

Addendum No. 2

SOUTH POINTE HS AUDITORIUM AV RENOVATION

ROCK HILL SCHOOLS
BID # 19-2042

ROCK HILL SCHOOLS, YORK DISTRICT THREE
ROCK HILL, SOUTH CAROLINA

MOSELEYARCHITECTS

ARCHITECTURAL

COLUMBIA, SOUTH CAROLINA



THORBURN ASSOCIATES

ACOUSTICAL, TECHNOLOGY, AND LIGHTING DESIGN

CONSULTANT

CHARLOTTE, NORTH CAROLINA

June 8, 2020

VOLUME 1 OF 1

APN #
591352

1 **GENERAL:**

2 Plan holders are requested to attach this Addendum to the inside front cover of each Project Manual.
3 Inform all concerned that the Bidding Documents are modified by this Addendum.

4 The following modifications and clarifications are hereby made a part of the Bidding Documents and
5 supersede or otherwise modify the provisions of the published *Project Manual* and *Drawings*, dated
6 April 29, 2020.

7 Refer to the Drawings and Specification Sections, if any, attached to this Addendum, which are
8 hereby made a part of this Addendum.
9

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11 **MODIFICATIONS TO THE PROJECT MANUAL**

12
13 SECTION 012300 – Alternates

14 DELETE 012300 and ADD 012300 attached to the end of the addendum
15

16 SECTION 274116 – Audiovisual Systems

17 DELETE 274116 and ADD 274116 attached to the end of the addendum
18

19 **GENERAL QUESTIONS AND SUBSTITUTION REQUEST:**

20
21 General Questions and Substitution Requests received.
22

23
24 **REFER TO SPECIFICATIONS ATTACHED TO THE END OF THIS ADDENDUM**

25
26 **END OF ADDENDUM NO. 2**

SOUTH POINTE HS AUDITORIUM AV RENOVATION; ROCK HILL, SC

Architect's Project No: 591352

Rock Hill Schools Bid No.: 19-2042

SECTION 012300 – ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1:
 - 1. Alternate: Add Wireless Lavalier Microphones To Base System (Qty 4).
- B. Alternate No. 2:
 - 1. Alternate: Add Video Distribution From Base System To Display Locations.
- C. Alternate No. 3:
 - 1. Alternate: Add Handheld Microphones To Base System (Qty 2).
- D. Alternate No. 4:
 - 1. Alternate: Add Control System Source Selection (Stage Or Control Room Desk)
- E. **Alternate No. 5A:**
 - 1. **Add Network Audio Distribution for Control and Future Expansion (AD02)**

SOUTH POINTE HS AUDITORIUM AV RENOVATION; ROCK HILL, SC

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F. Alternate No. 5B:

1. Expand Alternate 5A to provide Network Audio Interface off stage so events with wired microphones do not need control room access to mixing console for level control. (AD02)

END OF SECTION 012300

SECTION 27 4116 – AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.01 REQUIREMENTS

Contractor shall review all other documents for additional requirements and information that apply to the Work. If conflicts between this Section and/or the General Requirements and General Conditions occur, the more stringent shall apply. Contractor shall deliver the complete Audiovisual System, including any design-build requirements of this Section and the following Drawings:

TA-001	SHEET INDEX AND NOTES
TA-101	AV FLOOR PLAN -AREA "F"
TA-201	AV REFLECTED CEILING PLAN -AREA "F"
TA-202	AV REFLECTED CEILING PLAN -AREA "L"
TA-301	SECTIONS AND ELEVATIONS
TA-400	FUNCTIONAL LEGEND AND CABLING DETAILS
TA-401	AUDITORIUM VIDEO & CONTROL FUNCTIONALS
TA-402	AUDITORIUM AUDIO FUNCTIONALS
TA-501	RACK ELEVATIONS AND DETAILS
TA-601	INTERFACE PLATE DETAILS
TA-701	COORDINATION DETAILS
TA-801	CONTROL ROOM ENLARGED PLANS

1.02 PROJECT DESCRIPTION

- A. Auditorium Base Bid
1. Existing infrastructure is to be re-used, unless otherwise noted (UON).
 2. The following equipment as of July 2019 was in good working order and is to be re-used.
 - a. Fourteen (14) LF-HF SLS Loudspeakers in three different sizes from the US series. Two (2) large are flown above the stage flanking both sides of the projection screening, four (4) total. Four medium are flown mid-auditorium. Six (6) small are surface mounted under the balcony.
 - b. Draper projection screen (ceiling recessed, electric, 20' wide x 15' high)
 - c. Wall-mounted projection screen control
 - d. Floor standing equipment rack in control room
 - e. CD/Cassette player that is rack mounted in the control room
 - f. HDMI to fiber transmitter and receiver and the wall mounted equipment racks where they are housed.

- g. XLR patch panels wall-mounted by the stage and in the control room **and the cabling between these patch panel locations. (AD02)**
 - h. Ashly Audio 4-channel amplifier
3. The existing XGA-native resolution, lamp projector (4:3 aspect ratio, 12,000 lumen) is upgraded to a WUXGA-native resolution, laser projector (16:10 aspect ratio).
 4. The center stage floor box with three (3) single gang compartments requires replacing with a new 4-gang floor box. The stage floor box currently houses seven (7) XLR connectors and a single data port. There are three (3) XLRs in two (2) single gang compartments and an XLR and data port in one. All XLR connections are assumed to route back to the XLR patch panel in the control room. Two (2) gangs in the new floor box are for decora-plate HDMI twisted pair transmitter and receivers. One is an input for presenters and the other is an output for a display. The other two (2) gangs are to feature three (3) XLR connectors and a data port.
 5. Video sources are all to be HDMI. One (1) HDMI input in an AAP plate is added to the existing wall-mounted rack off stage left. One (1) HDMI input is to be added in the retrofitted new stage center floor box that will extend the signal over twisted pair to the off stage left wall rack. A third HDMI input is provided at the control room desk.
 6. Off stage left HDMI sources feed an HDMI auto switch that is mounted in the existing wall rack. The switch outputs to an existing fiber transmitter to a receiver housed in a wall-mounted rack in the control room. NOTE: power to support added equipment needs to be assessed on site.
 7. Control room HDMI sources feed another HDMI auto switch that is mounted in the existing wall rack. The switch outputs to a wall box mounted HDMI transmitter to the main control room rack mounted receiver. NOTE: power to support added equipment needs to be assessed on site.
 8. A video distribution amplifier distributes the source to the displays, see also Alternate 2, and to the DSP for program audio distribution.
 9. One (1) handheld wired microphones with on/off switches is provided for the retrofitted new stage center floor box.
 10. Six (6) choir microphones suspend from the ceiling suspension system are provided for coverage of the stage. The microphone cables are to route within reach to the XLR patch panel off stage left. Operation Manuals to be provided by AV contractor is to include instructions to have no more than three (3) microphones open at any one time to prevent potential feedback issues. Phantom power is to be provided by the mixing console in the control room.
 11. A wireless microphone system is to be provided including eight (8) wireless bodypack/lavalier (not headset) microphones. Four (4) are to be

supplied as hand-held/lavalier combination units. The receivers are to be rack mounted off stage left with XLR snake cable lengths to reach XLR patch panel. Equipment rack wall mounting is to comply with ADA protrusion requirements and is to be assessed onsite for access to power. Antenna placement is to be assessed onsite to optimize reception.

12. An ADA listening system (RF) is added to comply with code. The transmitter is to be rack mounted in the control room. Antenna placement is to be assessed onsite to optimize reception. A dipole antenna is included for remoting as needed. User worn receivers and ear phone/neck loop lanyards will be stored in the control room.
13. The Yamaha audio mixing console at the control room desk is upgraded to a 32-analog channel digital console featuring presets and the ability to record audio files to a compatible USB storage device (OFE) with a sector size of 512 bytes formatted in FATA32. It is recommended that a high-speed device, such as a hard disk drive (HDD) or solid-state drive (SSD) is provided by the owner for recording instead of a USB storage device. A compatible PC mixing console application is included to support a virtual audio mixing console at the stage.
14. An audio, video and control digital signal processor (DSP) is to be mounted in the control room rack. This will provide priority to fire alarm and announcement feeds (provided by Others) to override AV audio.
15. The audio amplifiers are to be rack mounted in the control room. One existing amplifier is to be reused. A failed amplifier is to be replaced by three new ones. A network amplifier compatible with the DSP serves the mid-auditorium loudspeakers wired with a high or low impedance and provides future growth capabilities. Two low impedance amplifiers are provided to serve the loudspeakers under the balcony.
16. AV control system simplifies systems operation for teachers, students and special event groups. Functions are to include system power on/off and presets, video and audio muting, projection screen control, and overall microphone and program audio levels. A desktop control panel is to be provided in the control room. A wall-mounted control panel is to be provided back of stage.
17. A network switch compatible with the DSP, network amplifier and able to power the control panels is rack mounted in the control room. Rack cable management is included.
18. A power sequencer/surge protector is rack mounted in the control room, a basic surge protector is mounted in the back-of-stage rack.

B. Alternate 1 – Add Wireless Microphones

1. Expand wireless microphone system to including twelve (12) total wireless bodypack/lavalier (not headset) microphones, an addition of Four (4).

2. Add wireless audio receiver for the four additional microphones.
 3. Add passive antenna splitter kit.
- C. Alternate 2 – Add Video Distribution for Displays
1. For a future x-large display on a mobile cart (OFE), add 330' HDMI twisted pair transmitter and decora HDMI receiver in stage center floor box.
 2. For confidence monitor in front of stage, add 330' HDMI twisted pair transmitter and HDMI receiver. Modify the existing auditorium power and data floor box to include RJ45 pass thru for twisted pair signal. Provide one (1) medium size confidence monitor with tabletop mount. This monitor and HDMI receiver will be stored in the control room and will be brought out for presenter events upon request.
- D. Alternate 3 – Add Handheld Microphones
1. Add two (2) handheld wired microphones with on/off switches.
- E. Alternate 4 – Add Control System Source Selection (Stage or Control Room Desk)
1. Add IO to RS232 Control device for HDMI switcher in control room.
 2. Add programming hours to add functionality to control panels.
- F. Alternate 5A – Add Network Audio Distribution for Control and Future Expansion (AD02)
1. Add Dante input card (Yamaha NY-64-D) to Yamaha TF5 mixing console and connect to QSC NX-1108P in Control Room equipment rack.
 2. Add a second network switch (QSC NS-1108P) and mount in the new wall mounted rack (R|1) off stage. Redirect the network cable for the off stage control panel to interconnect the network switches. Add a shorter network cable for connection to the local control panel.
 3. Add network cables to connect each Quad Wireless RX via Dante ports to the network switch in rack (R|1).
 4. Disconnect audio outputs of Quad Wireless RXs.
 5. Delete the XLR 12 channel snake cable for the Quad Wireless RXs and XLR patch panel off stage Left.
 7. Add wireless microphone level control to control system programming.
- G. Alternate 5B – Expand Alternate 5A to provide Network Audio Interface off stage so events with wired microphones do not need control room access to mixing console for level control. (AD02)
1. Add Network audio interface plate off stage by the existing XLR patch panel. Include surface mounted 2-gang wall box and 3/4" conduit to new wall rack R|1 per base bid.
 2. Add Mic/Line level control to control system programming.

1.03 SCOPE OF WORK

- A. The Contractor shall provide a turn-key audiovisual system installation including, but not limited to, all cabling, loudspeakers, projection & display equipment, mounting hardware and electrical components including the necessary equipment, interconnections, transducers, labor, and services required to meet the functional requirement outlined in the design documents.
- B. The Contractor will be held responsible to have examined the site and premises and satisfied them self as to existing conditions under which they will be obligated to operate in performing their part of the work, or that, which will in any manner affect the work under this contract. This includes test/verification that infrastructure and existing equipment is adequate to support the AV system upgrade. Notify the owner if any discrepancies exist prior to any rework.
- C. Permits: Obtain any necessary permits for the execution of this work in conformance with applicable union regulations, Local, State and Federal codes and regulations.
- D. All aesthetic issues are to be coordinated and approved by the Owner, Architect, and Design Consultant.
- E. Provide, size, and install all conduit and penetrations, wire raceways, back boxes, and cabling connecting system components, as required by the Audiovisual System.
- F. Verify all conduit and penetrations, wire raceways, back boxes, mounting hardware to building structure, and cabling connecting system components, as required by the Audiovisual System as part of the base building fit out. Notify Owner of any discrepancies that may exist between the Shell Contract Documents and existing conditions.
- G. Verify AC power requirements for each equipment location. Notify Owner of any discrepancies that may exist between Shell Contract Documents and existing conditions.
- H. Patch, repair, finish and paint any surfaces that are damaged or demolished for access during this work. Room finishes to be returned to initial condition.
- I. Coordinate the resolution of any audiovisual system issues including, but not limited to, architectural and structural items associated with the project.
- J. Coordinate with other trades to ensure that all required access and clearances to equipment and services are provided and maintained.

- K. Verify site conditions including dimensions and clearances. Coordinate and size the exact location of the equipment racks.
- L. Provide project Site Acceptance Testing (SAT) by equipment manufacturer for all devices that require programming. This applies to devices such as Audio DSPs, video switches and control processors that rely on a software application to program, adjust, route and process the audio, video or control system equipment. The AV contractor is to assist the manufacturer with project Site Acceptance Testing.
- M. Conduct preliminary testing and adjustment. Submit documentation required by this Specification. Participate in approval testing for acceptance by the Owner. Perform final adjustments as required to meet the Specifications.
- N. Deliver to the Owner bound "as-built" system documentation. Transfer all warranties and equipment guarantees to the Owner and provide a written description of system operation at the time of acceptance of the Work by the Architect/Owner.
- O. Provide system operation training as specified in Part 3 of this Section.

1.04 QUALITY ASSURANCE

- A. All materials must be newly manufactured current production models and conform to all applicable codes and the relevant standards listed below:
 - 1. American National Standards Institute (ANSI)
 - 2. Electronic Industries Alliance (EIA)
 - 3. Institute of Electrical and Electronic Engineers (IEEE)
- B. Experience: The Contractor shall specialize in the installation of audiovisual systems, have a minimum of five years of documented experience in the field of audiovisual system installation and be a manufacturer approved vendor for all of the components installed.
- C. Supervision: Contractor shall designate a Project Manager and Foreman to oversee the installation work for the duration of the Work, to ensure that the system is installed in accordance with the Specification and Drawings.
 - 1. Project Manager shall maintain adequate staff and be responsible for installing and testing the system on schedule.
 - 2. Project Manager and Foreman/Project Supervisor shall have at least five years of documented, recent and similar project experience.

- D. The Owner reserves the right to make use of the system prior to the completion of the Work. Temporary use of the equipment shall not constitute an acceptance of the system or any part. The Owner shall not pay additional cost to the Contractor and the commencement of the warranty period shall not begin for the system, or any device prior to the completion of the punch list and final acceptance of the system, by the Owner.
- E. Contractor shall promptly notify the Owner, in writing, of any site difficulties that may prevent proper coordination or timely completion of the Work. Failure to do so shall constitute acceptance of Work and indicate that the site is suitable in all ways for this Work, except for defects that may develop in the work of others after commencement of system installation.
- F. Insurance: Provide evidence of insurance for the full value of equipment and material located on-site. Insurance shall cover losses due to fire, theft and vandalism, until the final acceptance of the system, by the Owner. Maintain additional liability insurance to protect the supplier and/or Owner, Architect, Design Consultant against damage claims for personal injury, including death, which may arise during the performance of this work.
- G. The Lead Control System and Audio/Video Digital Processing Programmers in the office and in the field shall be certified as defined by the manufacturer of the equipment utilized.

1.05 REFERENCES

- A. All requirements of the latest published edition, unless otherwise noted, shall apply.
- B. National Electric Code (N.E.C.).
- C. National Electric Safety Code (N.E.S.C.).
- D. Davis, Don, Sound System Engineering, Second Edition, Howard W. Sams and Co., Indianapolis, Indiana, 1997.
- E. American National Standards Institute (A.N.S.I.).
- F. Electronics Industries Alliance (E.I.A.).
- G. Audio - Design and Installation, Giddings, Howard W. Sams, 1990.
- H. Society of Motion Picture and Television Engineers (S.M.P.T.E.).

- I. American Society for Testing Materials (A.S.T.M.).
- J. Dashboard for Controls (AVIXA).
- K. Advanced Dante Configuration, Audinate 2015
- L. AVB Systems (IEEE 802.1BA)
- M. Audio Coverage Uniformity (AVIXA A102.01)
- N. Projected Image System Contrast Ratio (AVIXA 2M)
- O. Cable Labeling for Audiovisual Systems (AVIXA F501.01)

1.06 SUBMITTALS

- A. Contractor shall comply with the General Requirements and General Conditions of this Specification.
- B. Bid Submittals: Contractor shall submit the following qualification documents with the bid proposal:
 - 1. Firm description of the Contractor, and a copy of the Contractor's license, as well as a statement regarding the relationship of the License Holder to the Contractor.
 - 2. Provide a minimum of ten related projects, four of which must have been completed within the last 12 months.
 - 3. Résumé of Project Manager and onsite Foreman/Project Supervisor documenting related experience. Foreman/Project Supervisor must have completed at least two similar installations in the past 12 months. Indicate any certifications held by the Project Manager and onsite Foreman/Project Supervisor such as PMP/CTS-I or other.
 - 4. Project Manager and Foreman/Project Supervisor cannot be changed without approval of Owner.
 - 5. Submit a list of major equipment components, along with any deviations, to the system design and Specification. Indicate which products will not be purchased directly from the manufacturer.
 - 6. Submit a list including names, firm description, job foreman, copy of license and scope of work, for any subcontractors whose work would be part of this Contract.
 - 7. Submit a list of names for the lead installers who will be working on this project and indicate for each, if they are NSCA NICET/EST or ICIA CTS-Install, certified or registered.

C. Construction Submittals

1. Provide shop drawings and record drawings using the following scales:
 - a. Plans - not less than $1/8" = 1'-0"$
 - b. Details - not less than $1/4" = 1'-0"$
2. Before ordering equipment, submit catalog data sheets, neatly bound with title page, space for submittal stamps and tabbed dividers between sections. List all proposed equipment with reference to corresponding specification paragraph numbers or equipment title. Denote all approved substitutions. Data sheets may also be delivered in a single flattened PDF format file if physical delivery is not practical.
3. Submit point-to-point wiring diagrams and typed wire lists identifying every connection. Include electronic devices such as switches, transformers and terminal blocks. Indicate location of all components. Identify cables by types, colors and wire numbers. Diagrams must be original documents, coordinated with other trades. Replication of any bid documents is not acceptable.
4. Submit system plans showing all device locations.
5. Submit reflected ceiling plans showing distributed loudspeaker layouts with wattage tap settings, projection systems, cameras and other ceiling mounted devices.
6. Submit conduit riser diagrams showing connection of all devices along with types and quantities of cables to be used and cable identification tags.
7. Submit rack layouts indicating the proposed arrangement of mounted equipment including junction boxes and locations of conduit penetrations.
8. Submit fully dimensioned construction details of all panels, plates and other custom fabricated items or modifications (e.g. installation of audio/visual equipment in lecterns). Include complete parts lists and, as required, schematic diagrams.
9. Submit fully dimensioned construction details of all coordination items, such as panel or plate installation in casework or millwork as needed to complete the Work.
10. Submit a schedule of finishes indicating proposed materials and color selections for all exposed items subject to Architect's approval.
11. Submit samples of engraved labels, cable-marking system, faceplate etching/finishes and loudspeaker grilles.
12. Submit mounting and support details for distributed ceiling loudspeakers, video projectors and all other items mounted overhead, complete with parts lists and dimensions. Include a full plan view, front elevation and side elevation of each item, with corresponding support structure and mounting hardware. Verify load ratings of all hanging components

including attachment hardware. A structural engineer registered in the State shall stamp details.

13. Submit a list showing coordination of selected frequencies for all wireless transmitters.
 14. Submit an Excel list showing all equipment requiring data connections. At a minimum identify the following fields, Location, Description, MAC address, Jack number, IP Address, Subnet Mask, Gateway, DNS. Submit list with first three items completed for submittal review, include jack number as well if available. Include items on client LAN as well as AV LAN. Once approved, provide client LAN list to owner's networking group to obtain IP information. Maintain list throughout project and provide final list with as-built documents.
 15. Before final control system program installation, submit interactive demonstrations of all control system touch panel pages as well as an electronic copy of the pages as required by Part 3 of this Section.
 16. Submit a key schedule indicating key assignments and groupings for all equipment racks, drawers, and lecterns subject to Owner's approval.
- D. Acceptance Test Submittals: Prior to requesting the completion of the acceptance tests, submit Preliminary Test Report Information required in Part 3 of this Section.

1.07 PROJECT CLOSE OUT

A. General

1. Furnish one initial set of Project Close Out Documents including but not limited to manuals, record drawings along with the results of all source quality control tests, and field quality control tests specified in Part 3 of this Section, to the Design Consultant, for use during acceptance testing.
2. If 'as installed' documents are rejected, correct and resubmit in the manner specified.
3. One set of B size drawings showing the components and wiring in each individual rack shall be mounted in a plastic jacket to the rear door of the associated rack.
4. After approval of 'as installed' documents, submit sets of record drawings as follows:
 - a. One set of full-size prints
 - b. One set of reduced B size prints
 - c. One set of manuals
 - d. Four electronic submittals on CD-ROM/DVD disk(s).
5. At the time of contract closeout, submit sets of the system Operation Manual and the Maintenance Data Manual as follows:

- a. One set hardcopy for owner.
 - b. Four sets electronic on CD-ROM/DVD disk(s).
- B. Manuals
1. Neatly bind each manual with tabbed dividers between sections, include a title pages between sections, binder title covers and spines.
 2. Manuals shall be presented in 3 ring – D style binders.
 3. The Manuals shall be broken down into the following minimum sections:
 4. Operations Manual
 - a. Table of Contents
 - b. Typed description of each system including key features and operational concepts (e.g. remote control features, switching or routing functions, patch points, mixing and linking capabilities).
 - c. Setup diagrams and typed instructions for use in typical situations as directed by the Design Consultant.
 - d. Single-line block diagrams showing all major system components.
 - e. One set of B size drawings showing the components and wiring in each individual rack.
 - f. Manufacturer's operation manuals for equipment intended for operation by system users (e.g. source equipment, communication equipment, etc).
 - g. Manual must be an original document created by the Contractor. Replication of any bid documents is not acceptable.
 5. Maintenance Data Manual
 - a. Table of Contents
 - b. Company name, address, telephone number and contact name for system service or maintenance.
 - c. Listing of all equipment and materials with names of manufacturers and model numbers or part numbers.
 - d. Catalog data sheets displaying manufacturer's names, addresses and telephone numbers.
 - e. Product manufacturer's warranties and a typed, one-year system warranty, explicitly covering all materials and labor.
 - f. Manufacturer's service manuals for all major equipment items.
 - g. Test documentation showing results of source quality control tests, field quality control tests, acceptance testing and equalization.
 - h. Document final settings for all non-user devices and controls after completion of acceptance testing and equalization, including raw and equalized house curves.
 - i. Document the physical position of settings as well as input and output signal levels as required by Part 3 of this Section.

- j. Provide a recommended preventative maintenance schedule for reference to the applicable pages in the manufacturer's maintenance manuals. Where the manufacturer provides inadequate information, develop and provide the information necessary for proper maintenance.
- C. Software
- 1. A properly licensed working copy of any and all software required to operate or configure the systems specified herein, shall be a part of the system supplied, including all software, firmware and hardware required for configuration, adjustment, diagnosis and repair.
 - 2. All software shall be fully documented, and that documentation included.
 - 3. Software shall be included in its 'installable' state on industry standard, CD-ROM/DVD, or other appropriate format from the manufacturer. Where possible a single master CD-ROM/DVD should be provided. If files are too large, break segments into logical sections, CD-ROM/DVD disk images are unacceptable.
 - 4. Where any elements of the software are based on user modifiable source code, both the source code and the compiler shall be provided and documented as stated herein.
 - a. The source code is to be licensed to the Owner for this project; the contractor maintains the copyright of the source code.
 - b. The Owner has the right to modify the source code.
 - c. If the source code is modified the Owner takes full responsibility for the effects caused by the modification to the source code.
- D. Electronic Submittal: In addition to the above listed hard copy submittals, submit all files necessary to produce the above submittals as follows:
- 1. Submit the following on CD-ROM/DVD media.
 - a. Files use long windows names file structure.
 - b. A Disk Master File List in text format shall be placed on the CD-ROM/DVD with a short description of files on that disk.
 - 2. Drawings shall be in AutoCAD r2000 or later drawing (.DWG) format. Drawing Exchange File Format (.DXF) shall not be acceptable. All XREFs, fonts, and other drawing parts necessary to the drawings shall be included.
 - 3. Documents and spreadsheets shall be in Microsoft Office .docx/.xlsx format.
 - 4. All files to be converted to searchable acrobat *.PDF files in addition to the native drawing, documents and spreadsheets formats.
 - 5. Manufacturers' service manuals provided by the Manufacturer to the Contractor or documents that are similarly, not otherwise available to the Contractor in electronic format shall be excluded from this requirement.

6. Provide all control system source files and compilers on the same CD-ROM/DVD media. This should include, but is not limited to, touch panel files, IR code files, DSP configuration files, web-based touch panel pages, or any other files or applications necessary to completely reinstall and configure all system components back to their operable state.
- E. Keys: Submit five sets of all keys required for access to and operation of the systems.

1.08 GUARANTEES AND WARRANTIES

- A. Transfer all manufacturer and subcontractor's warranties to the Owner at the completion of all Work.
- B. Guarantee all installation work to be free of faulty system-wide workmanship. Guarantee all new components purchased under this Contract and workmanship to be free from defects for a period of 12 months from the final date of acceptance, by the Owner, including solid-state devices.
- C. Guarantee a response window of 2 hours for call-back phone support upon notification from the owner of a system operational issue during the warranty period.
- D. Guarantee the on-site replacement of faulty materials and workmanship within 24 hours of notification at no cost to the Owner if failure occurs during warranty period. Provide loaner equipment as required to keep the system operational if the system cannot be repaired within 24 hours of notification.
- E. Register warranty in the Owner's name for any product with a manufacturer's warranty of more than one year.

1.09 OWNER FURNISHED EQUIPMENT

- A. Certain equipment may be identified as Owner Furnished Equipment (OFE). This OFE may presently be part of the Owner's systems or will be provided by the Owner and will be delivered to the Contractor's off-site construction facility, delivered to the Contractor's on-site secured storage area or installed on site by others, as appropriate, for incorporation into the system.
- B. Clean and inspect the OFE, and notify the Owner in writing of damage or defect and the extent of repair and/or adjustment required to bring the OFE to original specification. Service OFE only as directed by the Owner under the arrangements of a separate contract.

- C. Incorporate into the system as if provided new, excepting warranty coverage.

1.10 MAINTENANCE

With the bid, submit an annually renewable service and maintenance proposal for a total of two additional years meeting the same conditions for service and repair as required for the initial one-year warranty. If accepted, the service and maintenance proposal shall commence upon conclusion of the one-year system warranty.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Components are to operate on standard US voltage outlets. Rack mounted equipment is to be mounted in a standard EIA 19-inch wide rack. The components listed in the equipment schedule are the basis of the audiovisual system design and represent the minimum standards for each of the components. All of the properties of each component or system should be considered listed in full.
- B. Equipment, excepting the Owner Furnished Equipment (OFE), and materials shall be new. The latest version at time of delivery and shall conform to applicable UL, CSA, or ANSI provisions. Take care during installation to prevent scratches, dents, chips, etc.; equipment with significant or disfiguring cosmetic flaws will be rejected.

2.02 CABLE

- A. General
 1. Conductor jackets shall be color-coded to enable consistent polarity.
 2. Use plenum rated cable where required by code.
 3. Cables noted are referenced for minimum level of quality.
 4. Use outdoor or wet rated cables where required. Size may vary depending on distance requirements.
 5. Acceptable Manufacturers: West Penn, Canare, Belden, Extron, Covid, Gepco, and Liberty.
- B. Audio Cables
 1. Microphone: Shielded, stranded 20 AWG, twisted-pair cable (West Penn 292)
 2. Line Level Cable: Shielded, stranded 20 AWG, twisted-pair cable (West

- Penn 292)
 3. Program Loudspeaker Cable: Stranded, twisted-pair 12 AWG cable (West Penn 227)
 4. Distributed Loudspeaker Cable: Stranded, twisted-pair 16 AWG cable (West Penn 225)
 5. UHF Wireless Antenna Cable: 50 ohm, (RG-58) coaxial cable (RG-58) (Belden 8259)
 6. Digital Audio Transport Cable: 4 pair Category 6 Solid Twisted Pair cable, 24 AWG. (West Penn 4246)
- C. Video Cables
1. MATV Drop Cable: 75 ohm RG 6U co-axial cable (West Penn 256350)
 2. MATV Trunk Cable: 75 ohm RG 11U co-axial cable (West Penn 25811)
 3. High Resolution Cable DVI (Single-link): 100-ohm multiple conductor cable in one jacket (Extron DVID SL Pro Series)
 4. High Resolution Cable DVI (Dual-link): 100-ohm multiple conductor cable in one jacket (Extron DVID DL Pro Series)
 5. High Resolution Cable HDMI: 100-ohm multiple conductor cable in one jacket, 18Gbps data rate (Extron HDMI Pro/Ultra Series)
 6. Digital Media Transport Cable: 4 pair Category 6A (S)F/UTP cable, 24 AWG, 500MHz bandwidth. (Belden 10Gx series/Extron XTP DTP-24)
 7. HDMI Bulk Cable: 100-ohm multiple conductor cable in one jacket, 28 AWG. (Covid LUX-HD-28RD)
 8. HD/3G/6G-SDI Cable: Low loss serial digital co-axial cable RG-6/RG-11 (Belden 1695A/7732A)
- D. Data / Control Cables
1. Control System Cable: 2 pair (18 AWG pair and 22 AWG pair) (Liberty AXLINK)
 2. Data cable: 4 pair Category 6A Solid Twisted Pair cable, 24 AWG. (West Penn 4246A)
 3. RS-485 cable: 7-conductor, 22 AWG cable. (Belden 9430)
 4. RS-232 cable: 7-conductor, 22 AWG cable. (Belden 9430)
 5. 5 pair, Stranded Twisted Pair Shielded, 24 AWG cable. (Belden 9807)
 6. 9 pair, Stranded Twisted Pair Shielded, 24 AWG cable. (Belden 9809)
 7. 12 pair, Stranded Twisted Pair Shielded, 24 AWG cable. (Belden 9812)
 8. USB Revision 2.0 Compliant Bulk Cable: Two 24 AWG power conductors plus one 28 AWG twisted pair for data lines (L-com CBL-USB2-2824)
- E. Multimode Optical Fiber Cable
1. All multimode optical fiber cable must be OM4 rated and strands must have an outside cladding diameter of 125 micrometers and an inside core diameter of 50 micrometers with a dual operational wavelength of 850

- nanometers and 1300 nanometers.
2. All multimode optical fiber cables shall be OM4 OFNP-rated, and all cable jackets shall have the OM4 standard aqua coloring, that is constructed with a dielectric armor for protection, unless otherwise noted.
 3. Multimode Optical Fiber Cable Manufacturer and System Description:
 - a. Corning MIC Armored Cable System
 - b. CommScope Cable System
 - c. BerkTek Cable System
- F. Single-mode Optical Fiber Cable
1. All single-mode optical fiber cable must have industry standard outside cladding diameter of 125 micrometers and an inside core diameter between 8 and 9 micrometers with a dual operational wavelength of 1310 nanometers and 1550 nanometers.
 2. All single-mode optical fiber cable shall be OS2 OFNP-rated, have the industry standard yellow jacket, and be constructed with a dielectric armor for protection, unless otherwise noted.
 3. Single-mode Optical Cable Manufacturer and System Description:
 - a. Corning MIC Armored Cable System
 - b. CommScope Cable System
 - c. BerkTek Cable System
- G. Category-6 Copper Patch Cords
1. All patch cords are to be shipped pre-assembled, verified and tested from the factory in sealed packages.
 2. All copper patch cords shall have stranded conductors that match the TIA/EIA-568-B performance characteristics of the solid conductor category-6 cable specified.
- H. Multi-mode Optical Fiber Patch Cords
1. All multi-mode optical fiber patch cords must be LC type cords or combinations as required.
 2. All fiber patch cords shall match the performance characteristics of the premise fiber cable specified.

2.03 HARDWARE

- A. Jacks, Connectors, and Adapters
1. Provide panel mounted isolated ground jacks.
 2. Contacts are to be silver-plated, chromate dipped, phosphor bronze, or brass.
 3. Install connector and jacks per manufacturer's directions.
 4. Panel mounted jacks are to be recessed.

5. Acceptable Manufacturers: Canare, Switchcraft, Neutrik, Amphenol, Pomona, Extron, Covid, L-com, or Liberty.
 6. HDMI Type-A connector: 28 AWG DIY connector/clamshell for round cable (Covid LUX-DIY-28DS10).
 7. USB Type-A connector with hood: gold-plated solder contacts, nickel-plated steel shell, and UL94V-0 rated housing (L-com USBCN2.0-A, USBHD2.0-A).
 8. USB Type-B connector with hood: gold-plated solder contacts, nickel-plated steel shell, and UL94V-0 rated housing (L-com USBCN2.0-B, USBHD2.0-B, USB-C).
 9. Category 6a Shielded Keystone Style Jacks and plugs
- B. Audiovisual System Face Plates: Provide metallic cover plates at all control, switching and jack locations. Etch and ink all system faceplates to indicate function, input/output number, etc. Minimum engraved letter height 1/8 inch. Coordinate finish with the Owner. Center lettering vertically over or horizontally to the right of the appropriate connector. Connector mounting shall allow sufficient finger clearance for connector insertion and removal without interference from adjacent connectors.
- C. Electronic Component Face Plate Labels: Provide permanent labels as specified and shown on detail drawings. Engraved plastic labels fastened with epoxy are acceptable. Dymo type labels are not acceptable.
- D. Provide a neatly labeled floor plan with as-built locations of all audiovisual jacks. Locate floor plan in front cover of the equipment rack behind a clear Plexiglass cover. Minimum size of chart: 8-1/2 inches x 11 inches.
- E. Provide system functional description and operating procedures for each system configuration. Place behind clear Plexiglass near each of the equipment racks. Include basic operating procedures and troubleshooting steps.
- F. Provide a 1-rack unit panel with Consultant's name and web address and Contractor's name, address and phone number in the main equipment rack of each system. Panel shall state: Designed by "Consultant" Installed by "Contractor".

2.04 RACK SYSTEMS

- A. All audiovisual racks on the project are to be welded and from one manufacturer.
- B. Racks are to be rated for the Uniform Building Code Seismic zone 4.

- C. Racks and rack accessories are to be black in color.
- D. Rackplates: All custom rack plates are to be fabricated from 16 Gauge Aluminum with flange returns. All rack blanks and vents are to have flanges.
- E. Racks are to have moveable rear rack rails. All rack rails are to be tapped for 10-32 machine screws.
- F. Racks are to have a modular top option with different knockouts and openings as required by the design documents.
- G. Front and rear vented locking doors are required for all racks not directly secured by casework or other architectural door system.
- H. Rack slides shall be provided for all equipment requiring access to side or top panels for routine adjustment or cleaning.
- I. Provide security covers on non-user operated equipment having front panel controls.
- J. Install all rack mounted equipment with black oxide finish 10-32 oval head machine screws with black plastic cup washers protecting equipment panel.

2.05 RACK POWER

- A. Provide switched and constant power strips as specified, divided among the following categories.
 - 1. Provide constant power outlets for all equipment that requires it. This includes CATV tuners, digital audio/video processors, streaming transmitters, network switches, and other devices that require a boot process prior to use.
 - a. Rack systems will each be provided with vertical power strips for constant power distribution. Strips containing signal processing equipment will be run to rack UPS systems specified rather than building power.
 - 2. The remaining outlets are to provide switched power operated by the control system.
 - a. Multiple amplifiers on the same circuit shall power up with a minimum of a 2 second delay between each.
 - b. The system is to be free of measurable power transient noise when powering on or off.

3. Equipment with redundant power supplies will have independent building power circuits for each supply.

PART 3 - EXECUTION

3.01 GENERAL

The following is required for acceptance of the audiovisual system by the Owner:

- A. Install complete and functioning audiovisual system.
- B. Label equipment and cables corresponding to functional diagram.
- C. Conduct adjustments and preliminary testing.
- D. Report results of Site Acceptance Testing (SAT) and preliminary testing along with system documentation.
- E. Participate in acceptance test and deliver final system and documentation.
- F. Conduct any adjustments or re-testing required to meet the performance specifications.
- G. Provide training to an individual(s) designated by the Owner/Architect/Consultant.

3.02 AUDIOVISUAL OPERATIONAL REQUIREMENTS

Care shall be taken to eliminate electro-magnetic radio frequency and electro-static interference; the system shall be free of audible hum, rattles, buzzing sounds, distortion and visible hum bars or distortion.

3.03 CABLE WIRING STANDARDS

- A. General
 1. Provide proper cable management and support
 - a. Install cables in an organized manner.
 - b. Dress cables neatly.
 - c. Route cables parallel to the product in which they are landed. This should result in cables that are routed plumb and level and change directions in 90° increments.

- d. Secure cables to wire management products using reusable hook and loop type fasteners. Secure fasteners to the wire management product then wrap fastener around the cable bundle. Provide sufficient length of fastener wrap to extend around the final cable bundle side with at least 75 percent of the bundle circumference overlapped.
 - e. Do not use nylon cable ties or other fasteners that pinch and stress cables. Do not use ties that require tools to remove.
 - f. Do not bend cables to a radius that is less than 8-times the cable diameter, nor less than the cable manufacturer's recommended minimum bend radius.
- B. Equipment Racks
- 1. Provide vertical and horizontal wire management products to secure and manage cables.
 - 2. Provide horizontal wire support bars. Secure bars in such locations as to achieve a professional balance between cable support, equipment accessibility, service, and appearance.
 - 3. Install service loops. The length of service loops for each device shall be:
 - a. Long enough that the cable may be relocated to a variety of other compatible ports on the product.
 - b. Long enough to be moved aside without becoming unplugged, being damaged, or stressed while attempting to access another nearby connection.
 - c. Long enough that no stress is applied to the cable itself, a conductor, another cable, or connectors on the equipment.
 - d. Short enough not to hinder serviceability of an adjacent device.
 - 4. Provide security covers on non-user operated equipment having front panel controls. Install security covers at the conclusion of Acceptance Testing. Rack slides shall be provided for all equipment requiring access to side or top panels for routine adjustment or cleaning.
 - 5. Provide rack slides and mounts equal to those of the original manufacturer for the OFE requiring rack mounting. Where no same manufacturer mount is available, Contractor shall supply custom mounts as manufactured by Middle Atlantic Products Inc.

3.04 AUDIO DSP (Digital Signal Processing) PROGRAMMING

- A. The Contractor will ensure that:
- 1. Each DSP block has a description of its function.
 - 2. Each DSP block has fully labeled endpoint nodes
 - 3. Each DSP block with control dialogs has each channel labeled in a clear and concise manner to allow for simple signal identification.

- B. The values in the audio DSP box shall be set to allow the performance requirements outlined in this document to be met.
- C. Microphone mute shall be at DSP, not at microphone. If wireless microphones are muted at the transmitter the control system will mute the appropriate channel in the DSP. Un-muting the transmitter will un-mute the associated channel as well.
- E. Active signal from Fire Alarm (By Others) mutes the audio system.
- D. Proper gain structure practices shall be used. Signals will be brought to optimum levels upon entry to the DSP, and care will be taken to minimize level changes within the DSP signal path.

3.05 CONTROL SYSTEM PROGRAMMING

- A. Contractor shall provide all touch screen and control system programming to make fully functional and working systems. System functional requirements shall be as described in these documents.
- B. The contractor shall closely collaborate with the owner and designer through a multi-phased interactive process lead by the contractor.
 - 1. Phase I – Needs Analysis
 - a. This phase shall be used to refine the general expectations of the system(s) functionality from a high level perspective.
 - b. One or more meetings shall be expected.
 - c. Contractor will provide the Owner with 3 screen layout samples for aesthetics. Owner shall determine which layout will be used.
 - 2. Phase II – User Interface (UI) Development
 - a. Contractor will create user interfaces for each system based upon the needs analysis.
 - b. User interfaces shall be similar to any existing campus standards to allow for ease of use.
 - c. All user interface designs shall follow interface design fundamentals. Lighting, color, and contrast shall be used consistently and effectively. All interface elements shall be easily viewable and controls easily selectable. All panels on the project shall have the same template and functional flow unless otherwise stated by the Designer and Owner.
 - d. Contractor will create a software emulation of the interface design that mirrors the final operational and navigational flow, behavior, and general responsiveness.

- i. Emulation shall include full system navigation, button feedback, device and system status emulation, working page flips, popups, and messaging.
 - e. This phase is complete when the contractor has conducted working hands-on user interface demonstrations with the owner and designer and received acceptance from both.
 3. Phase III – Programming
 - a. Contractor will write system code based on feedback from the GUI demonstration and system specifications/requirements.
 4. Phase IV – Final Check Out
 - a. Changes will also be made during system check out. Budget for one 8-hour days of touch screen and system-programming changes during the system check out.
- C. General Requirements
 1. All devices able to be controlled over LAN will be. This is a majority of AV equipment. Any equipment without a network port is excepted.
 - a. Any further exceptions must be approved by the Designer.
 2. Each touchpanel will have a start page with a client supplied PNG format logo
 3. True feedback will be used for system status at all possible points. Emulated feedback is not acceptable for:
 - a. Display/projector status
 - b. Volume levels
 - c. Source routing
 - d. Microphone mute status/privacy
 4. All panels will have a prominent 'Help' button on each main page which will alert support staff of an issue, as well as a 'Cancel' button which will clear the help request in cases of an accidental button press. This button will be available to users at any point within the UI and not require multiple button presses to navigate to.
 5. Buttons shall be icon driven with smaller text for identification similar to mobile devices (iOS/Android/Windows 10).
 6. Warm up and cool down timing for projectors and displays will be determined by timing startup and shutdown of the specified equipment, then setting appropriate times to reliably allow warm up and cool down to complete undisturbed by additional system commands.
 7. Common user commands shall be accessible with no more than two button presses. Common commands would include source selection, display/projector power, volume, transport controls, or similar.

8. Care shall be taken to minimize page flips on the UI. Subpages and pop-ups shall be utilized where possible to prevent users from stepping through multiple pages in order to execute commands.

3.06 PERFORMANCE SPECIFICATIONS

- A. The sound pressure level spectrum from the program speaker system, in each 1/3 octave band shall be ± 3 dB (side to side) from 100 Hz to 12 kHz with 3 dB per octave roll off above 12 kHz and below 100 Hz. Total acoustical harmonic distortion shall not exceed 2% at sound levels of 90 dBC (1 kHz reference tone) at four (4) feet above finish floor in the middle of the room.
- B. The sound pressure level spectrum from the distributed speaker system, in each 1/3 octave band shall be ± 3 dB from 125 Hz to 10 kHz with 6 dB per octave roll off above 10 kHz and below 125 Hz. Total acoustical harmonic distortion shall not exceed 2% at sound levels of 85 dBC (1 kHz reference tone) at four feet above finish floor in the middle of the room.
- C. The gain structure for all audio system components (mixer input to amplifier output) shall be adjusted to achieve the highest signal-to-noise ratio, 75 dB from 50 Hz to 15 kHz minimum.
- D. The audio frequency response of the electronics system with equalizers bypassed shall vary less than ± 1 dB from 50 Hz to 12 kHz.
- E. The electronic system audio distortion shall be less than 0.5% at 1 kHz at the equipment's rated input signal level.
- H. High Resolution Digital Video
 1. System infrastructure must support data rates up to 23 Gbps and pixel clock up to 594Mhz.
 2. System infrastructure must support resolutions up to 4KDCI and 4KUHD @ 60 Hz 4:4:4 chroma sampling and 10-bit color depth (HDR capable)
 3. Extended Display Identification Data (EDID) shall be supported.
 4. System shall be High-bandwidth Digital Content Protection version 2.0 (HDCP) compliant.
 5. System shall manage HDCP encryption and keys between input and output devices for fast switching and distribution of a single source signal to one or more displays.
- I. Image size and clarity: Mount the video projector as indicated on the drawings and project the image onto the projection screen. Projected images shall be of maximum width and maximum height, centered on screen. Image tests shall

utilize standard AMI test slides and similar video media to establish any image sizes on the screen.

- J. Geometric Distortion: Shall be corrected using physical and/or optical adjustment only. Electronic or digital correction should be used only when called for by the design intent.
- K. Adjacent displays and projected images will be calibrated to match in color saturation and brightness/contrast.
- L. Control functions: Demonstrate that each of the controlled devices may be controlled either at the individual device or through the use of the remote control system and that all individual devices and combinations of devices may be utilized in the logical and common formats and that all systems are in proper working order.

3.07 CONTRACTOR'S TESTING AND ADJUSTMENTS

- A. Furnish all equipment and personnel including manufacturer's representatives to perform manufacturer's Site Acceptance Test (SAT) and to conduct these tests in accordance with the performance specification requirements.
- B. All timing and gain measurements shall be made while the operator controls of the device under test are set in the center-of-travel, in bypass, nulled out or at the manufacturer's detent position. Any adjustments should be made by modification of cable length or internal adjustments.
- C. Audio Testing
 1. Before connecting high impedance loudspeaker lines to the power amplifiers, measure and record the impedance curves of all loudspeaker circuits, using a sweep test or impedance bridge for at least six frequencies from 125 Hz through 8,000 Hz.
 2. Before connecting low impedance loudspeaker lines to the power amplifiers, measure and record the impedance of all loudspeaker circuits, Report the DC resistance reading.
 3. Test all low-level audio cables and connections for continuity and ground faults and correct polarity.
 4. Apply a sine-wave sweep signal to each loudspeaker system, sweeping from 50 Hz to 5,000 Hz at a sound pressure level, which is 10 dB below the loudspeakers rated electrical input power. Listen for rattles or objectionable noise and correct if apparent.

5. Check for proper polarity of loudspeakers by applying music program or pink noise to each system and walking through the transition areas of coverage from one loudspeaker to the next. Transition should be smooth with no apparent shifting of source, back and forth from one loudspeaker to the next.
 6. Coverage Uniformity: Scan and map the areas (Front: Left, Center, Right; Center: Left, Center, Right; Back: Left, Center, Right and Balcony: Left, Center, Right) served by the system and record sound pressure level in 1/3-octave bands. Perform any necessary adjustments to loudspeaker orientations as required to achieve the specified uniformity.
 7. Adjust all system gain controls, both physical and virtual in software, for optimum signal-to-noise ratio. After all adjustments required to meet the performance Specification requirements are made, measure and report the resulting system electrical signal-to-noise ratio at the amplifier outputs from 20-20 kHz in 1/3 octave bands referenced to the voltage required to achieve 85 dBC in the center of the room (1 kHz reference tone) at 4-feet above finish floor.
 8. Measure the sound pressure level using a calibrated type 1 precision sound level meter as defined by ANSI S1.4. Measure using the slow time Constant. Report the "raw house curve" with the equalizer controls set to "0" or "Bypass". Adjust all gain controls and equalizers to provide the 1/3-octave band sound levels specified.
- D. Video Testing
1. Verify and document performance of all video cables and connections by injecting full SMPTE color bars and a multiburst signal. Monitor performance on a calibrated waveform monitor. Confirm that all signal paths maintain a full 140 IRE signal and that frequency response is flat across a 6 Mhz band-range. Continuity tests will not be acceptable.
 2. Check all paths and outlets for appropriate compliance with the Performance Standards. Measure levels at all termination points. Compare actual values to design calculations and investigate any difference. Rectify or justify these discrepancies to the satisfaction of the Owner. In all cases, the more stringent of any referenced standard shall apply.
 - a. Video timing and phasing shall be achieved using the fewest delay lines, delay distribution amplifiers and other delay devices possible. At all times, match cable lengths between like paths to minimize timing errors. To the maximum extent possible, utilize precisely cut cables to achieve correct timing and phasing.
 - b. Verify performance of all video connecting cables, as specified herein. Continuity tests are not acceptable. Passive paths shall

- be tested by sweep or multiburst signals. Replace any defective cable without claim prior to continuing tests.
- c. System Timing: All video signals shall be in time as specified above, without readjustment of source phasing, delay lines, delay distribution amplifiers, or equalizers for the downstream equipment.
 3. Although some delay units (active or passive) may be shown on the video functional block drawing to achieve the required video timing, the Contractor shall be responsible for providing all such units that may be required to meet these performance specifications. In all cases, minimize the number of delay lines. Keep cable lengths equal to achieve timing.
 4. All signal paths from primary-source (video) equipment to the final distribution amplifier shall demonstrate unity gain of 1-volt peak to peak (140 IRE +2 IRE). This measurement shall be made with the SGE blanking processor and the final processing amplifier both set to bypass.
- E. Manufacturer's Site Acceptance Testing (SAT)
1. Testing of every channel of each I/O module with calibrated equipment.
 2. Verification of electrical characteristics, depending on the I/O module type and specifications (voltage/current levels, signal-to-noise ratio, etc.)

3.08 DATA CABLE TESTING

- A. The Contractor shall be responsible for all testing and performance parameters required by this section and all applicable TIA/EIA-568-C series standards.
- B. Furnish all equipment and personnel to conduct these tests in accordance with the performance section requirements.
- C. Prepare Test Reports Manual as described in this section documenting the results of these tests and readings.
- D. Test results must be submitted to the Owner as part of the project documentation prior to acceptance as required by this section.
- E. Testing of copper wiring shall be performed prior to system cutover (100 percent of the horizontal and riser wiring pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage).
- F. Any pairs not meeting the requirements of the standards shall be brought into compliance by the Contractor, at no charge to the Owner.

- G. Category-6A data cable test procedures must comply with and meet the following standards:
1. TIA/EIA-568-C
 2. NEMA Low Loss extended frequency requirements
 3. Any additional Owner standards attached to general conditions
- H. Complete four pair testing must be performed with full sweep frequency measurements from 1 MHz to 500 MHz, and the Power Sum Far End Cross-Talk test. This test will establish each channel's installed performance measurement. This is not a certification or compliance test, rather a measure of available headroom. Any copper cable failing to meet the above-indicated standards must be removed and replaced, at no cost to the Owner, with copper cable that proves in testing to meet the standards.
- I. Test all Category-6A cables with a third party approved tester noted above. The testing device must be provided by the Contractor and approved by the Owner's representative prior to use. It is the responsibility of the Contractor to get written authorization from the Owner's representative to commence testing with said device.
- J. All cables are to be tested for:
1. Continuity
 2. Polarity
 3. Insertion Loss
 4. Length
- K. Test procedure - Category-6A cables
1. All CAT-6A cables shall comply, must be tested, and meet the following TIA/EIA-568-C standards:
 - a. Insertion Loss
 - b. Near End Cross talk (NEXT)
 - c. Power Sum Near-End Cross talk (PSNEXT)
 - d. Attenuation to Crosstalk Ratio – Near End (ACRN)
 - e. Power Sum Attenuation to Crosstalk Ratio – Near End (PSACR-N)
 - f. Far End Crosstalk (FEXT)
 - g. Power Sum Attenuation to Crosstalk Ratio – Far End (PSACRF)
 - h. Return Loss (RL)
 - i. Wire Map
 - j. Propagation Delay
 - k. Delay Skew
 - l. Length

- L. Test procedure - fiber data cabling:
1. All fiber testing shall be performed on all fibers in the completed end-to-end system. There shall be no splices. Testing shall consist of a bi-directional end-to-end power meter test performed per TIA/EIA-568-C. The Contractor shall test all fiber cable prior to the installation of the cable. The Contractor shall assume all liability for the replacement of the cable should it be found defective at a later date.
 2. Loss budget:
 - a. Fiber links shall have a maximum loss of: (allowable cable loss per km)(km of fiber in link) + (.4dB)(number of connectors) = maximum allowable loss.
 - b. A mated connector-to-connector interface is defined as a single connector for the purpose of this section.
 - c. Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurements and dividing that sum by two.
 3. Any link not meeting the requirements of the standard shall be brought into compliance by the Contractor, at no charge to the Owner.
 4. Optical fiber splices, fusion or mechanical, shall not exceed a maximum optical attenuation of 0.3dB when measured in accordance with ANSI/TIA/EIA--455-34, Method A (factory testing) or ANSI/TIA/EIA--455-59 (field testing).
 5. The testing of all Fiber optic cables must include tests using an Optical Time Domain Reflectometer (OTDR) or other Owner and Owner representative-approved test equipment. Documentation of the signature trace of the cable must include each of the following:
 - a. Attenuation per kilometer
 - b. Total length of each strand
 - c. The length of the longest cable run from each closet must be recorded and entered into the projects cabling database
 6. The test results must include the loss generated by each connector. Loss should be stated in dB. No fiber optic link will be accepted with a loss greater than 2dB.
 7. Insertion Loss testing must be done using hand held units for the source and meter. Acceptance tests for all fiber strands shall include attenuation, attenuation uniformity, and end-to-end integrity. The Contractor is to ensure that losses are within budget levels. These tests shall be accomplished and documented using loss sets at the desired wavelength of 1300 and 850 NM. The loss test should be performed after all splicing, connectorization and interconnection has been completed. Loss tests should be zeroed using the test lead to be used making the measurements.

3.09 ACCEPTANCE TESTS

- A. Provide a STATEMENT OF COMPLETION, certifying that the system is installed and is ready for acceptance testing by the Design Consultant.
- B. Schedule a time for the Design Consultant to perform system acceptance testing and adjustment with at least 14 days advance notice.
- C. Qualification for Acceptance: Subsequent to completing preliminary testing, Contractor shall furnish the Owner/Design Consultant with copies of As Built documentation as required in this Specification.
- D. Furnish a technician who is familiar with the system to assist the Design Consultant during the acceptance testing and equalization for the duration it takes to complete the adjustments (regular time or overtime as required). A minimum of 24 hours as required to complete the adjustments.
- E. Acceptance Test: The Owner and Design Consultant shall be present during the acceptance testing and require the assistance and cooperation of the Contractor.
 - 1. Each major component shall be demonstrated to function.
 - 2. Measurements: Electrical, optical and acoustical measurements may be performed at the discretion of the Owner and/or their representatives. The Design Consultant will supply acoustical measuring equipment. Such measurements may include sound pressure levels, uniformity of coverage, distortion, or other pertinent characteristics. Contractor shall provide equipment for performing any necessary electrical test or adjustments.
 - 3. Viewing and listening tests may include subjective tests by observers at any location in the facility.
 - 4. Operating tests may include use of any individual or combination of systems provided and from any control location.
 - 5. Each cable may be inspected for proper termination.
 - 6. Under the direction of the Design Consultant, adjust signal levels and loudspeaker aiming, as required, to achieve the uniform sound distribution required by this Specification.
- F. Such tests may be performed on any piece of equipment or system. If any test shows the equipment or system is defective or does not comply with the Specifications, Contractor shall perform any remedies, at their expense, and pay the subsequent expenses of any re-testing required.
- G. Contractor shall provide a final report, which will document the final equipment settings and adjusted levels and values.

- H. If the system does not meet criteria or if additional trips to the JOB SITE for testing or adjustment are required, the Contractor shall reimburse the Owner for all expenses and professional time encountered by the Design Consultant/Architect.

3.10 OWNER PERSONNEL TRAINING

- A. As part of Work of this Section, provide a total of 16 hours of on-the-job training for personnel, designated by the Owner for instruction, in the proper operation and maintenance of the systems. This training shall take place after acceptance testing, in four (4) two-hour blocks.
- B. The contractor shall record two (2) end user training sessions and provide a digital hard copy on DVD disc as well as mpg4 format to the owner and design consultant.
- C. Provide the additional eight hours of training in a minimum of two-hour blocks during the first year after the system has been accepted. These training sessions are at the request of the owner.
- D. Provide one initial set of manuals for the system as described in this specification at the time of training for review and comment by the owner's personnel.

PART 4 - BIDDING INSTRUCTIONS

4.01 GENERAL

- A. This section provides the bid format for the project's audiovisual system. This bid form is to be completed in its entirety. Failure to provide information required by this document may be considered grounds for immediate disqualification.
- B. The installation of the audiovisual system is based on the attached design documents that describe the design developed by Thorburn Associates.
- C. All equipment substitutions must be equal to or better fully functional replacements of the specified items. This includes items such as rack mounting requirements, software operating requirements, functional features, maintenance features and warranty length. Any substitutions must be approved in advance by the Designer.

4.02 BID FORM

Provide the following documentation with your bid:

- A. Refer to bid submittal section 1.06 B for bid submittal requirements. Attach all required information.
- B. Provide a schedule indicating the number of workdays to install the system after each major sign-off by the Owner (i.e., after the bid is awarded, how many days to submit shop drawings, how many days after approval of shop drawings prior to construction, etc.) through the end of the project. Schedule shall be broken down as required by bidding firm's policies.
- C. Provide a copy of your standard contract for materials and installation services.
- D. A statement indicating all equipment is readily available. If not, provide a recommended solution as an alternate.
- E. Provide a bid for to install a complete and operational system. "Complete and operational" is defined as tested and adjusted per design documents.
- F. Complete bid form information called out in parts of this specification.
- G. Return one additional courtesy copy of the completed bid form and all required documentation to Thorburn Associates, 2500 Gateway Centre Blvd, Suite 800, Morrisville, NC 27560.

PART 5 – MAJOR EQUIPMENT LIST

5.01 GENERAL

- A. The following items are the owners preferred items. Any proposed changes need to be identified during the bidding period.
- B. It is the contractor's responsibility for all additional design work to show that the proposed change provides the same functionality and quality as the owners preferred items.

5.02 BREAKDOWN

- A. Provide Unit Cost for each item listed below.

- B. Provide a list of other equipment and hardware required for a complete and working system.
- C. Provide Total Line Cost for each item listed below based on quantity.
- D. Provide the following line item and unit costs:
1. Total Equipment Cost
 2. Engineering
 - a. Lump Sum
 - b. Hourly Rate
 3. Shop Labor
 - a. Lump Sum
 - b. Hourly Rate
 4. Field Labor
 - a. Lump Sum
 - b. Hourly Rate
 5. Training
 6. Manuals
 7. Shipping
 8. Taxes
 9. Overhead
 10. Profit
 11. Total Installed Cost

5.03 MAJOR EQUIPMENT COMPONENT LIST

- A. The following list describes the basis of design for the project base bid. Not all accessories and small items are listed.

Equipment Description	Manufacturer	Model	Qty	Notes
Audio New Amplifier, Network	QSC	CX-Q 2K4	1	Rack mounted
Audio Amplifier, 2CH, 430W @ 2 ohm	QSC	RMX850a	2	Rack mounted
QSC 2CH 430W @ 2 ohm Digital Signal & Control Processor	QSC	Core 110f	1	Rack mounted with UCI License and Scripting License for control system_(AD02)
RF Listening System Antenna	Listen	LA-116 CoAxial Dipole Remote Antenna	1	

Equipment Description	Manufacturer	Model	Qty	Notes
RF Listening System for 500 seats (Future add Receiver as required): 20 devices, 5 neck loops minimum per 2010 ADA Requirements	Listen	LA-166 neck loop lanyard	5	
RF Listening System for 500 seats (Future add Receiver as required): 20 devices, 5 neck loops minimum per 2010 ADA Requirements	Listen	LR-400-072 Receiver	20	
RF Listening System Transmitter	Listen	LT-800-072-01 RF Transmitter	1	
Choir Microphone, electret condenser	Shure	cvo-B/C	6	With Wire aiming hanger, windscreen, 25 ft XLR cable attached. Requires +48V phantom power
Wireless Lavalier microphone	Shure	ULXD1/MX150	8	
Wireless handheld microphone	Shure	ULXD2/SM58	4	
Wireless Audio Receiver	Shure	ULXD4Q	2	With two (2) UA8 antennas
Active Antenna Amplifier	Shure	UA834WB	2	
Mixing Console - 32 mic/line + 2 stereo line, 16 outputs, Presents and Scenes with PC Mixing Console Application	Yamaha	TF5	1	Recording device (OFE)
PC Mixing Console Application	Yamaha	TF Editor	1	3 devices running TF Editor or StageMix can be connected at the same time
Handheld Microphone, Wired	Shure	SM58S	1	On/Off Switch Included
Audio Existing (E)				
Audio Amplifier, 4CH	Ashly Audio	PowerFlwx 4400	1	Rack mounted
Large 8 Ohm Loudspeaker (OFE)	SLS	US1590T-1	4	Surface Mounted
Medium 4 Ohm Loudspeaker (OFE)	SLS	US8190T	4	Surface Mounted
Small 4 Ohm Loudspeaker (OFE)	SLS	US2403	6	Surface Mounted
Microphone 16 patch panel (OFE)			1	Wall Box, Stage
Microphone patch panel (OFE)			1	Wall Box, Control Room
CD/Cassette Player	Denon	DNT-625	1	Rack mounted

Equipment Description	Manufacturer	Model	Qty	Notes
Control New				
Control Panel, 8" POE Wall Mount	QSC	TSC-80W-G2-BK	1	
Control Panel, 8" POE Table Top	QSC	TSC-80TW-G2-BK	1	With Table Top Mounting accessory Included
IO TO RS232 CONTROLLER	Hall Research	HR-4P	1	Acceptable substitution is Global Cache GC-100-12 (AD02)
IO TO RELAY CONTROLLER	Winford Engineering	RLY204-12V-DIN	1	Delete if substituted Global Cache GC-100- 12 for Hall Research HR-4P (AD02)
Network Switch, 10 Port, 4x POE+	QSC	NS-1108P	1	Rack mounted
Surge Protector, Sequencer, 8 Outlet	SurgeX	SEQ-1U	1	Rack mounted
Basic Surge Protector, 9 Outlet	Middle Atlantic	PD-915R	1	Rack mounted
Low Voltage Control, Projection Screen (AD02)	Draper	LVC-IV	1	
Hardware New				
Equipment Rack, Wall mount	Middle Atlantic	CWR-12-17PD	1	With Rackrail (CWR- RR12)
Rackshelf Utility	Middle Atlantic	U1	1	
Floorbox	FSR	FL-1550	1	4-Gang
Video New				
Projector, Laser, 12K Lumen, WUXGA (1920x1200), 3 LCD	Epson	Pro L1505UHNL	1	Use existing mount @Ceiling Soffit
Lens, Projector Middle Zoom	Epson	ELPLM11	1	
HDMI X4 Distribution Amplifier	Extron	DA4 HD 4K	1	With optional rack shelf
HDMI TX Decora	Extron	DTP T HWP 4K 231 D	2	
HDMI TX	Extron	DTP HDMI 4K 230 TX	2	with (QTY 1) optional rack shelf
HDMI AAP	Extron	70-616-02	1	
HDMI RX	Extron	DTP T HDMI 4K 230 RX	4	
HDMI 2X1 SWITCH	Extron	SW2 HD 4K	2	With Middle Atlantic UTR1 rack shelf (Qty 2)
HDMI AUDIO DE-EMBEDDER	Extron	HAE 100 4K	1	With optional rack shelf

Equipment Description	Manufacturer	Model	Qty	Notes
Video Reuse				
Projection Screen, ceiling recessed, electric	Draper		1	
HDMI Fiber TX/RX			1	Wall Rack

- B. The following list describes the basis of design for Alternate 1 – Add wireless microphones. Not all accessories and small items are listed.

Equipment Description	Manufacturer	Model	Qty	Notes
Audio Add				
Wireless Lavalier microphone	Shure	ULXD1/MX150	4	
Wireless Audio Receiver	Shure	ULXD4Q	1	
Passive Antenna Splitter Kit	Shure	UA221	1	Includes two (2) splitters

- C. The following list describes the basis of design for Alternate 2 – Add video distribution to displays. Not all accessories and small items are listed.

Equipment Description	Manufacturer	Model	Qty	Notes
Video Add				
HDMI TX 2	Extron	DTP HDMI 4K 330 TX	2	
HDMI RX 2 Decora	Extron	DTP R HWP 4K 331 D	1	
HDMI RX 2	Extron	DTP HDMI 4K 330 RX	1	
Confidence Monitor, Consumer Grade	Insignia	NS-50D510NA19	1	

- D. The following list describes the basis of design for Alternate 3 – Add handheld microphones.

Equipment Description	Manufacturer	Model	Qty	Notes
Audio Add				
Handheld Microphone, Wired	Shure	SM58S	2	On/Off Switch Included

- E. The following list describes the basis of design for Alternate 4 – Add control system source selection (stage or control room desk).

Equipment Description Control Add	Manufacturer	Model	Qty	Notes
IO TO RS232 CONTROLLER	Hall Research	HR-4P	1	Delete if base bid substituted Global Cache GC-100-12 (AD02)

Programming to add functionality to control panels.

- F. The following list describes the basis of design for Alternate 5A – Add network audio distribution for control and future expansion (AD02)

Equipment Description Control Add	Manufacturer	Model	Qty	Notes
Dante Input Card	Yamaha	NY-64-D	1	
Network Switch, 10 Port, 4x POE+	QSC	NS-1108P	1	With network cables for local connection to Wireless Microphone Receivers and Control Panel

Programming to add functionality to control panels

- G. The following list describes the basis of design for Alternate 5B – Expand Alternate 5A to provide Network Audio Interface with control off stage (AD02)

Equipment Description Audio Add	Manufacturer	Model	Qty	Notes
Network Audio Interface Plate – 2 Mic/ Line XLR inputs and 2 Mic/Line XLR outputs	Attero Tech by QSC	unDX2IO+	1	With 2-gang surface mounted box and ¾" conduit to R 1. Network cable connection to POE port on Network Switch

Programming to add functionality to control panels

END OF SECTION 274116

<https://tainc0.sharepoint.com/Projects/Active Project 2019/19064 - South Pointe HS Auditorium/Audiovisual/Spec/2020-04-28 kje 19064 AV SPECIFICATION 274116AD02.DOCX>

MEMORANDUM

DATE: 5 June 2020

TO: James Wilhide **Email:** jwilhide@moseleyarchitects.com
Moseley Architects
6210 Ardrey Kell Road
The Hub at Waverly, Suite 425
Charlotte, NC 28277

FROM: Karen Espenhahn, CTS-D
Steve Thorburn, PE, LEED-AP, CTS-D, CTS-I

SUBJECT: South Pointe High School Auditorium – TA Reply to Questions & Substitution Requests
TA Project #19064

The following bidder *Questions* and *Substitution Requests* were received from Moseley Architects by 4 June 2020. **TA Reply** follows each item.

Question: Suggested Add Alt 5:

We suggest the addition of a NY-64-D Dante input card to the Yamaha TF5 digital console. This will allow for additional system flexibility: The use of several microphones in the QSC Q-Sys in a simplified "House" mode. It will also allow the 8 new Shure ULXD4Q receivers to input into the console digitally and bypass the existing analog patch panel on stage left. It would also allow for the future addition of digital input stage boxes via Dante.

As part of this proposed Alt 5 a second QSC NS-1108P should be located in the new stage wall mount rack.

TA Reply: Accept alternate proposal. See Addendum update that adds Alternates 5A/5B per 274116.1.02.F/274116.1.02.G and 274116.5.03.F/274116.5.03.G respectively.

Question: Where are Ceiling Loudspeakers LS15 (OFE) on plans?

TA Reply: There are four loudspeakers (OFE) flanking the projection screen with two on either side. TA-202 tags these as LS8_E, but they should be LS15_E.

Question: AV Specification states that the XLR patch panels wall-mounted by the stage and in the control room are existing equipment. Is the cable to be repulled between the off stage and control room patch panels?

TA Reply: No, the base bid considers the cable that ties the off stage and control room patch panels as existing. It was in good working order during the 2019 site visit. Note, the external cables used for making the patches are to be provided as part of the scope. See Addendum clarification in AV Specification 274116.1.02.g.

Question: The QSC core 110f will require a UCI license and Scripting license in order to be used as a control system.

TA Reply: QSC core 110f is to be used as a controller for the control system. Provide UCI License and scripting license for system functionality.

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ORLANDO

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THORBURN ASSOCIATES
ACOUSTICAL, TECHNOLOGY, AND LIGHTING DESIGN

2500 GATEWAY CENTRE BLVD., STE 800, MORRISVILLE, NC 27560

TEL: 919.463.9995

JustAsk@TA-INC.COM

Question: The OFE screen is currently controlled via high voltage switching only. A Draper LVC-IV will be required in order to add control via contact closure.

TA Reply: Add Draper LVC-IV for control via contact closure.

Substitution Request: We would like to substitute a Global Cache GC-100-12 IP to RS-232 and contact closures in place of the Hall Research HR-4P and Winford Engineering RLY204.

TA Reply: A single Global Cache GC-100-12 is an acceptable substitution to replace one Hall Research HR-4P and one Winford Engineering RLY2004 in the base bid and one Hall Research HR-4P added per Alternate 4.

#

We trust this information is helpful. If you have any questions or need additional information, please do not hesitate to contact us.

KJE/tmb

Enclosure(s): Addendum

https://tainc0.sharepoint.com/Projects/Active Project 2019/19064 - South Pointe HS Auditorium/_Correspondence/2020-06-04 TA Reply Bidder Q AD02/2020-05-26 kje 19064 AV Bidder Questions TAReply.docx

