

SECTION 27 51 25 – SOUND REINFORCEMENT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contractor shall furnish and install all materials, labor, and equipment, as herein specified, a locally controlled sound reinforcement system including wire, loudspeakers, console, etc. all ready for operation. The sound reinforcement systems shall provide all components necessary to pick-up, process, amplify, and reproduce both voice and music sources.
- B. Systems shall be installed in the Auditorium, Cafeteria, Gymnasium and Auxiliary Gymnasium.
- C. Provide interconnections as listed in Part 2.
- D. Provide demonstration, training and commissioning as listed in Part 3.
- E. A vendor capable of meeting all requirements of these specifications is Sage Technology Solutions of Mount Joy, PA.

1.2 SUBMITTALS

- A. Submit manufacturer's product literature and installation instructions for all of the major components required for a complete and fully operational system. Submit system wiring diagrams for approval.
- B. Submit manufacturer's printed instructions for maintenance of all installed components, including methods for maintaining proper conditions and environment to provide optimum performance. Provide three complete sets of operating instructions including wiring and circuit diagrams.
- C. Submit dimensioned drawing showing location and height of speakers, and aiming angles for review. Care shall be taken in locating speakers to respect the architecture of the space, as well as acoustics. Drawings shall also show locations of all permanently installed devices (i.e. racks, jacks, power needs, etc.)

1.3 QUALIFICATIONS

- A. Firms regularly engaged in the manufacture of professional and commercial sound system components with a minimum of five years' experience in the design and installation of systems equal in size and type required by this project shall be accepted.
- B. The equipment supplier must maintain a local service organization within fifty (50) mile radius of the installation with spare service replacement components and accessories as needed to ensure a potential down time of no more than twenty-four (24) hours.
- C. The supplier must be an authorized representative of the equipment specified with authority to provide warranty rights and rebates. Full-time technicians shall be trained and certified in the installation and service of the equipment. A minimum NICET level 2 or EST Level 2 certification in Low Voltage Communication Systems is required for each full-time technician. Qualified installer must provide twenty-four (24) hours a day seven (7) days a week, as needed for system service and instructional procedures.

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- D. The system supplier must provide a minimum of three (3) completed project references identifying project names with contacts for sound system installations similar in scope to this project that have been completed within the last two years.
- E. The supplier must provide a summary of capabilities, which satisfactorily demonstrates that the sound system vendor maintains the physical plant, personnel, and equipment necessary to provide the specified systems. The supplier must provide evidence of their test equipment inventory as of the submittal date. This inventory at a minimum must include:
 - 1. 1/3 Octave Spectrum Analyzer with Calibrated Microphone
 - 2. Dual Channel 20mHz. Oscilloscope
 - 3. Calibrated SPL Meter
 - 4. SmaartLive V8 Audio Measurement Software and related computer
 - 5. Audio Test Generator with Pink Noise
 - 6. Impedance Meter
 - 7. Cable Polarity Tester
- F. The supplier must utilize acoustic simulation modeling software in order to accurately model the space. This software shall be used to accurately position and aim the speakers in the space. Software similar to E.A.S.E. shall be utilized, where indicated.
- G. All of the qualification information shall be reviewed by the Owner's representative to verify that the Sound System Supplier maintains the capabilities and experience necessary to ensure that a satisfactory system installation is accomplished. Should the Owner determine that the submitted qualifications do not meet the specified requirements, the bidding Contractor shall be required, at no additional cost to the Owner, subcontract the services of a sound system vendor whose qualifications meet the specified requirements.

1.4 MANUFACTURER

- A. The naming of the manufacturer or item is not intended to be restrictive, but rather to establish criteria for system design and quality. Other manufacturers shall be considered for use if submitted for substation request per non-technical specifications prior to the bid date. The substitution submission shall include all catalog cut sheets and a line-by-line comparison of the specified product, including inter-panel wiring diagrams and schematics. In addition, samples may be required to perform proper evaluation of the proposed alternate at no additional charge.

1.5 PERFORMANCE AND OPERATION

- A. Following are general performance and operation requirements for all systems:
 - 1. Each system shall be locally controlled sound reinforcement systems that operate independently from the main intercommunications system. Each system shall be provided with a tie into the intercommunications for priority override paging.
 - a. Programming of the override shall be verified with the owner. There may be a desire to bypass this override at the time of installation; however, the override relays shall be part of the system, and identified on the as-builts and O&M manuals.
 - 2. All amplification and signal processing equipment components shall be located in equipment cabinets with locking front doors per products section. The manufacturer's rack mounted products of suitable hardware shall securely fasten all equipment in the equipment cabinet. A remote on/off keyed switch with an LED indicator lamp shall be included on a custom two-gang plate to show the status of the system operation.

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3. Each system shall provide a high threshold of gain before feedback and shall accurately reproduce and amplify all voice and music signal without feedback, oscillation, distortion, or other unwanted effects or interference.
 4. Remote antennas shall be provided for wireless microphones and assistive listening systems if required for a fully functioning system whether or not specifically specified in part 2.
 5. Each system shall accept microphone and stereo line-level inputs, and faithfully and accurately amplify those signals uniformly to all seated occupants. The audio shall be monaural.
- B. Following are additional Auditorium performance and operation requirements:
1. The system shall be provided with a new digital mixing console and digital signal processor with new speakers, amplifiers, wireless microphone systems, stage monitors, wired microphones and accessories. A microphone patch panel system will be installed and will be used to patch all wired microphone jacks and wireless microphone systems to the mixing console. The system shall be programmed to operate in a standard PA-mode for basic PA functions as well as Production mode, which will be used for theatrical productions.
 2. The system shall include iPad integration with all required equipment and programming for a fully functional setup.
 3. The space shall be designed to allow not only use of the stage, but the pit area as well. Speakers shall be located and aimed, to ensure that feedback is minimize when microphones are used in the pit area for choral and other events.

PART 2 - PRODUCTS

2.1 SIGNAL PROCESSING, AMPLIFICATION, AND CONTROL EQUIPMENT

- A. The following equipment shall be provided in the Auditorium.
1. The Auditorium shall be provided with a new locally controlled sound reinforcement system with equipment as follows. The system shall be provided with a dedicated 20-amp power circuit.
 2. Provide one (1) Allen & Heath AHM64 audio matrix processor with 12 analog inputs and 12 analog outputs, capable of 64 input channels and 64 output channels, all independently assigned. The processor shall be provided with Dante digital audio networking. The Dante networking connection shall be implemented on a RJ-45 connector. The server shall have internal DSP processing. The server shall support Ethernet connection for programming and control on a RJ-45 connector.
 - a. Provide with Crestron control module for Touchpanel Control of Assembly Mode.
 - b. The matrix mixer shall be used for both 'PA' mode and 'Performance Mode'.
 - c. Install in main audio rack.
 3. Provide one (1) Denon Professional model CD-500CB CD/Media Player with Bluetooth/USB/Aux Inputs and RS-232c. The player shall feature Bluetooth 3.0 pairing, slot-loading CD transport, USB host port for file playback, 10-button direct track access, 3.5mm AUX input for playback from portable players, RS-232 control capable, compact IR remote control included, balanced XLR and unbalanced RCA outputs.
 - a. Equal by Tascam shall be acceptable.
 - b. Install in remote rack at sound console locations.
 4. Power amplifiers shall be supplied and allocated as follows:
 - a. One (1) LEA model Connect 704 four-channel amplifier, each channel providing 700 watts at 4 & 8 ohms or 70 & 100 volts. The amplifier shall drive the left/center and right speakers.

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- b. Two (2) LEA model Connect 354 four-channel amplifiers, each channel providing 350 watts at 4 & 8 ohms or 70 & 100 volts. The amplifiers shall drive the delay row in the center of the auditorium, and the stage monitors.
 - c. One (1) LEA model Connect 352 two-channel amplifier, each channel providing 350 watts at 4 & 8 ohms or 70 & 100 volts. The amplifier shall drive the music room monitors.
 - d. All power amplifiers shall have the following minimum performance characteristics: less than 0.35% THD at rated power; frequency response of 20Hz to 20kHz +/- .25dB; input sensitivity for rated output 1.4Vrms. The unweighted signal to noise ratio over the range of 20 Hz to 20 kHz shall exceed 105 dB, reference to full output.
 - e. Install amplifiers in main rack.
5. Provide one (1) D&M Professional model DN-500BD MKII Universal Digital Media Player. The digital media player shall support Blu-Ray Disc, DVD, CD, SD, and USB device (mass storage class) AVCHD playback format. Features shall include: Blu-Ray, DVD, CD and SD/USB media playback; supported Blu-Ray disc formats: BD25, BD50, BD-RE, BD-ROM, and BD-R; supported DVD formats: DVD, DVD+R, DVD+RW, and DVD-RW; SD/USB supported video, audio, and picture file formats: .3gp, .asf, .avi, .dat, .divx, .mkv, .mov, .mp4, .mpg, .m2ts, .ogm, .rmvb, .tp, .ts, .wmv, .ass, .smi, .srt, .ssa, .sub, .ape, .flac, .mp4 (AAC), .mp3, .wav, .gif, .jpg (or jpeg), and .png; panel lock and IR remote lock.
- a. Install in remote rack at sound console location.
6. Twenty-two (22) digital diversity wireless microphone combination system shall be provided. The systems shall utilize Automatic Frequency Selection that allows the unit to scan for open channels across the UHF band for clear operation. The unit shall provide frequency and volume lockout features to prevent accidental setting changes. The receiver shall be constructed of a durable, metal chassis with rack mount hardware. The unit shall utilize ½ wave antennas to allow for optimum antenna placement to enhance signal reception. Both ¼" line level and XLR microphone level output signals shall be provided. The digital wireless microphone receiver shall be Shure model SLX-D systems. Provide Shure model SLXD2/58 handheld transmitters and SLXD1 bodypack transmitters with WL185 Lavalier microphones and WCE6X Countryman earsets (provide tan and cocoa as directed by the Owner) as described below.
- a. Provide six (6) combination systems with handheld and bodypack transmitters.
 - 1) Two (2) of these system receivers shall be located in the main sound rack, and be used in PA mode.
 - 2) Four (4) of these system receivers shall be located in the remote wireless microphone cabinet.
 - b. Provide sixteen (16) systems with bodypack transmitters. These system receivers shall be located in the remote wireless microphone cabinet.
 - c. Provide remote antennas for the wireless receivers to ensure good coverage.
 - d. Neatly train cables, and use wire loom, to create snake of audio cables from receiver outputs to console input.
7. The system shall contain a master power switch to activate the sequential power control modules at each of the racks. The sequential power switching system shall use a model SEQ programmable sequencer, surge eliminator, and power conditioner as manufactured by SurgeX. This configuration shall supply power in a three-step time-delayed sequence to all components located in the equipment rack specified. The sequence shall be reversed when the master power switch is turned off. The unit shall have a load rating of 20 amps at 120 volts, a self-test circuit with visual indicator,

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and provide EMI/RFI filtering, inrush current elimination and catastrophic over/under-voltage shutdown. The unit shall have a 10-year warranty.

- a. Providing minimum of two (2) to fully power system at the main rack. Verify amp and component power draw, and provide additional if/as needed.
 - b. Provide an additional sequencer in the remote rack at the sound console location.
8. The main equipment racks shall be a fully welded floor-mount equipment cabinet with locking front door. Ensure enough racks are provided at this location to include all installed equipment, including microphone patching. The cabinet shall be constructed using 14-gauge steel for the top and bottom and 16-gauge steel welded to integral structural side panels. The rack shall contain a minimum of forty (40) rack units and shall be at least twenty-seven (27) inches deep. Provide vent panels at the top and bottom of the rack for additional ventilation. Provide matching blank panels for all unused spaces. Provide Middle Atlantic Products model WRK-40SA-27 with VFD-40 25% Perforated Front Door. Provide additional rail kit model WRK-RR40. Provide Caster Base model CBS-WRK-27. The equipment cabinet shall be equipped with a 4-space locking security drawer. Provide one (1) PDLT-815RV-RN Rackmount Power/Lighting, 8 outlet, 15A, 2-stage power distribution panel in the cabinet.
 - a. Equal by Atlas Sound or Lowell Manufacturing shall be acceptable.
9. The remote equipment rack shall be located with the digital mixing console. Provide a fully welded table-top equipment cabinet with locking front door. The rack shall be constructed using 14-gauge steel for the top and bottom and 16-gauge steel welded to integral structural side panels. The rack shall contain seven (7) rack units and 19 inches deep. Provide vent panels at the top and bottom of the sides. Provide matching blank panels for all unused spaces. Provide Middle Atlantic Products model DTRK-718 with DT-VFD-7 Vented Front Door and DT-RAP7 solid rear access panel with brush cable entry.
 - a. Verify rack type with installed location.
 - b. Equal by Atlas Sound or Lowell Manufacturing shall be acceptable.
 - c. Locate adjacent to existing wireless microphone cabinet, and power microphone cabinet from this rack. Connect equipment into microphone patch panel located in the microphone equipment rack.
10. Provide Gater Case model G-PRO-12U-19 portable equipment rack for wireless microphones.
11. Provide all necessary connectors, hardware, wire management, power supplies, combiners, switch panels, power panels, etc. to enable complete system functions. Include passive summing devices for stereo connections to the system mixers as required for auxiliary and projector inputs.

B. The following equipment shall be provided in the Cafeteria.

1. The Cafeteria shall be provided with a new locally controlled sound reinforcement system with equipment as follows. The system shall be provided with a dedicated 20-amp power circuit.
2. Provide one (1) BSS Audio Soundweb London BLU-100 Networked Signal Processor with a fixed configuration of 12 analog inputs and 8 analog outputs, configurable signal processing and a high bandwidth, fault tolerant digital audio bus. The signal processor shall feature low latency, fault tolerant digital audio bus of 48 channels which uses standard Category 5e cabling giving a distance of 100m between compatible devices. The signal processor shall include 12 Control Inputs and 6 Logic Outputs for GPIO Integration for sending or receiving logic signals. The programming of the GPIO ports shall be software configurable. The signal processor shall include RS232 connection for control data transmission into or out of the processor for and shall be capable to integrate to third party control systems. Available system components shall include, but not be limited to, various forms of mixers, equalizers, filters, crossovers, dynamics/gain controls, routers, delays, remote controls, meters, generators, and diagnostics.

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- a. Provide BSS Audio EC8-WHT Ethernet Controller. The control panel shall be a PoE network appliance with a one push/rotary encoder, one encoder ring, eight buttons, and two LCD screens. The buttons, encoder ring, and LCD screens are multi-color backlit, capable of eight different colors with adjustable intensity. The push/rotary encoder can be rotated for continuous parameter control (e.g. volume). The push/rotary encoder can also be pressed for binary parameter control (e.g. mute) or preset recall.
 - 1) Provide one (1) controller adjacent to the sound rack and one (1) controller in space, where directed in the field.
 - 2) Provide additional controllers where identified on the drawings.
 - b. Provide support for iPad and PC integration for mixing controls during performances. Provide all accessories and programming as required, and include training of the settings as part of the project.
3. Power amplifiers shall be supplied and allocated as follows:
 - a. One (1) LEA model Connect 354 four-channel amplifiers, each channel providing 350 watts at 4 & 8 ohms or 70 & 100 volts. The amplifiers shall drive the delay row in the center of the auditorium, and the stage monitors.
 - b. All power amplifiers shall have the following minimum performance characteristics: less than 0.35% THD at rated power; frequency response of 20Hz to 20kHz +/- .25dB; input sensitivity for rated output 1.4Vrms. The unweighted signal to noise ratio over the range of 20 Hz to 20 kHz shall exceed 105 dB, reference to full output.
4. One (1) digital diversity wireless microphone combination system shall be provided. The systems shall utilize Automatic Frequency Selection that allows the unit to scan for open channels across the UHF band for clear operation. The unit shall provide frequency and volume lockout features to prevent accidental setting changes. The receiver shall be constructed of a durable, metal chassis with rack mount hardware. The unit shall utilize ½ wave antennas to allow for optimum antenna placement to enhance signal reception. Both ¼" line level and XLR microphone level output signals shall be provided. The digital wireless microphone receiver shall be Shure model SLX-D systems. Provide one (1) Shure model SLXD124/85 Combination Systems each equipped with one (1) SLXD2/58 Handheld Transmitter and one (1) SLXD1 Bodypack Transmitter with WL185 Lavalier Microphone.
 - a. Provide remote antennas for the wireless receivers to ensure good coverage.
5. Provide one (1) SurgeX Surge Eliminator and Power Conditioner, model SX1120RT. The unit shall be in a magnetic shielding enclosure, operate from 120VAC, and have a 9-foot grounded, 3-wire #12-line cord. The unit shall have a load rating of 20 amps at 120VAC, a self-test circuit with visual indicator, and provide EMI/RFI filtering, inrush current elimination, and catastrophic over/under voltage shutdown.
6. The above equipment shall be contained in a fully welded wall-mount equipment cabinet with locking front door. The cabinet shall be constructed using 16-gauge steel with triple-formed side-to-bottom and side-to-top wrapped construction to achieve strength equivalent to 3/16" thick steel. The mounting section shall attach to the backbox from the inside using two heavy-duty, spring-loaded L-pins that are self-seating and positive locking. The rack shall contain a minimum of twenty-four (24) rack units and shall be at least twenty (20) inches deep. Provide vent panels at the top and bottom of the rack for additional ventilation. Provide matching blank panels for all unused spaces. Provide Middle Atlantic Products model DWR-24-22 with VFD-21 25% Perforated Front Door. The equipment cabinet shall be equipped with a 4-space locking security drawer.
 - a. Equal by Atlas Sound or Lowell Manufacturing shall be acceptable.

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7. Provide all necessary connectors, hardware, wire management, power supplies, combiners, switch panels, power panels, etc. to enable complete system functions. Include passive summing devices for stereo connections to the system mixers as required for auxiliary and projector inputs.
 8. Provide audio input at the existing projection system, and connect into the sound system. Provide interface, wiring and programming as required.
- C. The following equipment shall be provided for the Gymnasium and Auxiliary Gymnasium.
1. Provide BSS Audio Soundweb London BLU-100 Networked Signal Processor(s) with a fixed configuration of 12 analog inputs and 8 analog outputs, configurable signal processing and a high bandwidth, fault tolerant digital audio bus. The signal processor shall feature low latency, fault tolerant digital audio bus of 48 channels which uses standard Category 5e cabling giving a distance of 100m between compatible devices. The signal processor shall include 12 Control Inputs and 6 Logic Outputs for GPIO Integration for sending or receiving logic signals. The programming of the GPIO ports shall be software configurable. The signal processor shall include RS232 connection for control data transmission into or out of the processor for and shall be capable to integrate to third party control systems. Available system components shall include, but not be limited to, various forms of mixers, equalizers, filters, crossovers, dynamics/gain controls, routers, delays, remote controls, meters, generators, and diagnostics.
 - a. Provide BSS Audio EC8-WHT Ethernet Controller. The control panel shall be a PoE network appliance with a one push/rotary encoder, one encoder ring, eight buttons, and two LCD screens. The buttons, encoder ring, and LCD screens are multi-color backlit, capable of eight different colors with adjustable intensity. The push/rotary encoder can be rotated for continuous parameter control (e.g. volume). The push/rotary encoder can also be pressed for binary parameter control (e.g. mute) or preset recall.
 - 1) Provide one (1) controller adjacent to the sound rack and one (1) controller in **EACH** space, where directed in the field.
 - 2) Provide additional controllers where identified on the drawings.
 - b. Provide support for iPad and PC integration for mixing controls during performances. Provide all accessories and programing as required, and include training of the settings as part of the project.
 - c. Processor shall be programmed to allow each space to function independently. Provide additional processors, and accessories as required.
 - 1) A "partition switch" shall be provided to allow the auxiliary gymnasium system to be used as a "monitor" to the man gymnasium, or be separated.
 2. Power amplifiers shall be supplied and allocated as follows:
 - a. Two (2) LEA model Connect 704 four-channel amplifier, each channel providing 700 watts at 4 & 8 ohms or 70 & 100 volts. The amplifiers shall drive the main gymnasium speakers.
 - b. One (1) LEA model Connect 354 four-channel amplifiers, each channel providing 350 watts at 4 & 8 ohms or 70 & 100 volts. The amplifier shall drive the auxiliary gymnasium speakers.
 - c. All power amplifiers shall have the following minimum performance characteristics: less than 0.35% THD at rated power; frequency response of 20Hz to 20kHz +/- .25dB; input sensitivity for rated output 1.4Vrms. The unweighted signal to noise ratio over the range of 20 Hz to 20 kHz shall exceed 105 dB, reference to full output.
 3. Three (3) digital diversity wireless microphone combination system shall be provided. The systems shall utilize Automatic Frequency Selection that allows the unit to scan for open channels across the UHF band for clear operation. The unit shall provide frequency and volume lockout features to prevent accidental setting changes. The receiver shall be constructed of a durable, metal chassis

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with rack mount hardware. The unit shall utilize ½ wave antennas to allow for optimum antenna placement to enhance signal reception. Both ¼" line level and XLR microphone level output signals shall be provided. The digital wireless microphone receiver shall be Shure model SLX-D systems. Provide one (1) Shure model SLXD124/85 Combination Systems each equipped with one (1) SLXD2/58 Handheld Transmitter and one (1) SLXD1 Bodypack Transmitter with WL185 Lavalier Microphone.

- a. Provide remote antennas for the wireless receivers to ensure good coverage.
 - b. Provide (2) systems in main gymnasium and (1) system in auxiliary gymnasium.
4. The system shall contain power switches to activate the sequential power control modules at the rack. The sequential power switching system shall use a model SEQ programmable sequencer, surge eliminator, and power conditioner as manufactured by SurgeX. This configuration shall supply power in a three-step time-delayed sequence to all components located in the equipment rack specified. The sequence shall be reversed when the master power switch is turned off. The unit shall have a load rating of 20 amps at 120 volts, a self-test circuit with visual indicator, and provide EMI/RFI filtering, inrush current elimination and catastrophic over/under-voltage shutdown. The unit shall have a 10-year warranty.
- a. Providing minimum of two (2) to fully power system at the rack. Verify amp and component power draw, and provide additional if/as needed.
 - b. Provide master power switch in the gymnasium and auxiliary gymnasium, near the sound controls.
5. The above equipment shall be contained in a fully welded wall-mount equipment cabinet with locking front door. The cabinet shall be constructed using 16-gauge steel with triple-formed side-to-bottom and side-to-top wrapped construction to achieve strength equivalent to 3/16" thick steel. The mounting section shall attach to the backbox from the inside using two heavy-duty, spring-loaded L-pins that are self-seating and positive locking. The rack shall contain a minimum of twenty-four (24) rack units and shall be at least twenty (20) inches deep. Provide vent panels at the top and bottom of the rack for additional ventilation. Provide matching blank panels for all unused spaces. Provide Middle Atlantic Products model DWR-24-22 with VFD-21 25% Perforated Front Door. The equipment cabinet shall be equipped with a 4-space locking security drawer.
- a. Equal by Atlas Sound or Lowell Manufacturing shall be acceptable.
6. Provide all necessary connectors, hardware, wire management, power supplies, combiners, switch panels, power panels, etc. to enable complete system functions. Include passive summing devices for stereo connections to the system mixers as required for auxiliary and projector inputs.

2.2 LOUDSPEAKERS

- A. The following equipment shall be provided in the Auditorium.
1. Provide Danley model SH96HO-I full range loudspeaker featuring 11 drivers coupled to a single Synergy Horn that includes four 15-inch drivers, six 4-inch mid-range drivers and a 1.4-inch high exit HF compression driver, all mounted within a 45-inch x 26-inch horn. The nominal coverage pattern shall be 90° x 60°. The operating frequency shall be 45Hz – 13.5kHz (+/-3dB) with a power rating of 2800W (11,000W peak) low, and 800W (3200W peak) mid/high. Sensitivity shall be 105dB SPL (2.83V into rated Z, at 1 meter. Speaker shall be suspended at the front, center of the space.
 2. Provide two (2) Danley model SH50HO-I full range loudspeakers. The loudspeaker shall utilize the synergy Horn/Tapped Horn patent-pending enclosure covering three pass bands. The coverage pattern shall be 50° x 50°. The loudspeaker shall have an operating range of +/- 3dB 50Hz – 18kHz. Sensitivity of 100dB SPL @ 1m. Output of 127 dB SPL/133dB SPL Peak. Power handling shall be

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1000W continuous, 2000W peak. Speakers shall be suspended at the front, right and left of the space.

3. Provide four (4) Danley model SHmini delayed loudspeakers. The loudspeaker shall utilize the Synergy Horn patent-pending enclosure covering two pass bands. The coverage pattern shall be 100° conical. The loudspeaker shall have an operating range of +/- 3 dB 125Hz – 18kHz. Sensitivity of 88dB SPL @ 1m. Output of 111dB SPL/117dB SPL Peak. Power handling shall be 200W continuous, 400W program. Speakers shall be suspended at the midpoint of the space, aimed toward the back, delayed from the front speakers.
4. Provide four (4) JBL model JRX212 speakers shall be provided for stage monitoring. The enclosures shall be black carpeted and shall be a ¾" MDF enclosure construction for ruggedness and low-end performance. The speakers shall utilize a 12" LF speaker and integral HF horn with 2414H-C one-inch compression driver. The horn pattern shall be 90 degrees by 50 degrees in a vertical orientation. The speaker shall have a frequency response of 80 Hz to 18 kHz, + 0 dB/-3 dB and a long-term power rating of 250 watts. Each speaker shall be supplied with a heavy-duty 25" speaker cable with Neutrik mating connectors.
5. Provide two (2) Electro-Voice model EVID P6.2 6" coaxial pendant. The EVID P6.2 loudspeaker system shall be comprised of a UL 94V-0 fire rated ABS baffle/bezel/enclosure assembly, powder coated grille with safety tether that attached magnetically to the bezel, transformer with 8 ohm bypass, and 6.5-inch polypropylene low frequency transducer with coaxially-mounted 1 inch titanium dome tweeter. The loudspeaker shall meet the following criteria: power rating shall be 75 watts of EIA RS-426A pink noise (6 dB crest factor). Frequency response, uniform from 60 Hz to 20 kHz. Pressure sensitivity, 87dB SPL at 1 meter (3.3 feet) on axis with one watt of pink noise (ref. 20µPa). Minimum impedance, 6.0 ohms. The loudspeaker shall be 301 mm (11.9.0 in.) deep and 310 mm (12.2 in.) in diameter. Weight shall be 5.28 kg (11.65 lb). Speakers shall be located in the band room.

a. Provide minimum 10 step attenuator for speakers, and label.

6. Provide two (2) Electro-Voice model EVID C8.2HC 8" coaxial recessed ceiling speaker with tile bridge and all required parts for complete installation. The EVID C8.2HC loudspeaker system shall be comprised of a UL 94V-0 fire rated ABS baffle/bezel assembly, zinc plated steel rear enclosure, powder coated grille with safety tether, transformer with 8 ohm bypass and waveguide loaded 8-inch polypropylene low frequency transducer with coaxially-mounted waveguide coupled 1-inch titanium dome tweeter. Both the low frequency and high frequency drivers shall be waveguide coupled to provide dispersion control over the specified frequency range. The loudspeaker shall meet the following criteria: power rating shall be 75 watts of EIA RS-426A pink noise (6 dB crest factor). Frequency response, uniform from 50 Hz to 20 Hz. Pressure sensitivity, 93 dB SPL at 1 meter (3.3 feet) on axis with one watt of pink noise (ref. 20µPa). Minimum impedance, 6.0 ohms. The loudspeaker shall be 320 mm (12.6 in.) in diameter and 303 mm (11.9 in.) deep. Weight shall be 6.0 kg. (13.2 lb). Speakers shall be located in the choral room.

a. Provide minimum 10 step attenuator for speakers, and label.

B. The following equipment shall be provided in the Cafeteria.

1. Provide Crestron model SAROS IC6T-W-T 6.5-inch two-way coaxial ceiling loudspeakers for the Cafeteria. Speaker is provided with built-in 60W 70/100V multi-tap transformer, 125W program power handling at 8ohms, 50Hz – 20kHz frequency response and a 100 deg. nominal coverage pattern. Provide with appropriate tile bridge and other accessories as required. Provide quantity indicated on the drawings.

C. The following equipment shall be provided in the Gymnasium.

1. Provide two (2) Danley model SH60-I full range loudspeakers. The loudspeaker shall utilize the synergy Horn/Tapped Horn patent-pending enclosure covering three pass bands. The coverage

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- pattern shall be 60° x 60°. The loudspeaker shall have an operating range of +/- 3dB 48Hz – 18kHz. Sensitivity of 100dB SPL @ 1m. Output of 127dB SPL/133dB SPL Peak. Power handling shall be 1000W continuous, 4000W peak. Speakers shall be suspended at indicated locations.
2. Provide one (1) Danley model THmini subwoofer. The subwoofer loudspeaker shall utilize one 12" long excursion transducer in a patent-pending enclosure. The subwoofer shall have an operating range of 48 Hz- 200 Hz - 3 dB with sensitivity of 101 dB SPL, 129 dB SPL/135 dB SPL peak. Power handling shall be 700 Watts continuous, 1400 Watts program. The impedance shall be nominal 8 ohms. Speakers shall be suspended at the structure.
 3. All speakers in gymnasium shall be painted **WHITE**.
- D. The following equipment shall be provided in the Auxiliary Gymnasium.
1. Provide Crestron model SAROS SMT8T-AW-W-T 8-inch two-way coaxial loudspeakers for the aus. gymnasium. Speaker is provided with built-in 80W 70/100V multi-tap transformer, 160W program power handling at 8ohms, 57Hz – 20kHz frequency response. Mount speaker in structure. Provide quantity indicated on the drawings.

2.3 ACCESSORIES

- A. The following equipment shall be provided in the Auditorium.
1. Provide two (2) Audix model MICROBOOM 50 microphones.
 2. Provide two (2) Shure model SM58S cardioid vocal microphones with an on/off switch.
 3. Provide four (4) Atlas/Soundolier MS-12CE microphone stands.
 4. Provide four (4) Audix model ADX60 boundary microphone with cable.
 5. Provide four (4) twenty-five (25) foot microphone cables.
 6. Provide six (6) Shure model MX202B/C overhead hanging microphones to be used when the system is in the "performance" mode of operation.
 - a. Coil minimum 15' of extra cable at steel to allow flexibility in microphone adjustment.
 - b. Provide microphone jack at structure, off to side of stage for microphones. Cables shall be routed through structure, and dropped, using strain relief, to appropriate height (at stage bar height). Label each jack.
 7. Provide Whirlwind custom Microphone Patch Bays as required to accommodate all inputs, including, but not limited to wired microphones, projection inputs, auxiliary inputs, etc. plus an additional 12 unused jacks for future use. Also, include sufficient jacks for the stage monitors to allow additional patching. The patch bay shall be located in the audio rack to allow patching from this patch bay to the digital patch bay for the audio rack.
 8. Provide digital microphone audio expander for the sound console as specified on the in the mixing Console section.
 - a. Provide all necessary power and run two (2) shielded CAT6 cables to ensure a clean connection, and provide a spare incase a cable fails in the future.
 9. All microphone receptacles shall utilize Switchcraft model D3F connectors where indicated on the drawings. All microphone and auxiliary input plates shall be engraved with permanent lettering and numbering. Engraved characters shall be filled with black acrylic paint or color approved by the Owner.
 10. All auxiliary input locations indicated on the drawings, provide 3.5mm (1/8") and left/right RCA inputs audio inputs in a single gang box and plate for auxiliary inputs. These shall be connected to the matrix mixer for 'PA' mode and shall operate on the side where they are indicated
 - a. Provide an additional aux. input at the main and remote racks in a blank panel.

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11. Provide one (1) ProCo iFace Portable Audio Player Interface to allow simple and reliable connection of stereo -10dBV audio devices such as MP3 players, iPods, laptop computers, and consumer-type CD and DVD players to the balanced microphone inputs located on the drawings.
- B. The following equipment shall be provided in the Cafeteria.
1. Provide one (1) Shure model SM58S cardioid vocal microphones with an on/off switch.
 2. Provide one (1) Atlas/Soundolier MS-12CE microphone stands.
 3. Provide one (1) twenty-five (25) foot microphone cables.
 4. All microphone receptacles shall utilize Switchcraft model D3F connectors where indicated on the drawings. All microphone and auxiliary input plates shall be engraved with permanent lettering and numbering. Engraved characters shall be filled with black acrylic paint or color approved by the Owner.
 5. All auxiliary input locations indicated on the drawings, provide 3.5mm (1/8") and left/right RCA inputs audio inputs in a single gang box and plate for auxiliary inputs. These shall be connected to the matrix mixer for 'PA' mode and shall operate on the side where they are indicated
 - a. Provide an additional aux. input at the rack in a blank panel.
 6. Provide one (1) ProCo iFace Portable Audio Player Interface to allow simple and reliable connection of stereo -10dBV audio devices such as MP3 players, iPods, laptop computers, and consumer-type CD and DVD players to the balanced microphone inputs located on the drawings.
- C. The following equipment shall be provided in the Gymnasium/Auxiliary Gymnasium.
1. Provide one (1) Shure model SM58S cardioid vocal microphones with an on/off switch.
 2. Provide one (1) Atlas/Soundolier MS-12CE microphone stands.
 3. Provide one (1) twenty-five (25) foot microphone cables.
 4. All microphone receptacles shall utilize Switchcraft model D3F connectors where indicated on the drawings. All microphone and auxiliary input plates shall be engraved with permanent lettering and numbering. Engraved characters shall be filled with black acrylic paint or color approved by the Owner.
 5. All auxiliary input locations indicated on the drawings, provide 3.5mm (1/8") and left/right RCA inputs audio inputs in a single gang box and plate for auxiliary inputs. These shall be connected to the matrix mixer for 'PA' mode and shall operate on the side where they are indicated
 - a. Provide an additional aux. input at the rack in a blank panel.
 6. Provide one (1) ProCo iFace Portable Audio Player Interface to allow simple and reliable connection of stereo -10dBV audio devices such as MP3 players, iPods, laptop computers, and consumer-type CD and DVD players to the balanced microphone inputs located on the drawings.

2.4 MIXING CONSOLE(S)

- A. The following equipment shall be provided in the Auditorium.
1. Provide one (1) Allen & Heath model SQ-7 digital mixer. The mixer shall be a compact digital mixer built around a 96kHz XCVI FPGA core with 48 input channels mixing to LR and 12 stereo mix outputs. The surface shall include 33 moving faders with 6 layers, each layer having dedicated keys, giving easy access to input channels, mixes, FX sends, FX returns, DCA masters and MIDI control. There shall be a local "sLink" Ethernet audio expansion port with locking EtherCON connector, supporting multiple AoIP protocols and providing access to a maximum 128x128 digital channels, connected over a single cable 'digital snake' and allowing remote preamp control of remote audio units. A digital I/O Port shall be provided to accept optional cards, supporting a

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maximum 128x128 channels and the ability to interface with 3rd party AoIP protocols such as Dante and Waves.

- a. Provide Console with Dante® module, providing a full 64x64 channel, 96kHz or 48kHz interface to a Dante network.
 - b. All "digital snake" cabling shall be shield cables, meeting the performance characteristics as specified in Division 27 "Communications Cabling."
 - c. Provide additional extender hubs as required to accommodate all digital connections.
2. Provide Allen & Heath model DX32 expander. The unit shall be a rack-mountable remote audio device for Allen & Heath mixing systems. The remote audio unit shall be provided with modules to provide 24 XLR inputs and 8 XLR outputs. The unit shall work at 96kHz sampling rate. One EtherCON connector shall be provided for transport of the digital audio and control signals to and from the mixing system. An additional EtherCON connector shall be provided for further expansion with compatible Allen & Heath remote audio devices. The Ethernet protocol shall provide control to the remote preamp, and all mic preamps shall be recallable by the digital mixing system.
 - a. Mount in main audio rack, and use to provide connection point for all wired microphones and stage monitor jacks.
3. Provide one (1) Allen & Heath model DX164-W expander. The unit shall be wall-mountable remote audio device for Allen & Heath mixing systems. The remote audio unit shall provide 16 XLR inputs with individually configured Phantom Power and 4 XLR outputs. The unit shall work at 96kHz sampling rate. One EtherCON connector shall be provided for transport of the digital audio and control signals to and from the mixing system. Two further EtherCON connectors shall be provided for further expansion with compatible Allen & Heath remote audio devices. One of these ports shall be compatible with the Allen & Heath ME personal mixing system when the device is used with an Allen & Heath Avantis or SQ digital mixer. The Ethernet protocol shall provide control to the remote preamp, and all mic preamps shall be recallable by the digital mixing system.
 - a. Locate on stage where indicated on the drawings.
4. The owner will provide one (1) Apple iPad Air for use with the System and turn over to the vendor for programming with the system. Coordinate all requirements with the owner. Provide all applicable software to control the console, including any paid software. The iPad shall be cleaned of any and all pre-installed software as much as possible.

2.5 ASSISTIVE LISTENING SYSTEMS

- A. A Listening Assistive System shall be provided with each of the specified sound systems to comply with ADA requirements. Provide one (1) rack mounted base station transmitter model Listen Technologies LT-800 at each sound system rack. Provide additional base stations for sound systems that are specified to function as two systems with closed dividers. The transmitter shall operate at 72MHz range. The unit shall be equipped with 17 wide band channels and 40 narrow band channels. Include a model LA117 remote antenna with each base station to be installed in the actual space served. Field verify exact location with architect before rough-in. Provide LR-400 57-channel receiver complete with Channel and Seek features to allow automatic operation with other ADA systems within the school district. Provide each receiver with a LA-161 earbud and alkaline battery. Provide an additional six (6) earbud cushion covers for each receiver with the system. Provide hearing aid neckloops to meet ADA requirements with the system. Provide a quantity of receivers and neckloops as indicated below:
 1. Auditorium: Provide (26) receivers and (7) neckloops.
 2. Cafeteria: Provide (14) receivers and (4) neckloops.
 3. Gymnasium: Provide (19) receivers and (5) neckloops.

4. Aux Gymnasium: Provide (7) receivers and (2) neckloops.

2.6 PRODUCTION INTERCOM SYSTEM

- A. The following equipment shall be provided in the Auditorium.

1. Provide one (1) Clear-com model MS-702 two-channel Intercom Master Station. The Master Station shall support up to two intercom channels with up to 40 Beltpacks or 10 speaker locations. The system shall be capable to monitor intercom activity on one or both channels with individual listen-level controls. Locate master station at the sound booth area.
2. Provide six (6) Clear-com model RS-701 Single Channel Analog Beltpacks. The Beltpack shall be equipped with an XLR-3 line connector and XLR-4M headset connector. Include a Clear-com model CC-300 single-ear headset and 25-foot cable with each Beltpack.
3. Provide Clear-com model WP-2 two-channel Selectable Intercom Outlet Wall Plate, 3-pin male connector and channel select switch on a single-gang wall plate at the locations indicated on the drawings.
4. Provide Clear-com model HME DX210 Wireless Intercom System and integrate to the wired Master Station. The system shall include one (1) BS210 Base Station, two (2) BP210 Wireless Beltpack Transceivers, Four (4) CC-15-MD4 Headsets, and one (1) AC-40A Battery Charger Unit. The wireless Beltpacks shall work up to 14 hours on a battery charge. The system shall be capable to expand to up to fifteen (15) Beltpacks.
5. Comparable production intercom system as manufactured by Telex shall be considered an acceptable equivalent system. Ensure all parts and pieces, including, but not limited to the receivers, transmitters, headsets, etc. match the specified.

2.7 VIDEO SYSTEM

- A. The following equipment shall be provided in the Auditorium.

1. Video Distribution

- a. Video Distribution and Control System:

- 1) Provide two (2) Crestron TSW-770 series 7-inch Touch Screen Control Panel user interface controllers for use with the audio/video and projection system.
 - a) One touch screen control panel shall be located on stage adjacent to the lighting control stage manager panel. Provide wall mount kit to install touch screen.
 - b) The other touch screen control panel shall be provided with table kits to install touch screens. Jacks shall be located throughout the room as indicated on the plans.
 - c) Provide wiring as required at each location.

- b. Provide one (1) Crestron CEN-SW-POE-5 5-port PoE Switch.

- c. Provide audio/video input locations as indicated on the drawings. Each input location shall have (1) HDMI input, (1) VGA, (1) 3.5mm audio, and (1) USB HID. Provide Crestron model DM-TX-200-C-2G Wall Plate DigitalMedia 8G+ Transmitter.

- 1) In addition to the input locations on the drawings, provide inputs at the following locations:

- a) At the main sound rack.

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- b) At the remote sound rack.
 - c) At DVD/Blue-ray players indicated above.
 - d. Provide Crestron series DM room controller, switcher and CP3 3-Series Control Processor System at sound rack as required to accommodate all inputs indicated in the specifications and on the drawings. Input selection shall be accomplished through the use of the Touch Screen Control Panels.
 - e. Provide Crestron model DM-RMC-4K-100-C-1G wall plate DigitalMedia 8G+ Receiver at projector to connect video sources.
 - f. Provide all additional accessories, wiring and programming as required to interface the touch screen with the following:
 - 1) Simplified control of the sound system when in 'PA' mode. The controller shall control the different inputs, etc. The controlled inputs shall include the 'PA' mics and Blu-ray player at a minimum.
 - 2) Control of the projector.
 - 3) Control of the backdrop projectors (location of SDI connections).
 - a) Provide RS-485 connection to SDI locations to provide programming.
 - 4) Control of the projection screen.
 - 5) Control of the draw curtain (if electrified).
 - 6) Simplified control of the house lighting system (main house lights at 0, 25%, 50%, 75%, 100%; aisle lighting on/off; stair lighting on/off (if present) and decorative wall lighting (if present) at 0% and two (2) owner directed preset levels and 100%). Coordinate connection with the theatrical lighting control system vendor.
 - 7) Provide additional lighting presets to match the presets in the theatrical lighting system. Coordinate programming with the theatrical lighting system vendor.
 - g. Provide all Interface Cables and accessories necessary for a complete and operational system.
2. Video Projection System
- a. Provide one (1) Panasonic model PT-RZ14KU 3-chip DLP laser WUXGA projector with a **Black** finish. Provide appropriate lens to fill the permanent wall screen as shown on drawings. The projector shall meet these minimum specifications at the time of installation.
 - 1) Resolution: WUXGA 1,920 x 1,200)
 - 2) Brightness: 14,000 ANSI lumens
 - 3) Contrast Ration: 20,000:1
 - 4) Aspect Ratio: 16:10
 - 5) Light source life: 20,000 hours (normal mode)
 - 6) Motorized lens shift and power zoom/focus
 - b. Chief ceiling mount and pipe in required length for the projector at the indicated location. Mount projector from structure with lateral cable supports as required to properly support projector. All mounting equipment shall be provided with a **Black** finish.
3. Video Projection Screen
- a. Furnished and installed by General Trades Contractor. Wire screen into Video Distribution and Control System.

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- B. The following equipment shall be provided in the Cafeteria.

1. Video Distribution

- a. Provide one (1) Crestron MPC-302-B Media Presentation Controller, ten button user interface controller for use with the audio/video and projection system.
- b. Provide audio/video input locations as indicated on the drawings. Each input location shall have (1) HDMI input, (1) VGA , (1) 3.5mm audio, and (1) USB HID. Provide Crestron model DM-TX-200-C-2G Wall Plate DigitalMedia 8G+ Transmitter.
 - 1) In addition to the input locations on the drawings, provide inputs at the sound rack.
- c. Provide Crestron series DM room controller and switcher at sound rack as required to accommodate all inputs and outputs indicated in the specifications and on the drawings.
- d. Provide Crestron model DM-RMC-4K-100-C-1G wall plate DigitalMedia 8G+ Receiver at projector to connect video sources.
 - 1) Provide wall plate at each of the two (2) televisions in the room.
 - 2) Provide wall plate at existing projector, and connect.
- e. Provide audio connection to sound system matrix.
- f. Provide all Interface Cables and accessories necessary for a complete and operational system.

2.8 INTERCONNECTIONS

- A. Provide necessary components, wiring, etc. to interconnect all sound systems with the master intercom system so that during a general page, the remote system will mute.
1. Verify each space with the owner. Should the owner request that the system not be muted, the wiring shall remain in place, with the system programmed to ignore the input, so that the system can be programmed to must upon page in the future.
- B. Provide necessary components, wiring, etc. to interconnect all sound system with the Fire Alarm System so that during an alarm the remote system will mute.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with installation instructions provided by system manufacturer. Provide type of cables as shown on plans and schedules.
- B. All wiring shall be plenum rated where required by code.
- C. Install system to comply with drawings and final shop drawings in compliance with manufacturer's printed instructions.
- D. Cable identification: shall be provided on both ends of each cable and termination with the owner's room number and the wiring block or device to which it is connected. Tags shall be permanent and neat.

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- E. Furnish and install necessary conduit, raceways, pull boxes, outlet boxes and wire to provide a complete system or systems as herein specified. All wiring shall be tested for continuity and freedom of all grounds and short circuits.
- F. Each cable run between the amplifiers and remote locations shall be one continuous cable.
- G. The Contractor shall use the types of wire recommended by the Sound Equipment Manufacturer. However, the size and quality shall not be less than that previously specified or indicated on the drawings. If cross talk, appreciable loss of volume or distortion occurs after installation has been completed, it shall be the mutual responsibility of the Contractor and Manufacturer to correct any such condition without cost to the owner. The Contractor in no case shall use the type of wire which he merely assumes to be the best. This recommendation shall be from the equipment manufacturer.
- H. Remote Reinforcement Sound System loudspeakers shall be connected to their local amplifiers with minimum 12awg cable when low impedance (4 or 8 ohms) and minimum 16awg cable when high impedance (70 volt line).
- I. The central control console shall be provided with a 10AWG ground wire to earth ground. Conduit ground shall not be acceptable for this purpose.
- J. All microphone wiring shall be No. 22 AWG twisted pair stranded with aluminum shield of 100% coverage and rubber or vinyl plastic jacket. Capacitance between conductors shall not exceed 30 mmf per foot. All microphone wiring shall be run in conduit with no other wiring.
- K. Provide necessary connections to the intercommunications system to must the local sound system during a page.
- L. Install remote antennas for the AM/FM tuners on the roof per manufacturer's recommendations.
- M. Install all remote antennas for assistive listening and wireless microphones as required, per manufacturer's recommendations in the spaces for fully functioning systems.

3.2 SUPERVISION

- A. Installation of these systems shall be supervised by a factory trained representative who shall accompany the Owner's representative on an inspection of the entire system and shall demonstrate the entire systems performance.
- B. A complete operational test of the entire system shall be performed to demonstrate proper system function in accordance with the specified requirements. Correct any malfunctions within the system where necessary.
- C. All remote sound reinforcement systems shall be tuned by a qualified technician. The technician shall provide printed documentation of all system settings and raw and final system equalization settings as determined by real time analyzer from a minimum of 3 averaged locations in each space. Provide reports in close-out documentation.

3.3 DEMONSTRATION AND TRAINING

- A. Once system is operational, provide a complete demonstration of the entire system to the owner showing the usage of all components of the system to allow acceptance of the system by the Owner.

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- B. Upon acceptance of the system by the Owner, arrangements shall be made to provide a minimum of eight (8) hours of training for each system for the Owner's representatives in proper and full potential operation of the system. The training session shall be scheduled through the Electrical Contractor, Construction Manager, Electrical Engineer, and Architect.
- C. Provide three (3) complete sets of bound operating instructions including circuit diagrams, part numbers, names, addresses and telephone numbers of parts and equipment sources.

3.4 COMMISSIONING

- A. Once the system is installed and functioning, the installer shall set up a meeting with the owner and contractor to tune each of the specified systems. The installer shall account for a minimum of four hours to spend in each space.
- B. Provide additional commissioning as follows:
 - 1. Approximately 6-9 months after substantial completion, the installer shall contact the owner to set up a meeting. This meeting shall be used to "re-tune" the system by moving speakers, aiming the speakers and/or reprogramming the mixers to the owner's satisfaction. The installer shall also review any training that may have previously occurred if required by the owner. The installer shall account for a minimum of four (4) hours to spend in each space.
 - 2. Approximately 12 months after substantial completion, the installer shall contact the owner to set up a final meeting. This meeting shall be used for any final program changes as well as additional training. The installer shall account for a minimum of four (4) hours to spend in total.

END OF SECTION 27 51 25