressor/limiter and assignable dual channel outputs available. 12 to 40 channel mixers shall at a minimum have 4-8 sub master outputs, 2-6 aux or monitor sends per channel, 2-3 Main output channels with matrix mixing outputs preferred.

2. An automatic mixer may be substituted to reduce the total number of FOH mixing console inputs and provide higher gain before feedback of vocal microphone inputs.

3. Provide a 5-channel mixer with phantom power to mix signal sources from the overhead stage condenser microphones, Connect as shown in the drawing.

ACCEPTABLE MANUFACTURERS

Soundcraft, Allen and Heath, Mackie Designs, Bogen, and RDL

SIGNAL PROCESSING EQUIPMENT

DIGITAL SIGNAL PROCESSOR

The audio processing shall be in the digital domain following the input source and shall remain until power amplification is required. The system shall be able to provide a list of audio devices that may be chosen and configured into the system at anytime, from a device menu running under the Windows TM environment. The list shall include, but not be limited to: externally controllable levels, delay lines of various delay length, Compressor/limiter, 1/3-octave equalizers, parametric equalizers, high and low pass filter. This device will be installed in the Mixer Position Equipment rack.

ACCEPTABLE MANUFACTURERS

Bogen Core 12 X 4 DSP

MICROPHONES, STANDS, CORDS, AND MISCELLANEOUS

Furnish various types of Bogen microphones for use in sound reinforcement and recording. Each microphone shall be equipped with its own cable, with Switchcraft connectors installed on each end. Furnish and install the following:

1. Bogen WCU-250 hanging condenser Microphone (Qty per drawing)

2. Bogen GDU-250 18” uni-directional gooseneck Microphone with isolation low profile shock mount MSM (Qty 1)

3. Bogen HDU-250 unidirectional condenser Handheld Microphone (Qty per drawing)

4. Bogen SF4 and MC22 Microphone stands and Microphone clips: (Qty per drawing)

5. Bogen MAC 25' Microphone cable with one (1) male and one (1) female Swithcraft series connector or approved equal. (Qty: per Drawing)

WIRELESS MICROPHONE SYSTEM

1. Diversity UHF PLL single channel/wireless microphone systems shall be used in the facility.

   Operating frequency shall be as high as possible and shall be selected to avoid interference. The wireless receivers shall be provided with rack-mount kits. Mount the receivers in the Mixing position equipment rack at the sound control booth.

   Mount the antennae vertically in locations shown in the drawings, being careful to avoid interfering objects. The antennae shall be mounted to the side of the equipment rack.

   Provide active antenna combiner/distribution system as necessary.

   Furnish and install the following wireless system and accessories:

2. Combination Wireless Microphone System with lavaliere microphone supplied with each belt pack system.

3. Handheld Microphone transmitter.

ACCEPTABLE MANUFACTURERS

Bogen: UHT8011 Wireless Handheld Microphone System
Bogen: UBP8011 Body-Pack w/Lavaliere Microphone System

Bogen: UHFADS - Antenna Distribution System
Bogen: UHFASA - Antenna Signal Amplifier
Bogen: UHFDCD - Dual Charging Dock
Bogen: UHFUDA - Unidirectional Antenna

AUDIO CASSETTE RECORDER-PLAYER

1. Furnish an audiocassette player/recorder for recording and playback through the sound reinforcing system. Connect as indicated on the drawings. Locate in equipment rack.

ACEPTABLE MANUFACTURERS

Denon
Tascam

COMPACT DISC PLAYER

1. Furnish a compact disc player for playback/recording of compact disks through the sound reinforcing system Connect as indicated on the drawings.

Bogen PMD-526C - Audio Source Player
Tascam or Denon

ASSISTIVE LISTENING SYSTEM

1. Furnish and install a FM wireless assistive listening system for use by the hearing- impaired

2. Mount the transmitter in the main equipment rack. Ensure that the operation frequency does not interfere with the wireless microphone systems.

3. Furnish and install the following:

Williams Sound PPA or Listen LP-9-216 Complete System or approved equal. (Qty: 1 ea.) Complete system)

PRODUCTION INTERCOM (optional for elementary and middle schools)

1 A two channel Production Intercom will be used within the facility for communication between individuals associated with the event staff. (Optional for Middle and High School Auditoriums.

2. Install the Power Supply in the equipment rack.

3. Provide additional power supplies as needed in order to drive all intercom outlets and intercom speaker stations shown in the contract documents.

Furnish and install the following:

1. 2-channel headset/Speaker Main Station. (Qty1ea.)

2. 2-channel select flush mount headset/speaker station.

3. Single channel monaural belt pack.

4. Single-Ear Headset.

5. Wall Plates, Intercom outlet wall plate. (Qty as required)

6. 25' Super flexible cable (6 Pin)

7. 50' Super flexible cable (6 Pin)

ACCEPTABLE MANUFACTURERS

Audiocom by Telex
Clearcom Communications

EXECUTION INSTALLATION

Furnish components, racks, wire, cabinetry, connectors, materials, parts, equipment and labor necessary for the complete installation of the systems, in full accordance with the recommendations of the equipment manufacturers and the requirements of the drawings and specifications.

Installation shall follow standard broadcast wiring and installation practice and shall meet or exceed industry standards for such work. Equipment shall be held firmly in place with proper types of mounting hardware. All equipment affixed to the building structure must be self-supporting with a safety factor of at least three. All equipment shall be installed to provide reasonable safety to the operator. Supply adequate ventilation for all enclosed equipment items, which produce heat.

Furnish the system to facilitate expansion and servicing using modular, solid-state components. All equipment shall be designed and rated for continuous operation and shall be listed by an OSHA standard testing laboratory and manufactured to meet those standards.

Observe proper circuit polarity and loudspeaker wiring polarity. No cables shall be wired with a polarity reversal between connectors with respect to either end. Special care shall be taken when wiring microphone cables, to ensure that constant polarity is maintained.

WIRE CONNECTOR SIGNAL

Shields of audio cables shall be grounded at one end only, at the inputs of the various equipment items in the system. Route cables and wiring within equipment racks and cabinetry according to function, separating wires of different signal levels (video, microphone level, line level, amplifier output, 120V AC, intercom, control, etc.) by as much physical distance as possible. Neatly arrange and bundle all cables loosely with plastic cable ties. Cables and wires shall be continuous lengths without splices.

All system wire, except spare wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No un-terminated wire ends will be accepted. Heat shrink type tubing shall be used to insulate and dress the ends of all wire and cables. Include a separate tube for the ground or drain wire.

All cables in conduits shall be insulated from each other and from the conduit the entire length and shall not be spliced. All cables and wires are to be continuous lengths without splices. All solder joints and terminations shall be made with resin-core silver solder. Temperature regulated soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns or temperature-unregulated irons shall be used on the job site. Mechanical connections shall be made using approved connectors of the correct size and type for the connection. Wire nuts will not be accepted.

Each mechanical connector shall be attached using the proper size controlled-duty-cycle ratcheting crimp tool, which has been approved by the manufacturer of the connectors.

Conventional non-ratcheting type crimping tools are unacceptable and shall not be used on the job site. Label all wires in racks and console as to destination and purpose. Clearly and permanently label all jacks, controls, and connections with permanent engraved laminated plastic labels or by engraving and filling mounting plates, unless otherwise noted. Attach laminated plastic labels with contact cement. Embossed or printed label tape, and press-on or lift-off lettering systems will not be accepted. All labeling shall be completed prior to final system inspection. If permanent labels cannot be furnished prior to final system inspection, label all controls with write-on tape.

FINAL TESTING AND EQUALIZATION

1. The completed sound system is to be inspected and tested for compliance with the Specifications.

2. The testing and equalization work shall be performed after the installation work has been completed, but prior to any use of the system. During the testing and equalization work, the Installer shall have on the job site one (1) competent technician who is fully familiar with the project, and who will be prepared to stay if their services are needed. It is estimated that approximately sixteen (16) hours will be required for this work.

3. The process of equalizing and testing the system may necessitate moving and adjusting certain loudspeakers. Adjustments shall be performed without claim for additional payment.

4. Coordinate as necessary to ensure a totally quiet room during the sound reinforcement systems testing and balancing period.

5. Prior to requesting systems testing, verify the following:

6. All systems are in first-class working condition and free of short circuits, ground loops, parasitic oscillations, excessive system noise beyond published specifications of the equipment, hum, RF interference, or instability of any form.

7. All loudspeaker circuits have been tested, are connected to the proper crossover frequency, and are in perfect working order.

8. All equipment controls are labeled, even if unused. If permanent labels cannot be furnished prior to system inspection, temporarily label ~ control as to its function with write-on tape. Supply labels or markers suitable for indicating knob settings after equalization is performed.

9. Operation manuals for all equipment items furnished are on hand at the job site.

10. Should the performance testing show that the Contractor has not properly completed the systems, the Contractor shall make all necessary corrections or adjustments, and a- second demonstration shall be arranged at the Contractor's additional expense.

11. The final acceptance of the system by the Owner will be based upon the report of the Contractor following inspection, testing, and demonstration.

SYSTEM PERFORMANCE

1. After equalization and testing, the sound system shall meet or exceed the following specifications:

   System shall be free of short circuits, ground loops, parasitic oscillation, excessive system noise, hum, RF interference, and instability of any form.

2. Maximum SPL with band-Limited pink noise input to the system shall be 96dB before audible

distortion occurs.

3. Seat-to-seat variation in SPL at 4kHz octave band pink noise shall be within a tolerance of plus or minus 3dB SPL.

4. Acoustic response of the system shall be plus or minus 1.5dB along a line which is flat from 60Hz to 4000Hz and which rolls off at 2 dB per octave to 16kHz.

5. Approved measurement devices shall include but not be limited to: GOLDLINE TEF20, IVIE IE30, IE33 and SIA SMART SYSTEM.

6. STI, RASTI, ALCONS and Clarity measurements shall meet or exceed industry standard acceptable measurements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The installation, adjustment, testing and final connection of all conduit, wiring, boxes, cabinets, etc., shall conform to the requirements for branch circuit wiring and shall be sized and installed in accordance with NEC, NEMA and manufacturer's approved shop drawings.

B. Low voltage wiring may be run exposed above ceiling areas where they are easily accessible.

C. Contractor shall install new rack console at location shown on plans.

1. Solder each speaker line splice and tape each individual wire. Wire nuts will not be accepted.
2. Connect remote slave clocks to master clock in console.

D. All classroom phones shall be wall mounted.

1. Mount at 54" AFF.
2. All wiring should be concealed.
3. Verify exact location with Architect.

E. All administrative telephones shall be desk or counter mounted.

1. Provide standard wall receptacle 16" AFF.
2. Verify exact location with Architect.

F. Speaker and telephone lines run above ceiling and not in conduit shall be tie wrapped to ceiling joist with a maximum spacing of 8' between supports. No wires shall be laid on top of ceiling tile.

G. Connect field cable to each speaker transformer using UL butt splices for 22 AWG wire. <u>Wire nuts will not be accepted.</u>

H. Terminate field wiring on wall adjacent to rack using Telco 66 type blocks. Provide neat cross connect system for wiring. Wiring to be labeled to indicate final architectural room number that it services on the Telco block.

I. Rack shall be labeled in numerical order with speaker/phone combinations first, speaker/outside horn combinations last. Labeling and order shall reflect final Architectural room numbers posted outside the rooms. Use three digit dialing extensions.

J. Contractor shall provide a minimum of (8) hours of operational and programming instruction to school personnel.

K. On the first school day following installation of Multicom System, the Contractor shall provide a technician to stand-by and assist in system operation.

M. Mark and label all telephone outlets and or set with the graphic room numbers. Label all demarks IDF and MDF points with destination point numbers. Rooms with more than one outlet shall be marked XXX-1, XXX-2, XXX-3, to XXX-25 where XXX is the room number.

N. No graphic room number shall exceed the sequence from 100 through 699. This reserves the numbers 770-999 for the telemedia system.

O. All outside speakers shall be on separate zone.

P. All zones shall be laid out not to exceed 12 watts maximum audio power zone.

Q. All outside speakers shall be tapped at 3-1/2 watts maximum.

R. All classroom speakers shall be tapped at ½ watt maximum.

S. Large rooms such as Cafeteria shall be tapped at 2 watts maximum.

PART 4 - EXECUTION

4.01 DIVISION OF WORK

A. While all work included under this specification is the complete responsibility of the contractor, the division of actual work listed following shall occur.

B. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work shall be furnished and installed completely by the electrical contractor. The balance of the system, including installation of speakers and equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative. The entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative.

4.02 EQUIPMENT MANUFACTURER'S REPRESENTATIVE

A. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.

B. As further qualification for bidding and participating in the work under this specification the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of California. The manufacturer's representative shall have completed at least ten (10) projects of equal scope, giving satisfactory performance and have been in the business of furnishing and installing sound systems of this type for at least five (5) years. The manufacturer's representative shall be capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.

C. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state the manufacturer guarantees service performance for the life of the equipment, and that there will always be an authorized distributor assigned to service the area in which the system has been installed.

D. The contractor shall furnish a letter from the manufacturer of the equipment, which certifies that

the equipment has been installed according to factory intended practices, that all the components used in the system are compatible and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of one (1) year after final acceptance of the project by the owner.

4.03 INSTALLATION

A. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.

B. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T & B "Ty-Rap" cable. Edge protection material ("cat-track") shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge.

C. Cable identification: Cable conductors shall be color-coded, and individual cables shall be individually identified. Each cable identification shall be a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.

D. Shielding: Cable shielding shall be connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in same manner as conductors.

E. Provide complete "in service" instructions of system operation to school personnel. Assist in programming of telephone system.

4.04 DOCUMENTATION

Provide the following directly to the Supervisor of Technology Service.

A. Provide a printed copy of all field programming for all components in system.

B. Provide one copy of all diagnostic software with copy of field program for each unit.

C. Provide one copy of all service manuals, parts list, and internal wiring diagrams of each component of system.

D. Provide one copy of all field wiring runs, location and end designation of system.

END OF SECTION