Audio / Video
System Specifications Section
For
Arlington Schools District Offices

1.00 DESCRIPTION

1. The Contractor shall deliver, erect, connect, and furnish all Material, Appliances, and furnishings as detailed herein.

2. The Contractor shall complete assembly of all equipment in the System and perform all necessary wiring in order to effect complete interconnection of the components in the system.

3. The Contractor shall provide all incidental material, appliances, Tools, etc., required to complete the sound reinforcement system enumerated herein.

4. The Contractor shall also perform all tests and calibrations necessary in order to show that the installed system is in proper and complete working order as specified herein.

5. Substitution requests are to be submitted fourteen (14) days prior to bid. Equipment not approved shall not be used.

1.01 SUBMITTALS

A. Submittals: Shop drawings shall be furnished detailing the proposed equipment installation in AutoCAD format on 30x40 sheets using 1/8 scale.

1. Equipment List - A Full equipment manifest that details all components of the proposed system.

2. Manufacturer's cut sheets or brochures shall be provided for all components in the system.

3. Reference List. - Sound contractor shall provide a list of similar and recent installation references for verifications of past quality of work and customer satisfaction. Include a contact name and phone number for each installation.

4. Submit detailed speaker support drawings showing exact mounting techniques for the speaker systems.

5. Shop drawings showing proposed layout of equipment and any custom or or altered devices.

6. A system schematic including the items described below:
a. Nomenclature of components and cables written on schematic.

b. Wire designations and/or color codes.

c. Terminal block designations.

d. Equipment designations and locations.

e. All documentation of electronic and acoustical tests and measurement after installation.

7. Manufacturer's instruction manuals and warranties for each component in the system including 2 sets of as-built drawings and 2 copies of all equipment manuals, operating instructions, service manuals and test documentation.

1.02 QUALIFICATIONS OF THE A/V CONTRACTOR

A. The A/V Contractor shall be a contractor normally and primarily engaged in the business of Audio/Video system installation for not less than five (5) years. The A/V Contractor shall also be a authorized dealer for all products prior to Bidding the project that are to be furnished and installed. Contractor should have a State of Tennessee Contractors License in the name that the contractor is doing business as, and should be a Member of Infocomm International.

B. The contractor must employ at least one technically competent person who is capable of providing complete service and technical assistance for all of the products installed. One employee must also be experienced in complex engineering techniques associated with specified equipment. The Contractor must have one technician that has completed CST training program. Sub-Contracting for installation and service will not be permitted.

2.00 AUDIO/VIDEO SYSTEM DESIGN SPECIFICATIONS

A. The intent of this section of the specification is to secure a complete and satisfactory operating system to provide video reproduction to monitors in the main audience and lobby locations, natural sound amplification for speech and music or other sound source (PC, Apple TV, etc.) within the main chamber & Lobby. The systems shall be Equalized for naturalness and preset for ease of operation and minimum adjustment. The system shall be of modular design to facilitate both system expansion and service, and shall be completely solid state.

The main loudspeaker systems for the Main chamber and Lobby shall be mounted as multiple distributed ceiling speaker system.
2.01 PERFORMANCE OBJECTIVES

A. Provide even distribution of the reinforced sound throughout the designated areas, typically plus or minus 3db SPL (Sound Pressure Level) front to back and side to side for one octave band pink noise centered at 2000Hz measured at Flat. Total variation shall not exceed plus or minus 3dB SPL.

B. Provide uniform frequency response throughout the designated areas. Typically, plus or minus 3dB across the areas with 1/3 octave-bands of pink noise from 80Hz to 15,000 Hz.

C. System shall be free of short circuits, ground loops, parasitic oscillations, noticeable noise, hum, and instability of any form, including RF interference.

2.02 STRUCTURES

A. The AV Equipment, source equipment and amplifiers are to be installed in the equipment racks as designated. Any unused spaces in the racks are to be filled with blank panels; taking care to install vents or blanks panels between all digital processor and amplifiers. Any millwork, counter tops or tables will be furnished by owner.

2.03 EQUIPMENT

A. All wire and equipment supplied by the contractors shall be new, and the custom designed components or control circuitry shall be assembled with new parts.

B. All materials and equipment will be new and will conform to the applicable requirements of the Underwriters Laboratories and the American National Standards Institute.

C. All references in this document to specific brands or models of equipment are made to set a standard of quality. This standard is based upon product history, budget limitations, Owner's preferences and compatibility with other systems currently installed within the complex or school system.

2.04 CONNECTORS AND CONTROLS

A. All connectors which are installed by the manufacturer in a given piece of equipment shall be acceptable as installed in that piece of equipment, unless otherwise noted in these specifications. All connectors to be installed by the contractor shall be those listed below where applicable.

1. All microphone receptacles shall be Neutrik or approved equal.

2. In-line microphone or balanced line connectors shall be Neutrik or approved equal.
2.05 MICROPHONES

A. Podium and Table Microphone

1. Qty Eight (8) Shure MX-415R with windscreen or approved equal by AKG.  
   *(Provide cabling for eight (8) microphones at board member table and two for front table)*

B. Microphone Accessories

1. Provide total Eight (8) Shure MX400DP programmable gooseneck microphone bases.  
   *(No Substitutes)*

2.06 SOURCE EQUIPMENT

A. Furnish and Install:

1. Apple TV for tablet and Laptop mirroring. (owner provided)
2. Rack Mounted PC (owner provided).
3. QSC Q-Sys Core 110F for Audio Conferencing.

2.08 SIGNAL PROCESSORS

A. All processing units are to be mounted in the main rack. Each signal processor that is to be supplied shall be mounted in rack above amplifiers allowing space between the amplifier and processor to allow heat to escape from the rack to keep from causing overheating issue with DSP unit. Furnish and install the following units

B. The DSP unit shall have open architecture for allowing system software configuration of all inputs and outputs of DSP unit. Each system shall have the function to work as separate systems or in the combine mode of operation for using the room as one system.

C. The DSP unit shall provide Rs 232 or Ethernet connection points to allow interconnection to control system for control of Audio systems.

   1. Provide Qty One (1) QSC Q-Sys Core 100F for Audio Conferencing. *(No Substitutes)*

2.09 POWER AMPLIFIERS

A. Furnish and Install the following type power amplifiers. All amplifiers shall be from same manufacture:

1. Qty One (1) Ashly Audio Nx 4004 or equal by QSC CXD
2.10  LOUDSPEAKER SYSTEMS

A. Furnish and install the following:

Main Chamber System:
1. Qty Eight (8) Tannoy CVS 8 70v series ceiling speakers provide structural support hangers from building structure and attach them to each speaker during installation to remove weight from ceiling tile. (zone 1) Six speakers located over audience evenly spaced for proper coverage. (zone 2 & 3) Two speakers located over board members table. Mix minus to be set up for these three zones.

Lobby:
1. Qty Two (2) Tannoy CVS 8 70v series ceiling speakers provide structural support hangers from building structure and attach them to each speaker during installation to remove weight from ceiling tile.

2.11  EQUIPMENT RACKS

A. Furnish and install the following:

1. Qty One (1) Lowell LER-4432 Series Rack with locking perforated front door, rack shall house all equipment as mentioned in section 2.02 or equal by Middle Atlantic. Include in rack qty as required Lowell ACSP-RPC1R-1509 power distribution. In Control system provide contact closure so system can be turned on /off at podium control touch panel or within equipment rack.

2. Each rack bay shall come equipped with 1 pair of 11-gauge steel rack rail tapped with 10-32 mounting holes in universal EIA spacing, black e-coat finish and numbered rack spaces. A/V rack shall have one 70 CFM thermostatically controlled fan per bay. A/V rack shall have a slide-out keyboard shelf, 18.99” W x 2.25” H x 12.06” D. A/V rack shall have a side shelf/drawer with a useable area of 20.93” W x 7.49” H x 7.56” D. A/V rack shall have a side with a useable area of 20.93” W x 7.49” H x 7.56” D. Thermostatically controlled fans shall be powered on at 87°F and turn off at 85°F. A/V rack shall include a 15 Amp, 8 outlet surge-protected power strip with a 10’ cord. A/V rack shall have venting on the top. A/V rack shall be finished in a durable black powder coat.

3. Side panel finishing kit shall be furnished as required for rack, be available in a Traditional style and shall be available in a black powder coat finish.
2.12  VIDEO / CONTROL SYSTEM

A. Furnish and install the following equipment for main chamber system.

1. Qty Two (2) Sharp LC-80LE661U 80” LCD TV display for main chamber audience viewing. No Substitute.
2. Qty Two (2) Premier Wall mount and any hardware required for mounting main chamber displays.
3. Qty. One (1) Sharp LC-60LE661U 60” LCD TV display for Lobby viewing. No Substitute.
4. Qty One (1) Premier Wall mount and any hardware required for mounting lobby display.
5. Qty Three (3) Premier GB-INWAVPL in-wall w/power outlets and surge protection.
6. Qty. One (1) Extron 60-1434-01 control processor w/rack mount.
7. Qty. One (1) Extron 79-2546-01 link license for iPad control.
8. Qty. Two (2) Extron 60-1413-01 serial port control expansion
9. Qty. Two (2) Apple iPad Air2 9.7”(32gb) tablet for control surface. (owner furnished)
10. Qty. One (1) FSR iPad rack mount with power supply option.
11. Qty One (1) Atlona AT-UHD-PRO3-1616M HDMI switcher.
12. Qty Seven (7) Atlona AT-UHD-EX-100CE-RX twisted pair receivers for each TV location.
13. Qty Eleven (11) Crestron DM-TX-4K-100-C-1G twisted pair transmitter for desk, table and podium locations.
14. Qty Eleven (11) Crestron DM-RMC-4K-100-C twisted pair receivers at TV locations and switcher w/rack mounts.
15. Qty One (1) FSR PTB-2G-BLK pop-up table box for front table with a HDMI transmitter, USB and mic jack on each side
16. Provide Qty as needed for inter-connection cables and Qty 1 interface wall plate to interface owner provided computer.
17. Owner shall reserve the right to all source codes, programming files and configuration files with no lock puts or password protected content.
18. Provide all necessary cabling and hardware for a complete and functioning system.

2.13  VIDEO EQUIPMENT

CONFERENCE ROOMS  (typical of 3)

A. Furnish and install the following equipment in each of three conference rooms.

1. Qty One Sharp LC-70LE661U, 70” display
2. Qty One (1) FSR T3-AC2 pocket mounted box with HDMI twisted pair transmitter (table w/feed through)
3. Qty One (1) HDMI twisted pair receiver at TV display
4. Qty One (1) Premier GB-INWAVPL In-wall w/power outlets
5. Qty Two (2) Tannoy CVS 8 70v series ceiling speakers provide structural support hangers from building structure and attach them to each speaker during installation to remove weight from ceiling tile.
6. Qty One (1) Extron XPA 1002 power amplifier mounted in wall box
7. Qty One (1) Extron MLC 62 RS D button panel for control-on/off, volume,
8. Qty One (1) TrippLite power surge protection strip
Provide all necessary cabling and hardware for a complete and functioning system.

SUPERINTENDENT OFFICE

A. Furnish and install the following equipment in the superintendant’s office.
1. Qty One Sharp LC-60LE661U, 60” display
2. Qty One (1) FSR T3-AC2 pocket mounted box with HDMI twisted pair transmitter (table w/feed through)
3. Qty One (1) HDMI twisted pair receiver at TV display.
4. Qty One (1) HDMI wall plate with active cable below display for local input.
5. Qty One (1) Premier GB-INWAVPL In-wall w/power outlets
6. Qty One (1) Extron MLC 62 RS D button panel for control-on/off, volume, source.
7. Qty. One (1) Extron 60-1480-01 HDMI Distribution Amplifier.
8. Audio to be from TV display
Provide all necessary cabling and hardware for a complete and functioning system.

2.14 CABLES

A. Furnish and install the following cables with permanent heat
Shrink labels that state the owner name and each location that cables are used.

Permanent Installation Cable
1. Furnish all microphone, line level, remote control in gym floor outlets using West Penn 10454 shield pair or equal in Belden.
2. All ceiling speakers shall be West Penn 225 or equal in Belden.
3. Video Cables use West Penn Cat6 or equals in Belden.
4. West Penn 224 to be used for DC voltage power supply to wall plates.

3.00 INSTALLATION

A. Wiring Practices:

1. All wiring shall be executed in strict adherence to standard broadcast practices. Care shall be exercised in order to avoid damage to the cables and the equipment.

2. Cable runs through the conduit system, in the equipment racks, and mixer console assemblies shall be routed in four (4) different groups according to circuit level and function. These groups shall be microphone level circuits (level below - 20 dbm), line level circuits (up to +30 dbm), loudspeaker circuits (above +30 dbm), and electrical power circuits. Keep wires of different power levels separated by as much physical distance as possible.
Any crossing of different circuit levels must be made at a ninety (90) degree angle to the other circuit level. All cables shall be neatly arranged with plastic cable ties or in Pundit Wiremold Raceways.

3. The contractor shall observe proper circuit polarity and loudspeaker wiring polarity. Clearly label all cables at connections as to function. Connectors shall be wired by IEC 268 standard as follows:

<table>
<thead>
<tr>
<th>WIRE</th>
<th>XLR CONN</th>
<th>TRS 1/4&quot; CONN</th>
<th>POLARITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red or White</td>
<td>Pin #2</td>
<td>Tip</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>Black</td>
<td>Pin #3</td>
<td>Ring</td>
<td>Negative (-)</td>
</tr>
<tr>
<td>Shield or Drain Wire</td>
<td>Pin #1</td>
<td>Sleeve</td>
<td>Common</td>
</tr>
</tbody>
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4. All cables and wires will have suitable cross sections to provide safe current carrying capacity and intrinsic strength for the purposes for which they will be used.

5. All cables, wires and equipment will be firmly held in place. Fastenings and support must be adequate to carry twice the anticipated load, or a safety factor of 100%.

6. All cables shall be continuous lengths without splices. All system 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. Except where noted otherwise in the specifications, NO BARE WIRE TERMINATION'S WILL BE ACCEPTED. Heat-shrink tubing shall be used to insulate the ground or drain wire. Unused wires at the end of a cable shall remain unstripped and shall be laid back and held in place with wire ties. Any system wiring terminations shall be kept in equipment cabinets or junction boxes adjacent to the equipment racks only. Once again, all wiring runs to remote locations shall be continuous and splice free. Signal cables shall be of a high quality, low loss, low capacitance type.

7. All solder connection shall be made with rosin-core solder. Care shall be taken to avoid cold or cracked solder joints. Any solder connections that do not appear to be clean and shiny or which show signs of cracking shall be resoldered by the contractor before final acceptance of the system.

8. All mechanical connections shall be made with insulated, crimp-on type connectors. The wire shall be bonded to the connector by soldering the wire to the metal part of the connector. The only exception to this shall be for the connections to speaker components.

9. The wire ends that connect to the speaker terminals shall be tinned and shall not be stripped more than 1/2 inch. Connections of the bare wires to the terminals shall then be made in the conventional manner.

10. ALL SPEAKER DEVICES SHALL HAVE HOME RUNS TO THERE RESPECTIVE TERMINAL BLOCKS WITHIN OR ADJACENT TO THE AMPLIFIER RACKS.
B. Grounding Scheme:

1. The grounding point for all rack-mounted equipment shall be the right rack rail. To accommodate this, all paint must be removed from the front of the right rack rail where the equipment is mounted. A #4 stranded insulated ground wire must be firmly bonded to each grounding rack rail. The connection point on each rack rail must be a bare metal area free from any corrosion.

2. For locations where multiple equipment racks exist, the grounding rack rail in each rack shall be connected by a #6 stranded insulated wire to any Isolated Ground Bus bar (IGB) at the rack location. The IGB may be located in one of the equipment racks or in a "J" box outside the racks. A #4 ground wire shall be connected to this IGB to complete rack grounding.

3. The sound contractor shall make the chassis ground connection for each piece of equipment the right rack ear. All paint must be removed from the back of the right rack ear that mounts against the grounding rack rail.

4. All adjacent equipment racks shall be bolted very tightly together. Casual contact is not acceptable.

5. All conduit feeding equipment racks MUST be totally insulated from the racks as the equipment racks must be electrically isolated from all conduits, raceways, ventilation ducts, and metallic objects excluding other equipment racks. This may be done with items such as Carlon PV-Duit.

6. The shields of all balanced interconnecting circuits in the audio signal path shall be lifted only at the signal input of each piece of equipment. The shields at the other end of those wires for circuit levels below +30 dbm must be terminated. Microphone circuits between patch bays and splitters shall have shield connected at both ends.

C. General Installation Practices:

1. All equipment shall be held firmly in place with proper types of mounting hardware.

2. The sound contractor shall assume responsibility for verifying there is adequate ventilation for all enclosed equipment items which produce heat.

3. The installation must appear neat and organized in all areas including but not limited to equipment racks, speaker systems, etc.

4. The work space in and around the audio equipment shall be free of debris of any kind. Care shall be taken to remove all metal shavings, stripped insulation, etc. from the racks and consoles.

5. Installation of materials and equipment must meet REA industry standards in all respects with specific attention given to methods employed for wiring,
cabling, terminations, cable dressing, cable and wire labeling, documentation, equipment room layout, general appearance, equipment operation and performance. The successful bidder must remove from the premises all packing, crates and other litter associated with the installation.

D. Speaker Installation:

1. The speakers shall be installed via rated and approved medium. All hardware and parts used shall have be appropriate for seismic ratings for safety.

3.01 LABELING

A. All nomenclature on labels, plates, and designation strips shall be done in capital letters - typically in 1/8" white block letters.

B. Clearly and permanently label all jacks, microphone receptacles, equipment controls and patch bays. This is to be done with an engraved plastic laminate strip or approved equal permanently affixed to each unit. Contractor should use different color strips for each signal level or type of circuit identified. This color code shall be approved by the owner.

C. Sound contractor shall use approved designations. He shall logically label any devices not having a designation in order to coincide with the designations used elsewhere in the system.

D. All patch panels shall be labeled with an engraved plastic laminate strip or approved equal permanently affixed to each unit. Letters shall be 1/8" white block. Care shall be taken in layout of labeling to avoid confusion between adjacent jack labels.

E. All rack mounted equipment shall be labeled on front and rear as outline in A, B, and C above. Labels shall be of a uniform size and layout for each type of equipment as follows:

1. Line 1: Generic name of device such as POWER AMPLIFIER

2. Line 2: Designation of device such as PA-1A

3. Line 3: Control area of device such as STAGE RIGHT HORN

F. All wiring should be permanently labeled at both ends with corresponding numbering or lettering noted on the "as built" drawings.

3.02 SYSTEM TESTING

A. Subsequent to the date of final system testing the sound contractor shall perform and document the following measurements. Copies of these test reports shall be available for review by the consultant and owner 14 days before the date of final system testing. Coordinate with Owner and Consultant scheduling of final tests
and adjustments. Provided two (2) technicians familiar with system during final testing.

1. Measure and record the AC. impedance of each speaker line at 500, 1000, and 4,000 Hz before connecting it to its respective amplifier. The load impedance shall be greater than or equal to the amplifier's rated impedance at the intended operating frequency. Record results.

2. Measure the output of each amplifier with an oscilloscope using a sine-wave oscillator having less than 0.5% THD as an input. The signal level shall be adjusted to produce 10dB less than the intended maximum SPL of each driver. This measurement shall be done with speakers connected using a frequency which the amplifier will be called upon to reproduce. Inspect the output sine-wave appearing on the oscilloscope for complete freedom from hum, noise parasitic oscillations, and RF interference. Record results.

B. Prior to the dates of the final system testing the sound contractor shall perform the following:

1. Burn in and test all electronics to insure proper operation and stability.

2. Check all microphone jacks, speaker jacks, inputs and outputs on all equipment for proper installation and operation.

3. Set the gain structure, adjust power levels and equalize all systems.

4. Verify all phases of system installation for accuracy and stability.

3.03 ACCEPTANCE OF SYSTEM

A. After completion of all initial test and adjustments by the contractor to ensure a fully operational and complete system, the Owner is to be notified in writing that the system is ready for final inspection, testing, setting of gain structure and equalization. This is to be done prior to any use of the system other than for testing purposes.

B. Should the need for further adjustments or work become necessary during final testing, sound contractor will continue his work until system is acceptable at no addition to the contract price. If approval is delayed because of defective equipment or failure of equipment or installation to meet these specifications, the contractor will pay for any additional time and expenses of the consultant during any extension of the testing period.

C. Final acceptance of the system by Arlington School District personnel will be forthcoming upon the following:

1. Delivery of all contracted equipment.
2. Completion of the Sound System as specified.
3. Final check of the system by owner.
4. Delivery of all specified documentation.
5. Completion of training period for facility technical crew.

3.04 ALTERNATES

1. Boardroom Camera Broadcast System

Furnish and install the following:
Qty. Four (4) Vaddio 999-9950-000 HD RoboShot Camera.
Qty. Eight (8) Vaddio 999-1105-043 one-link repeater at controller and cameras.
Qty. One (1) Vaddio 999-5655-000 HD-SDi MV switcher.
Qty. One (1) Vaddio 999-5520-022 touch screen controller.
Qty. One (1) Kramer VM-10XL video and audio distribution amplifier.
Qty. One (1) Dell 2824 Ethernet switch.
Qty. One (1) AJA FS2 format converter.
Qty. One (1) AJA HELO streaming/storage appliance
Provide category, digital coax and patch cables necessary for fully functioning system.

2. 4K Resolution TV upgrade

Provide and install
Qty. Two (2) LG 79UX340C 79” 4K resolution TV display for Board Room.
Qty. Five (5) LG 65UX340C 65” 4K resolution TV display for Board Room Lobby, Superintendent’s Office and the conference rooms.

3. Hard of Hearing System

Provide and install Qty. One (1) Listen LS-53-072 RF HOH package with four receivers and ear speakers

End of Section