SECTION 274100 – COMMON WORK RESULTS FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL INFORMATION

1.1 SCOPE OF WORK – GENERAL

A. This project encompasses the replacement of all existing and addition of new audiovisual systems within the Theater and associated Back-of-House spaces at North Central High School in Spokane, Washington, under the Spokane Public Schools district.

1. The building and spaces within the Scope of Work were constructed in 1980 and most installed systems are from that era, with incremental upgrades performed in the late 1990s and early 2000s.
2. The theatrical lighting and rigging systems were replaced approximately 2022-23 and all Work shall preserve and protect these systems from damage or malfunction. This previous work included all lighting, dimmer, lighting controls, onstage motorized rigging. The stage does not have a fly tower, and an existing barrier ceiling limits the ability to fly-in/out draperies and scenery.
3. The Scope contained herein will make use of new box and pathway infrastructure, which will be procured by the District under a separate Job Order Contract (JOC).

B. The Scope of Work includes the removal of all existing audiovisual systems, including all existing:

1. Wall panels, connectivity and analog cabling.
2. Existing loudspeakers, amplification, processing, mixing hardware, patching, and equipment rack.
3. Loose and portable front-of-house analog mixing hardware and outboard gear.
4. Wireless microphone systems and ALS systems.
5. Existing equipment rack and associated hardware.
6. Turning over to Owner of all existing hardware for reuse or disposal by the Owner.

C. The Scope of Work excludes the following, which will be provided under separate Job Order Contracts (JOCs) by SPS:

1. All new surface and in-wall boxes, specialty enclosures and pathways, as noted on the drawings, requiring conduit, or cutting/patching/painting of plaster, drywall or room finishes.
2. All new power receptacles and circuiting.
3. Surface raceway systems, covers, fittings and related floor cutting and patching to provide connectivity at the pit and stage apron.
4. Structural engineering verification of and designation of hang/mounting points for new large venue projector, and loudspeaker systems above the stage apron in the house.
5. Modification of the Control Booth architecture, including removal of existing windows, including glazing, mullions, and modification of wall structures to enlarge openings and trim/finishing of openings – to allow live audio mixing from within the Control Booth.

D. Spaces in Scope

1. Locations within the scope of this RFP include the following spaces as outlined in Related Work Sections:

a. Theater – A 524 seat proscenium theater without a fly loft, with a forestage apron leading into a shallow orchestra pit. The stage sits at the same level as the first flow of house seating, which provides ADA accessibility to the stage from the building corridors. Ancillary spaces to the Theater include:

i. Control Room – An existing space at the rear of the house that provides technical

crew a location for mixing and lighting control, as well as housing the AV headend rack.

a) The Control Room currently has small windows for viewing of the stage by lighting and sound operators, of which only one window is operable in a small 12" section, limiting the ability to mix live sound from the assigned position.

b) The Consultant has recommended the District, as part of the JOC contract work, remove the windows, glazing and mullions, and enlarge the current openings as much as physical possible to allow the ability to mix audio with minimal interference from the wall, as well as support better situational awareness for technical crew running shows from the Control Booth.

ii. Followspot Platform – Adjacent to the Control Booth, at stage right, at the last rows of seating. The Consultant has also designated this location, as well as the symmetrical location at the rear stage left of the house to function as videography locations, with appropriate connectivity to support this use.

iii. Stage – A 23'-6"' x 60' wide stage from the plaster line, with a motorized rigging system with drapery tracks and electric linesets, with adjacent stage manager's position and technical systems occupying a large portion of the stage right wing.

a) The stage right wing proscenium wall houses a lighting control panel, which will also be a location for an adjacent new AV touchpanel control.

b. Back of House Areas include the following:

i. Women's and Men's Dressing Rooms, 14 and 16 – With Production intercom, and situational awareness audio and video feeds.

ii. Drama Classroom 024A – With Production intercom, and situational awareness audio and video feeds, as well as Ethercon tie lines for use in remote production situations – such as off-stage pit band performance.

iii. Corridors N101G, Dressing Corridor and South Music Wing Corridors – With ceiling speakers, zoned for situational awareness without direct audibility in the House, and a situational awareness display monitor on the wall common to the Music Wing Corridor and Entry to the House and Stage from that corridor.

c. Other Front of House (FoH) Scope includes:

i. Video streams from the House H.264/65 camera output to be fed to the campus network, for playback on classroom or user devices.

d. Portable Equipment – Loose "pool" of equipment for shared use in the facility, including items such as audio/video break-out boxes, ALS receivers, streaming encoder/decoder devices, Dante appliances and microphones.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Equipment Schedules, as referenced in the drawings.

C. Related Sections under this Section, describing the audiovisual systems to be installed in each space-type, including details for function, operation, and programming.

1. 27 41 20 – Theater Audiovisual Systems

2. 27 41 25 – Back of House Spaces Audiovisual Systems

1.3 QUALIFICATIONS OF BIDDERS

A. The Bidder shall be a firm with at least ten years of experience in the design, engineering, fabrication, assembly, and installation of audiovisual systems of similar magnitude and quality as specified for the subject job and shall submit documentation to this effect with the bid return.

B. Each bidder shall have at least one project manager or engineering staff employee on this project possessing a certificate, from AVIXA (CTS-D) or another recognized organization or institution providing formal training in audiovisual systems design or engineering. Proof of this shall be supplied with bid.

C. Each bidder shall have at least one supervisory employee on this project possessing a certificate, from AVIXA (CTS-I) or another recognized organization or institution providing formal training in audiovisual systems installation and commissioning. Proof of this shall be supplied with bid.

D. All employees of the contractor to install this system must be competent technicians who are experienced in the installation and interconnection of professional audiovisual systems (AVIXA CTS and relevant manufacturer certifications (i.e. – Q-Sys Level 2, Control & UCI, Quantum).

E. All lead engineering and project management is to be handled by a qualified, full-time employee of the audiovisual contractor. No outsourcing or sub-contracting of this phase will be accepted. Engineering may be conducted in concert with a selected loudspeaker systems manufacturer, who may provide supplementary systems evaluation, modelling, design, or systems engineering to supplement the Contractor, under the supervision of the Contractor's project manager or engineer.

F. Each bidder shall maintain an adequately equipped and staffed service department and shall regularly provide service for systems similar to this design. This shall include an office staffed with personnel at all times, Monday through Friday, between the hours of 8:30 AM and 5:30 PM Eastern Time (adjusted to daylight or savings time – per that time of the year). Answering services, cellular telephones, pager numbers and call forwarding systems are helpful but do not meet nor comply with the intent of this specification.

G. The bidder shall include with their proposal a schedule of support, including response times for on- site service, from the time a service-call is placed by the Owner, to the time service personnel will be on-site to address the Owner's service need.

H. The bidder shall note whether phone or on-site responses will be provided directly by on-staff personnel or if they will be relying upon a 3rd-party which will be sub-contracted to supply such service(s). The bidder shall provide the name and location of such a 3rd party within their response.

I. Each bidder shall be currently authorized by the manufacturer of the major components of the system to sell their products and initiate warranty service on the same items. Major components of the system shall include, but not be limited to, data/video projectors and displays; video distribution, processing and switching equipment; audio distribution and processing equipment; power amplifiers, speakers, etc. Proof of this may be requested during the bidding process. Proof of franchise shall be in the form of a letter from the appropriate manufacturer addressed to the Owner's Representative stating that the contractor is currently authorized to sell their products. Letters from the sales representative (rep) shall not be accepted as proof.

1.4 DEFINITIONS OF TERMS

A. The term "Owner" shall refer to Spokane Public Schools, of Spokane Washington (also referred to as "SPS" or "The District").

B. The term "Architect" shall refer to the designated facilities representative of SPS or assigned Subcontractor to the District.

C. The term "Consultant" shall refer to ABD Engineering & Design of Portland, Oregon.

D. The term "Bidder" shall refer to a firm submitting a RFP response to this specification and the

Governing Documents provided as part of this RFP.

E. The term “Contractor” or “Integrator” shall refer to the Systems Contractor/Integrator who has been awarded the contract for the subject job and who has responsibility for performance of the work specified herein.

F. The acronym “NIC” shall refer to material and work which is “Not in Contract” and for which the Contractor is not responsible except as otherwise detailed herein.

G. The term “OFE” shall refer to “Owner Furnished Equipment”, which will be provided by the Owner. The Contractor shall be responsible for removing this equipment from the Owner’s premises as appropriate and re-installing and integrating this equipment in good working order as detailed herein.

H. The term “shall” is mandatory; the term “will” is informative; the term “should” is Advisory.

I. The term “Work” describes all construction type processes. Including but not limited to, labor, equipment, materials and services specified herein.

J. The term “Furnish” means to purchase and deliver to the project onsite location, with every necessary accessory and support, all as part of the Work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased items are free of all liens, claims, or encumbrances.

K. “Install” – To perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Work.

L. The term “provide” means furnish and install.

M. The term “commissioning” refers to the process by which equipment or systems (which are installed, complete or near completion) are tested to verify if they function according to their design objectives or specifications.

N. The term “Project” is the installation of Audiovisual Systems in the facility or facilities described within this specification.

O. The term “Drawings” refers to Audiovisual systems drawings and any details, risers, etc. associated with the work.

P. Certain words or phrases as used in the Drawings or Specifications for the Work may have multiple meanings such as those specified in codes or other industry standards. The words or phrases mentioned below shall be understood to have the following specified meanings with regard to the audiovisual systems described herein:

1. “Circuit” – Any design of circuitry.
2. “Circuitry” – Any type of Work which consists of wires/cables, raceways, specialty wiring method assemblies complete with associated junction boxes, pull boxes, outlet boxes, joints, couplings,-splices, and connections except where limited to a lesser meaning by specific description.
3. “Concealed” (as applied to circuitry) – Covered completely by building materials, except for penetrations (by boxes and fittings) to a level flush with the surface as necessitated by functional or specified accessibility requirements.
4. “EC” – Electrical Contractor, in the context of either a sub-contractor to the Bidder or an independent Contractor.
5. “Exposed” (as applied to circuitry) – Not covered in any way by building materials.
6. “Normal Work Conditions” – Locations within building confines that are not damp, wet, or hazardous and that are not used for air handling.
7. “Patch Panel” – A System of terminal blocks, patch cords, and backboards that facilitate administration of cross-connecting cables.
8. “Raceway” – Any pipe, duct, extended enclosure, or conduit (as specified for a particular System) which is used to contain wires, and which is of such nature as to require that the

wires be installed by a “pulling in” procedure.

9. “Riser” – Shall refer to the portion of the installation that transmits between building floors (or between Audio Visual Systems rooms), also referred to as “Backbone Cabling.”
10. “Audio Visual Closet” – The enclosed area or room specifically designated for the routing, termination, and/or cross connecting of audiovisual systems cable (i.e. riser cable) to other Audio- Visual Systems cable and/or equipment.
11. “AV Systems Control Room” and/or “AV Systems Headend” – The enclosed area or room specifically designated for the routing, termination, and/or cross connecting of audiovisual System cable (i.e. riser cable) to other Audio-Visual System cable, and/or equipment, and racks.
12. “AV System(s)” – Audio Visual System(s), includes all components contained herein that work in conjunction to create and completely integrated and fully functioning system as described within the Drawings and Specifications.
13. “Audio Visual Systems Wiring” – see “Circuitry.”
14. “Audio Visual Systems Work” – See “Work.”
15. “Standard” (as applied to wiring devices) – Not of a separately designated individual type.
16. “System” – See “AV Systems.”
17. “Wiring” – see “Circuitry.”
18. “AVC” – Audio Visual Systems Contractor.
19. Where the term “Conduit” is used without specific reference to type, it shall be understood to mean “raceway.”

1.5 INFORMATION TO BE SUBMITTED WITH BID RETURN

A. Upon close of Bidding, Bidder to provide as part of their submittal - within 5 days of request, the following breakdown of submitted Costs for evaluation:

1. Equipment Costs

    a. The bid return shall include detailed lists of all equipment to be supplied. Each piece of equipment shall be individually priced and carried over for multiples to a total. Equipment that is contained in lots or groupings, such as wiring, connectors, or loose general hardware shall be provided in a lump-sum lot and noted as “lot” and noted appropriately in the proposal.

2. Non-Equipment Costs

    a. Non-equipment costs shall be furnished separately with the equipment costs. These non-equipment costs shall be detailed for each of the following categories:

        i. **Engineering**: Including all required designs, drawings, run sheets, instruction manuals, etc.

        ii. **Pre-installation**: Including all fabrication, modification, assembly, rack wiring, etc., performed on the Contractor’s premises.

        iii. **Installation**: Including all on-site installation and wiring, coordination and supervision, , etc. performed on the Owner’s premises.

        iv. **Commissioning**: Including all final measurements and testing, performance verification, systems tuning and adjustments, and documentation of said measurements and testing, along with a final report summarizing the results of the commissioning. Include costs for on-site checkout/inspective by the Owner and Consultant, as well as costs for Owner Training sessions, as outlined further in this specification document.

        v. **General and Administrative**: Including all ‘G & A’ expenses, shipping, insurance, and guarantees.

        vi. **Taxes (if applicable)**.

3. Subcontractor Costs: Shall be provided for each subcontractor to be used by the Bidder, broken down by the same general order as items ‘A’ and ‘B’ above.

B. Upon close of Bidding, Bidder to provide as part of their submittal - within 5 days of request, the following General Information to include:

1. The number of years in business.
2. Resumes of key personnel. Resumes must reflect skills relating to audio, video & display systems, systems and hardware rigging, teleconferencing (audio and video), integrated control systems, software platforms, programming, project management, etc.
3. Locations of all currently staffed and operational offices complete with the number of technical support personnel in each office.
4. Project References (minimum of three (3) projects of similar size and scope)
    a. These should include:
        i. End user contact name, with current title and position, telephone number and e-mail address.
        ii. Functional description of the project.
        iii. Project scope and approximate dollar amount (single projects should be equivalent to the size of this project, not accumulative work of a single client).
        iv. Timeline of project and final completion date.
        v. **All projects identified must be verifiable and have been completed within the last three years (36 months)**.
5. List of products for which the firm is a direct dealer, including the duration of the dealership and the extent of any factory training. This list should include, but not be limited to:
    a. Large screen display systems, both projection and display-type, including but not limited to direct-view indoor/outdoor LED, LCD/LED/OLED, DLP/DMD and LCoS.
    b. Specialized display systems (as applicable).
    c. Video networked/IP switching/routing, scaling, conversion, and distribution systems.
    d. Distributed loudspeaker systems.
    e. Large-venue loudspeaker systems, such as long-throw and line-array systems, and high-power amplifiers and amplification.
    f. Computer processor-controlled audio systems including but not limited to audio digital signal processors and IP distribution systems.
    g. Integrated control systems.
    h. Video and Audio Broadcast systems – production & transport.
    i. IT and IP networking equipment as used in audiovisual systems implementations/installations.
6. List of technical products that the firm has installed and serviced but are not a direct dealer for.
7. Schedule of Implementation
    a. It is the responsibility of the bidder to verify the project schedule and confirm via their bid return that they will comply with the project schedule and deliver a complete audiovisual system within the specified time frame.
    b. Bidders may indicate their acceptance of the project schedule by submitting a scheduling plan with the bid return, indicating the various pertinent terminal dates after award of contract for completion of design, pre-installation work, on-site installation work, and

testing and acceptance on a “per phase” basis.

c. At a minimum the schedule should include the following information:

i. Number of days required for submission of engineering documents from receipt of notice to proceed.

ii. Days to complete the project from receipt of approved documents. This information should be broken down to indicate benchmark dates of other trades and days to completion of tasks associated with those benchmarks, including benchmarks for:

a) Acoustical measurements, space and systems modelling and analysis work.

b) Product submittals. – *In the interest of maintaining the desired schedule. The Contractor’s schedule shall prioritize procurement by scheduling the provision of product submittals as soon as possible after the award of the contract, which the Consultant will turn around for procurement within 3 business days. Once approved, the procurement shall not be delayed, and any long-lead items (over 8 weeks) shall be in procurement within a week of receipt of approved product submittals.*

c) Engineered system submittals, including interconnection and schematic diagrams, wire pull and run sheets, etc...

d) Shop drawings, including structural steel, rigging, footing or concrete work, etc.

e) Submittals for software/programming.

f) Systems tuning and commissioning.

g) Closeout submittals.

h) Closeout walkthroughs.

i) Owner training.

d. If provided, the Bidder shall review attached cover documents and schedule for additional information.

8. Alternate Equipment

a. All bids shall be submitted on the basis of the specified equipment as outlined in the Appendix ‘A’ sections of this specification. The Bidder may propose alternate equipment, or equipment they feel meets the intent of “equal” or “equivalent” as described below in paragraph 9. However, all such proposals shall be submitted separately and will be identified as “alternates” with equipment costs shown separate and apart from the costs of the equipment “as specified”.

b. Proposals for alternate equipment will receive careful and equitable consideration if the differences do not depart from the overall intent of the design and operation of the system, are in the best interests of the Owner, and are equal in durability and usability.

c. All such proposals for alternate equipment shall be accompanied by full technical information, “cuts” and specifications for the equipment so proposed. The Bidder shall identify the substantive differences between the alternate and the specified equipment.

9. Exceptions and Proposed Modifications

a. Should the Bidder have recommendations, which will enhance the performance of the system, or reduce costs without loss of performance, such comments shall be made in the bid submission. All suggestions that are of value to the Owner will be taken into consideration in the evaluation of the bid returns. All such proposals shall be made as “alternates”, with the appropriate cost modifications shown separate and apart from the costs of the system “as specified”.

b. Any and all exceptions to these specifications and related drawings must be made with the bid submission. In the absence of exceptions, these specifications and related drawings shall be binding in letter and intent on the successful Bidder. It will further be assumed that the Bidder has examined the design and specifications in detail, and is prepared to take full responsibility for the performance of the complete installation as designed and specified.

10. Sub-Contract Information

a. If the Bidder proposes to sub-contract portions of the work, as provided for under which follows, such sub-contractors shall be identified, and their responsibilities and qualifications detailed in the Bidder's bid submission. The work as performed by a sub-contractor shall be considered as part of the contractor's responsibility with that work as part of the contractor's statement. Any contract arising as a direct result of these proceedings shall be binding on the successful bidder and the terms of said contract shall be submitted with the bid return.

1.6 WARRANTY STATEMENT

A. To maintain certain manufacturer's warranties, said equipment must be installed, aligned and serviced by those installers authorized by said manufacturer to perform those duties. If the contractor is not authorized, by said manufacturer, it is t sole responsibility to make the appropriate arrangements and bear all cost and consequences thereof.

B. The Bidder shall include a statement of warranty on the entire system and on the individual pieces of equipment. The system warranty shall be for a minimum of 365 days from the date of commissioning by the Owner and Consultant (refer to 3.5 for "Commissioning Test" requirements). This warranty shall obligate the Contractor to provide all equipment, material, and labor at no charge to the Owner, during the warranty period, in the event of a system or equipment malfunction.

C. In cases where the manufacturer's warranty period is greater than twelve months, the contractor is required to honor that warranty for the full extent of the manufacturer's warranty period. This shall exclude any labor costs incurred by the contractor removing and re-installing the defective items after the system warranty expiration.

D. In cases where the manufacturer's warranty period is less than 12 months, the contractor is liable for defects in the item up to-but not exceeding-the first twelve-month period on any contractor provided items.

E. The system warranty shall include a minimum of four (4) preventative maintenance visits over the systems warranty time period, to perform operation checks of the equipment, re-measure systems performance and re-tune the system's DSP settings, equalization, dynamics, etc... for optimum performance, as well as check the projectors, screens, display and signal transport/switching/matrixing systems, network hardware, firmware and software, as well as respective mounting and rigging hardware for safety and integrity.

F. All manufacturers' equipment warranties shall be activated in the Owner's name and shall commence on the date that commissioning is completed. In the case of Contractor-modified equipment, the manufacturer's warranty is normally voided. In such cases, the Contractor shall provide the Owner with a warranty equivalent to that of the original manufacturer.

G. In the event of malfunction or failure of any audiovisual equipment provided by the AV integrator, the integrator is responsible for providing replacement of faulty equipment, or providing "loaner" equipment. In the event that "loaner" equipment is provided, said equipment shall meet or exceed the original equipment specifications until the original equipment can be replaced.

H. In Cases where the contractor is providing and installing audiovisual equipment and/or hardware to be integrated with equipment furnished by others, it shall be the responsibility of the contractor to warrant their equipment as described herein; unless said equipment shows misuse and or

abuse by others during re-installation of, or connection of equipment by others.

I. Telephone Support

1. The Audiovisual Contractor shall respond via telephone within four (4) hours to any request for service. This first contact should outline the nature of the problem or functional anomaly. The AV Contractor shall make available an individual knowledgeable with the installed system, and who can address specific system issues described by the system operators.

J. On-Site Support

1. The system warranty shall be an “on-site” warranty, with a twenty-four (24) hour response time. Telephone support shall be available between normal business hours, Monday through Friday. If a 3rd-part sub-Contractor is to be used, the Bidder shall include this information, with firm name, location and primary contact information included.

1.7 PREVENTATIVE MAINTENANCE & SERVICE CONTRACT

A. In addition to the preventative maintenance described under 1.5 Warranty and other paragraphs, the Bidder shall offer a separate annual preventative maintenance contract by pricing for five (5) years on a year-to- year basis. This preventative maintenance contract shall cover all installed systems and include a minimum of three (3) visits per year, at regular intervals during the fall and winter seasons as noted above in 1.4-I, to perform operation checks of the equipment, clean filters, check drivers, to inspect and perform safety checks on rigging, lubricate moving parts as recommended by the respective manufacturers and to adjust and align rigging and loudspeaker units or arrays to maintain performance as set initially. The preventative maintenance contract is an option for the Owner to exercise immediately after expiration of the warranty period. (A per item price for the service contract shall be submitted with the bid).

B. The Bidder shall also submit separate costs for other emergency “on-call” service visits and an “in-shop” hourly rate for repair and maintenance work.

C. The costs for this service contract shall not be commingled with the costs for the systems base bid.

1.8 SUB-CONTRACT

A. If the Bidder proposes to sub-contract the installation and wiring, or other portions of the work, the Bidder shall provide direct supervision of the sub-contracted work.

B. Because of the complexity of the systems, the supervision of such sub-contracted work cannot be intermittent, but shall be continuous during the installation.

C. It is the sole responsibility of the bidder to research and provide any and all necessary sub-contracts pricing for union labor that cannot be provided from within its own organization. Information related to this must be provided with this bid return.

D. If it is the intention of the Bidder to “team” with one or more other AV Contractors, then this must be clearly identified in the bid return. The Contractor returning the bid will be considered as the prime in respect of this, and will hold full responsibility for the performance of the members of their team, including themselves and all other sub-contractors engaged in the performance of this contract.

1.9 INVESTIGATION OF CONTRACTUAL AND SCHEDULING QUESTIONS

A. It shall be the responsibility of the Bidder to investigate all potential contract, union, and scheduling questions, and to guarantee compliance with all requirements and regulations in effect on the job site. Any potential problems in this respect shall be identified in the bid return. The contractor shall comply with all local state and federal regulations.

1.10 CONTRACTOR’S GENERAL RESPONSIBILITIES

A. The Contractor shall be responsible for delivering a turnkey system to the Owner.

B. The Contractor shall furnish all equipment and materials, whether specifically mentioned herein or not, to ensure a complete and operating system. The NIC and OFE equipment and materials are specifically exempted from this requirement.

C. The Contractor shall generate all shop drawings and information for the complete installation and wiring of the system. The Contractor shall provide (or sub-contractor for) the on-site installation and wiring, and shall provide on-going supervision and coordination during the implementation phase.

D. The Contractor shall be responsible for the initial adjustment of the systems as herein prescribed and shall provide all test equipment for the system checkout and commissioning. Contractor shall provide on-the- job training in the operation and maintenance of the systems for personnel designated by the Owner.

E. The Contractor shall coordinate and submit to all site policies and adhere to all site safety procedures put in place by the Construction Manager.

F. The Contractor shall attend all construction manager/sub-contractor coordination meetings as required by construction manager.

G. The Contractor shall perform an RF Spectrum Analysis Survey identifying all available frequencies that may be required by any wireless equipment under this specification such that appropriate frequency allocations may be identified for the purpose of purchasing corresponding transmitters and receivers. The Contractor shall be responsible for the validity of the survey and any subsequent equipment substitution that may result even if such equipment has been previously accepted by submittal.

1.11 PROJECT MANAGEMENT

A. The Contractor shall provide a Project Manager to oversee and coordinate all activities on the Project.

B. Project Manager's Duties and Responsibilities:

1. The Contractor shall provide to the Owner, as a part of the prefabrication submittal, the name of the Project Manager that will provide all duties and responsibilities as specified herein, during the term of the project.
2. The Project Manager shall maintain the ability of making all managerial decisions on behalf of the Contractor on a day-to-day basis, and shall retain the authority of accepting notices of deduction, inspection reports, payment schedules and any other project related correspondence on behalf of the owner.
3. The Project Manager shall attend project meetings as required, during which time all System related issues are discussed, scheduled, confirmed, and/or resolved.
4. The Project Manager shall be available during normal business hours (8:00 am to 5:00 pm local time) by telephone during the term of the project.
    a. After normal business hours, the Project Manager shall be available within four (4) hours (5:00 pm to 9:00 pm) by email during the term of the project for urgent matters.
    b. In the event that the Project Manager is not available within the allotted time frame, the Contractor may designate additional staff to temporarily act as the Project Manager for all correspondence with the Owner.
    c. The Contractor shall ensure that any individual temporarily assuming the duties of the Project Manager is at equal or higher level in the Contractor's managerial chain of command.
5. Upon notification by the Owner, of any project related installation issue, or issue that may contradict the Specifications as stated herein, the Project Manager shall respond to such issue, verbally and/or in writing within an eight (8) hour period.
    a. Responses to such issues as stated above shall include a clear understanding of the

issue, along with a tentative plan of action, reflecting milestones and/or deadlines to resolve the issue.

b. Where appropriate, based on the overall importance of the project issue, the Project Manager shall follow-up their initial response with a written response to the issue within 24 hours of identification of the issue.

6. Prior to the initiation of the Work, the Project Manager shall submit a schedule reflecting key milestones of the Work, including but not limited to the following:
   a. Bid award.
   b. Kick-off meeting
   c. Product submittals – *to be prioritized as noted above in 1.5.B.7.c.ii.b)*
   d. Plan submittal
   e. Prefabrication submittal
   f. Ordering, delivery, and installation of System equipment
   g. Field equipment delivery
   h. Project management schedule
   i. Payment schedule
   j. Installation completion date
   k. System training
   l. Delivery of As-Built documentation
   m. Delivery of Operations & Maintenance Manuals
   n. Commissioning
   o. Acceptance of System
7. The Project Manager shall update the schedule on a weekly basis to reflect the status of each key milestone as the Work progresses.
8. As the System installation progresses, the Project Manager shall be capable of discussing any/or all of the above-mentioned items at the request of the Owner, and shall address each item, as it relates to the current status of the Work.
9. If for any reason, the contractor shall become unable to meet the milestones outlined in their project schedule, the project manager shall notify the consultant, design team, and contractors associated with related work, so as minimize delays in other project work paths.

1.12 REFERENCE TO ARCHTECT/OWNER'S GENERAL CONDITIONS

A. The Architect and/or owner's General Conditions shall be considered part of this Specification except where this Specification contains statements which are more definitive or more restrictive than those contained in the General Conditions regarding a specific item or items. This specification shall not be interpreted as waiving or overruling of any requirements expressed in the General Conditions.

1.13 APPLICABLE CODES, STANDARDS, PERMITS, AND INSPECTIONS

A. All audiovisual work shall meet or exceed the latest requirements of all National, State, City, County, Municipal and other Authorities having Jurisdiction over the audiovisual work and the project.

B. Any portion of the audiovisual work not subject to the requirements of an electrical code published by a specific authority having jurisdiction over such work shall be governed by the National Electrical Code and any and all applicable sections of the National Fire code, as

published by the National Fire Protection Association.

C. Installation procedures, methods and conditions shall be in compliance with the latest requirements of the Federal Occupational Safety and Health Administration (OSHA), the Americans with Disabilities Act (ADA) and the Architectural Barriers Act (ABA).

D. The Contractor is responsible for all costs incurred to meet these codes and conditions.

E. Additional codes and requirements pertaining to the work:

1. International Building Code (IBC)
2. NFPA-72 National Fire Alarm and Signaling Code, 2013 Edition
3. International and National Electric Codes (IEC/ NEC)
4. IEC 60268-16 Third Edition 2003-05 Objective rating of speech intelligibility
5. ANSI/AVIXA
6. Sustainable Technology Environments Program
7. Underwriters Laboratories, Inc. (UL)
8. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual - latest edition.
9. ANSI/TIA/EIA-568-B - Commercial Building Telecommunications Cabling Standard
10. ANSI/TIA/EIA-569 - Commercial Building Standards for Telecommunications Pathways and Spaces
11. ANSI/TIA/EIA-606-A. Administration Standard for Commercial Telecommunications Infrastructure
12. ANSI J-STD-607-A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
13. EIA RS-232 Serial Communications Electrical Interface
14. EIA RS-310-C Racks, Panels and Associated Equipment
15. FCC Part 15
16. FCC Part 68
17. IEEE 802.3
18. NFPA 70 National Electrical Code, 2023 Edition
    a. Article 770 Optical Fiber Cables
    b. Article 800 Communications Circuits
    c. NFPA 75 Protection of Electronic Computer / Data Processing Equipment, 2013 Edition

1.14 CONFORMANCE WITH EXISTING SYSTEMS

A. In cases where systems and/or facilities in this scope of work are similar in nature to existing systems and/or facilities:

1. The required hardware, system functionality and system flow shall conform to the existing systems in order to share existing resources and minimize training requirements for the end user. This includes, but is not limited to, the following:
    a. Commonality in equipment
    b. Commonality in operation
    c. Commonality in room layout

B. It is the responsibility of the Contractor to inspect the existing systems prior to beginning engineering and fabrication to ensure consistency with any and all existing systems and notify the design team of any discrepancies.

1.15 STATUS REPORTS

A. After the award of contract, the Contractor is responsible for providing weekly status reports outlining his progress on the project. These reports should include information on the work completed during the week, the work to be completed during the upcoming week and any

potential scheduling issues. The following should be included in this Status Report:

B. Expected date of project submittals, including equipment cut sheets, shop drawings, control system interface designs, etc.

C. Anticipated completion date and percentage complete of in-house rack fabrication and testing, prior to shipping to the job-site.

D. Anticipated completion date and percentage complete of control system programming, prior to shipping to the job-site.

E. Schedule and percentage complete of on-site wiring and supervision.

F. Schedule and percentage complete of on-site installation.

G. Schedule and work-plan outline for owner training.

H. Schedule for systems checkout and turnover to the Owner.

1.16 RELATED WORK NOT IN CONTRACT (NIC)

A. Certain equipment and materials will be provided and installed by others. Unless otherwise indicated in these specifications, or on the related drawings, these will include the following:

1. Pathway infrastructure, structural evaluation and support and 120/208V electrical circuits and modifications will be provided as described in Part 1.1 under the District's JOCs for each Scope.
2. Enterprise IP network hardware, such as IP switches, routers, wireless access points (WAPs), enterprise servers and end-user computing devices, such as desktop PCs, tablets, smartphones, and terminal hardware will be provided by SPS Information Technology.
3. Enterprise IT infrastructure, such as horizontal and riser backbone and station copper UTP and fiber-optic cabling, terminations, patch-panels, fiber trays and patch panels. All IT infrastructure shall be coordinated and provided by SPS Information Technology group and their designated Contractors and Subcontractors.

B. Though not under the scope of this document, the Audiovisual Systems Contractor is responsible for coordination of these and any other related items required to provide and integrate a fully functional AV system as described in this specification, including accessory hardware or cabling necessary to interface to the NIC equipment.

1.17 OWNER FURNISHED EQUIPMENT

A. The Contractor shall be responsible for obtaining any new or existing OFE equipment from the Owner. Existing equipment shall be brought back to the Contractor's facility where they shall ascertain that the OFE equipment is performing at or above factory specifications.

B. If existing equipment is not operating "as-new", or is missing accessories necessary to be properly integrated with the rest of the system as intended, the Contractor shall provide a proposal, including a time line, for returning the equipment to "as-new" condition, provide the needed accessories, arrange to have the owner replace equipment, or submit a proposal for replacement or alternative equipment.

C. All designated desktop, laptop or tablet computers to be installed in rooms for use by staff will be OFE, provided and configured by SPS Information Technology.

D. The contractor shall coordinate with the SPS Information Technology for all I/O interfacing and performance requirements, including any specific hardware and software requirements, including CPU or GPU performance, RAM, input connectivity and quantities (i.e.: HDMI, Display-Port, 3.5mm audio USB 2.0/3.0/3.2 buses, etc.)

1.18 QUALITY OF MATERIALS AND EQUIPMENT

A. All materials and equipment supplied by the Contractor shall be new and shall meet or exceed the latest published specification of the manufacturer in all respects.

B. The Contractor shall supply the latest model available at the time of order placement for each piece of equipment.

C. All equipment shall be UL listed, or equivalent.

1.19 CONTRACTOR'S DOCUMENTATION

A. Pre-Construction Submittals

1. Prior to fabrication, the Contractor shall submit to the Owner's Representative, for approval, any custom designs pertaining to the systems. Contractor is to provide one (1) sets of all documentation. Drawing submittals to be delivered electronically in PDF and working format (such as AutoCAD or Revit 2021) to ABD and the Owner, and at their option to the architect. These designs include, but are not limited to, the following:

   a. Complete system construction and point to point wiring schematic drawings, including all component values, and showing complete letter and number identification of all wire and cable as well as jacks, terminals, and connectors. All connections are to be shown; details with "typical" connection diagrams are not acceptable.

   b. Provide bound technical specification details (cut sheets) on all equipment required to complete this project.

   c. All control system GUI design pages, both touchpanel-based and control computer based as appropriate.

   d. All control system panel layouts, where applicable.

   e. All panels, plates, and designation strips, including details relating terminology, engraving finish and color.

   f. All custom designed structures, supports, rigging (motorized and fixed) consoles, tables, carts, support bases, and shelves.

   g. Schematic drawings of all custom components, assemblies and circuitry, including wall and/or floor plates.

   h. A schedule of IP networked equipment, in Excel format, which lists, for each piece of equipment with IP network interface – whether intended to be hosted to a dedicated AV network, or on the enterprise network – to be coordinated with the Owner's IT group:

      i. Device name (as noted on the schematics), make and model number

      ii. Device serial number

      iii. Device MAC address

      iv. Static IP address request, range, or DHCP

      v. Subnet assignment or VLAN request.

      vi. Default and assigned login credentials (see Part III)

      vii. List of open port requests, to accommodate specific user or protocols.

      viii. List of switch settings or configuration necessary to accommodate specific AV related protocols such as:

         a) IEEE 802.1Qat

         b) IGMP snoop and fast-leave settings

         c) Querier assignments

      ix. Matrix list of all Dante I/O assignments in Dante Controller, showing fixed/locked Dante routes and open Dante routes/channels for flexible assignment/reassignment by crew. A default Dante setup should be included for reference as a typical I/O

assignment to/from DSP.

i. All unusual equipment modifications.

j. Run sheets or field wiring details.

k. Patch panel assignment layout drawings.

l. Electrical distribution and modifications/expansions, including all one-line diagrams, load-calculations for existing distribution with new breakers, distribution panels, transformers, branch panels, feeders, PDUs, UPSs, and programmable sequencing switched-breaker panels and accessories.

m. Elevation Drawings of each equipment rack, both front and rear as appropriate.

n. All items of equipment, whether a stock manufactured item or custom-built item, shall be supported by complete and detailed schematic drawings and replacement parts lists. No "black boxes" or unidentified components shall be acceptable under this specification.

o. Verification of the focal lengths of projection lenses to achieve the specified image sizes.

p. Testing procedures, passing criteria and checklists for all systems included in this specification. Testing procedures are to include (at a minimum) testing methods, materials, equipment, and documentation of results to be provided.

q. Submittals not providing testing procedures will be rejected.

r. ***Submittals that copy, in part or in entirety, the Bid Documents or Construction Documents verbatim, will be rejected.***

1.20 SUB-CONTRACT

A. No sub-contract will be permitted for the Contractor's responsibilities, as herein defined, unless specifically identified in the bid submission and approved by the Owner.

B. The Contractor shall have sole responsibility for the satisfactory implementation of each system, even though the Contractor may have sub-contracted a portion of the installation or had certain manufacturers install their own equipment.

1.21 COOPERATION WITH OTHER TRADES

A. It shall be the responsibility of the Contractor to cooperate at all times, and to the fullest extent, with all trades doing work in the building, to the end that lost time, work stoppages, interference, and inefficiencies do not occur.

B. It shall also be the responsibility of the Contractor to participate in the preparation of coordination drawings and attend coordination meetings, before and during construction, at the request of the Construction Manager. It is not anticipated that these meetings will be held more than once a week.

1.22 EQUIPMENT DELIVERY AND STORAGE

A. All equipment delivered prior to installation shall be stored by the contractor, at their place of business. Costs of all shipping, and of all unusual storage requirements, shall be borne by the Contractor. The contractor shall inform the owner seven (7) days in advance to delivery to the site. It shall be the responsibility of the Contractor to make appropriate arrangements, and to coordinate with authorized personnel at the site, for the acceptance, handling, protection, and storage of equipment so delivered.

1.23 CLEANUP AND REPAIR

A. Upon completion of work each day the Contractor shall remove all his refuse and rubbish from and about the premises, and shall leave the relevant areas and equipment clean and in an operational state. The Contractor shall be responsible for repairing any damage caused to the premises by the Contractor's installation activities, at no cost to the Owner. All repairs are to be

completed by the General Contractor and will be billed to the AV Contractor.

1.24 OWNER TRAINING

A. The Contractor shall provide on-the-job training by a suitably qualified instructor, to personnel designated by the Owner, to instruct them in the operation and maintenance of the systems. In the event the Contractor does not have qualified instructors on staff for certain sophisticated equipment, the contractor will provide a manufacturer's representative for such instruction to the owner at no additional cost. All training shall take place after the systems are operational and accepted. Owner is to retain 10% of contract fee until completion of owner training. There shall be a minimum of 12 hours, over four (4) sessions of end-user training included in this specification. The cost to train owner's personnel to service the equipment shall be listed separately by item of equipment.

B. The Contractor shall facilitate availability of self-directed online training to Owner's technical staff and IT support for network systems and software, such as:

1. Audinate Dante audio networking, including software such as Dante Controller, Dante Virtual Soundcard, Dante VIA, and if applicable – Dante Domain Manager.
2. IGMP-Snoop based encoder/decoder systems and management platforms, such as: Extron NAV, Q-Sys NV, etc…

1.25 PUBLICATION

A. No information relative to this job may be released for publication without prior written approval from the owner, Architect and Owner's Representative.

1.26 INSURANCE

A. Before commencing work, the Contractor shall procure and maintain, during the life of the contract, such comprehensive liability and property damage insurance as shall protect him and the Owner from claims for bodily injury, including death, and claims for property damage which may arise from the operations under this contract.

B. See attached documents for detail and insurance requirements.

PART 2 - PRODUCT

2.1 EQUIPMENT AND MATERIALS—GENERAL

A. All equipment and components shall be new and the manufacturer's current model.

B. All components and the system as a whole shall meet or exceed the minimum standards issued by the EIA and TIA.

C. All work and materials in conjunction with this installation shall meet or exceed the provisions of the current edition of the National Electrical Code and other applicable codes.

D. The materials, appliances, equipment, and devices shall be tested and listed by Underwriters' Laboratories, Inc. or other similar testing agency. The system shall be listed by U.L. or other testing agency, and each major component shall bear the manufacturer's name, catalog number, and U.L. or other testing agency label.

E. The Installing Contractor shall be responsible for providing a complete and fully functional system, including all necessary components, whether included in this specification or not.

F. Pricing for Alternates shall be provided on the same document as the base bid, under a separate line item for each Alternate. All costs associated with each Alternate shall be included in the price for each.

2.2 MANUFACTURERS

A. Listing of approved manufacturers for each component follows component description below and within the Appendix 'A' documents.

2.3 COMPONENTS

A. The following approved manufacturers, quantities, and model numbers shall form the basis of the system. These are minimum requirements. Installing Contractor shall verify all quantities prior to ordering and installation. Quantities are provided for reference only. Installing Contractor is still responsible to provide a complete and working system without claim for additional payment. All equivalents and alternates must be approved by the Consultant prior to system installation.

B. The Installing Contractor shall furnish all equipment and work as noted on the drawings or specifications. Contractor shall follow the specific design references and account for clear design intent. In case of a conflict between the drawings and specification, furnish the equipment and work with the greatest cost impact.

2.4 EQUIPMENT

A. Provide all equipment, including hardware devices, accessories, mounts and mounting hardware as per the Appendix ‘A’ Equipment List included in the drawings. Provide pricing and quantities, per manufacturer and model numbers listed.

B. Where options and accessory selections exist that are not identified in Appendix ‘A’, provide pricing for base-line option, with finish, color or option selection to be determined through submittal process, by Architect and Consultant.

C. Provide costs for all wiring, connectors, terminations, fasteners, labels, and miscellaneous hardware not noted by individual lines under then row so named in the Appendix ‘A’ section.

D. Provide costs in the spaces provided, with the Master Recap sheet to include totals for equipment, and related costs for:

1. Engineering time
2. Pre-Installation labor and services
3. Installation labor and services (on-site)
4. General and Administrative Costs
5. Total for all Scope and Work

2.5 WIRE, PLATES, SPLITTERS, BOXES

A. AV plates (see drawings for details and qty): All panels and plates are to be constructed of engraved black laminate with 1/8” steel backing or engraved black anodized aluminum unless otherwise noted. All lettering is to be white and should be easily readable.

1. Unless otherwise called for in these specifications and drawings, the following cables, or their approved equals, shall be used in these systems:

Type	Manufacturer	Non-Plenum	Plenum
RF-50 Ohm (Horizontal RG-8)	Times Microwave	LMR400	LMP400
RG-58 (50 OHM)	Belden	8262	82240
Video (SDI)	Belden	4505R	4505P
Control (4 conductor shielded)	Belden	1502R	1502P
Audio (mic/line) (balanced or unbalanced stereo)	Belden	9451/1266A	6200UH
Audio (analog production intercom – 2 channel)	Belden	1814R	9451DP

Audio (mic/line – balanced stereo)	Belden	1266A/9451D	9451DP
Audio (8 Ohm program speakers)	Belden	8473	1861A
Audio (70 Volt Speaker)	Belden	8461	1863A
Audio (NL4 Speaker tie lines)	Belden Gepco	5202FE SSS164R	6202FE SSS164P
Audio (NL2 Speaker tie lines)	Gepco	SSS122R	SSS122P
Multi-Channel Audio	Belden	8774	88778
HD-Base-T (DM) & AV-over-IP, CAT6a-F/UTP (Ethercon tie-lines)	Belden	10GX62F	10GX63F
Ethernet (control/enterprise), CAT6a UTP	Belden	10GX32F	10GX33F
2- and 4- Strand Fiber Riser Cable OS1 Single-mode Fiber	REFER TO SECTION 27 13 00 (or related structured cabling sections)		

Note: These cable types are cited to illustrate the type and quality of cable required. Unless otherwise noted, cables from other manufacturers, i.e. Canare, CommScope, Extron, Liberty, etc. will be considered if data sheets indicating equivalency are submitted to Consultant for approval prior to installation.

PART 3 - EXECUTION

3.1 INSTALLATION PRACTICES

A. General

1. Installation shall include the delivery to the installation site, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, interconnecting wiring of the system components, equipment alignment and adjustment, programming and configuration and all other work whether or not expressly required herein which is necessary to result in complete and fully operational systems.
2. Prior to ordering equipment, the contractor shall coordinate the frequencies of all wireless devices to prevent unwanted interaction between devices and rooms. This includes, but is not limited to, wireless microphones, assisted listening system devices, wireless control panels, etc.
3. All accessories, including rack mounting hardware, power supplies, etc., shall be obtained from the original equipment manufacturer. Unless otherwise noted or specified, third party accessories shall not be used.
4. All installation practices shall be in accordance with, but not limited to, these specifications and drawings. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of National, State, and Local authorities having jurisdiction.
5. If, in the opinion of the Contractor, an installation practice is desired or required, which is contrary to these specifications or drawings, a written request for modification shall be made to the Design Team. Modifications shall not commence without written approval from the Design Team.
6. During the installation, and up to the date of final acceptance, the Contractor shall be under obligation to protect his finished and unfinished work against damage and loss. In the event of such damage or loss, the damage shall be replaced or repaired at no cost to the Owner.

B. Physical Installation

1. All equipment shall be firmly secured in place unless requirements of portability dictate

otherwise.

2. All equipment shall have an engraved plaque permanently affixed, denoting its function.
3. Fastenings and supports shall be adequate to support their loads with a safety factor as per AHJ. All boxes, equipment, etc., shall be secured plumb and square.
4. Projectors, lenses, and mirrors shall be solidly mounted and braced or isolated, so that there is no observable movement in the image induced by motor vibration or other mechanical operations at the intended minimum viewing distance.
5. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.
6. All overhead equipment must have security cables attached to the building structure to assist in the prevention of loss as required by building code.

C. Finishes, Trim and Escutcheon Components

1. To insure a proper finished appearance, the AV Contractor shall furnish and install trim/escutcheon components at all conditions where A/V components pass through the finished ceilings. This would include but not be limited to video projector supports, television monitor/receiver supports and any other component which is not specifically supplied with integral flanges/trim components, i.e. speaker mounts, assistance listening devices, etc.
2. The visible component of any trim should be minimal in size, preferably no wider than 1/2". All trim components at the ceiling plane shall be finished to match the approved ceiling finish. The audiovisual contractor should obtain a sample from the General Contractor, including any custom color information, or standard color numbers.
3. All visible components and finish options shall be submitted to the Design Team for review and approval prior to fabrication.

D. Raceway Systems and Cable Installation

1. All wire bundles are to be neat and combed free of cable crossovers.
2. All cables, regardless of length, shall be marked with a permanent, self-laminating wrap-around number or letter cable marker at both ends, similar to the Panduit "Pan-Code" system. Labels must be computer-generated for legibility. Wire labels done by hand in the field must be replaced with computer generated labels. There shall be no unmarked cables at any place in the system. Marking codes used on cables shall correspond to codes shown on drawings and or run sheets.
3. All cables shall be grouped according to the signals being carried. In order to reduce signal contamination, separate groups shall be formed for the following cable families:
    a. Power cables
    b. Control cables
    c. Data cables (both IEEE 802 and proprietary signal types (HD-Base-T)
    d. Video cables
    e. Audio cables carrying signals less than – 20 dBm
    f. Audio cables carrying signals between – 20 dBm and +20 dBm
    g. Audio cables carrying signals above +20 dBm
4. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of an equipment rack as viewed from the rear. All other cables shall be run on the right side of an equipment rack, as viewed from the rear.
5. Cables ties shall be placed at appropriate intervals of no greater than six inches for vertical bundles, two inches for horizontal bundles.
6. All vertical cable bundles shall be attached to the rack frame.
7. 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 TERMINATIONS 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 Velcro ties.

8. All solder connections shall be made with rosin-core solder using temperature-controlled solder stations. Care shall be taken to avoid cold or cracked solder joints. Any 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.
9. Mechanical connections using insulated, crimp-type connectors shall be bonded to the connector by soldering the wire to the metal part of the connector.
10. Connections made with screw actuated pressure type terminal strips shall be made by stripping approximately 1/4 inch of insulation from the stranded conductor. Then the un-tinned wire shall be inserted into the terminal and the screw tightened using a secure fitting precision screwdriver.
11. Terminal blocks, boards, strips or connectors shall be furnished for all cables which interface with racks, cabinets, consoles, or equipment modules. No audio cables shall run directly to the audio patch panel jacks. Each audio patch panel shall be furnished with an audio terminal block and all audio cables to and from the audio patch panel shall terminate on this block.
12. All wire markers shall face a common direction.
13. All cables shall have proper connector housing.
14. Cables shall not protrude from the back of racks.
15. All cable entry shall be through the tops of racks or through entrance holes in the base of the rack. No cable shall enter racks through front, rear or side panel openings.
16. All cables that can be terminated in the field (except video and pulse cables, which must be cut to an electrical length) shall be cut to the length dictated by the run. No splices shall be permitted in any pull boxes without prior permission of the Consultant. For equipment mounted on casters, in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length.
17. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer.
18. Where cables are visible, the cables will be sheathed in a color wrap that has been submitted for approval by the Design Team.
19. All cables and cable bundles shall be bound using only Velcro wrap, flexible rubber wrap, or other approved means. Ratcheting zip-ties are prohibited and will not be accepted.

E. Connection Plate Receptacles unless otherwise specified:

1. Audio (microphone or line level) – XLR type.
2. Audio (loudspeaker level) – Neutrik Speakon®.
3. HD-Base-T and AV-over-IP (QaT and IGMP-Snoop based systems) – Neutrik Ethercon, Ruggedized RJ-45, CAT6A compliant, full-shielding for F/UTP applications.
4. Audio over IP (Audinate Dante, AES67, AVB (IEEE 802.1 TSN) - Ruggedized RJ-45, CAT6A compliant, full-shielding for F/UTP applications.
5. Intercom – XLR or ¼ inch diameter tip/ring/sleeve type, or as required by the intercom system. Jack shall be insulated from panel type.
6. 3G/12G SDI Video – BNC type (50 or 75 Ohm as required).
7. DVI (Inclusive of DVI-A, DVI-I and DVI-D signal types) – DVI-I type connector unless otherwise specified.
8. HDMI – HDMI 2.1b compliant with locking nut.
9. USB – USB Type A (for 2.0/3.0 applications), USB Type C (for 3.0/3.1 and later applications, including high-power charging).
10. Category 6/6A – RJ45 Type, full shielded body/barrel.
11. **Note**: All connectors on wall plates, or in other exposed locations, are to be recessed, and when able, to have the face-flange mounted behind the panel.
12. Panels finishes shall be as approved by the Architect, with typical panels finished in white powder coat (not ivory) white finished Philips screw heads to match. Where available,

connector finishes shall be white or clear nickel.

F. Patch Panel Assignments

1. All patch panels shall be wired so that signal “sources” (outputs from) appear on the upper row of a row pair; and all “loads” (inputs to) appear on the lower row of a row pair.

G. Patch Panel Designation Strips

1. All audio and video patch panel designation strips shall utilize alphanumeric identifications and descriptive information. The jack position in each horizontal row shall be numbered sequentially from left to right. The horizontal jack rows shall be lettered sequentially from top to bottom. The alphanumeric identification of each jack shall be included on the functional block drawings, as well as on reproductions of these drawings, which shall be mounted in an appropriate location near the patch bays.

H. All IP switches furnished by the Contractor, whether specified by the Consultant or Owner, or not specified, shall be verified for use in their intended application by the manufacturer of the transport platform being supported by the IP switches in the systems. Applications shall include, but not be limited to:

1. AV-over-IP transport platforms, such as:

a. Creston NVX

b. Extron NAV

c. QSC Q-Sys

2. Audio-over-IP transport platforms, such as:

a. AVB audio (refer to Part 3)

b. Audinate Dante

c. AES67 standard transport

I. Network switches provided shall meet the minimum bandwidth requirements, not only of the endpoint nodes, but also provide adequate switching and ‘backplane’ bandwidth to allow support of all endpoint nodes that will be in simultaneous use in the system or network segment in question.

J. IP network equipment whether wired or wireless, shall – immediately upon delivery to the integrator for configuration, have all default login credentials replaced with secure login credentials, as specified by the Owner’s IT group. These credentials shall be documented in the equipment IP coordination table, as specified in 1.19.A.1.h.

K. Maintaining Ground Integrity

L. In order to minimize problems resulting from improper grounding, and to achieve maximum signal-to- noise ratios, the following grounding practices shall be adhered to in order to maintain the integrity of the grounding system:

1. General

a. Because of the great number of possible variations in grounding systems, it shall be the responsibility of the Contractor to follow good engineering practice, as outlined below, and to deviate from these practices only when necessary to minimize crosstalk, ground loops, ground- induced noise, and to maximize signal-to-noise ratios in the audio, video, and control systems.

2. System Power Ground

a. A single primary “system ground” shall be established for the system in each particular area. All grounding conductors in that area shall connect to this primary system ground.

b. The system ground shall be provided at the audio equipment rack for the area, and shall consist of a copper bar of sufficient size to accommodate all secondary ground conductors. A copper conductor having a maximum of 0.1 Ohms total resistance shall connect the primary system ground bar to the nearest approved ground. The Contractor shall be responsible for determining if the metallic conduit is properly electrically bonded to the building ground system.

c. Secondary system grounding conductors shall be provided between all racks, audio consoles, and audiovisual system equipment local to the area. Each of these grounding conductors shall have a maximum of 0.1 Ohms total resistance.

d. Under no conditions shall the AC neutral conductor, either in the power panel or in a receptacle outlet, be used as a system ground, except as specifically defined by NFPA 70 for bonding.

e. Ungrounded equipment with either an inline transformer or a 2-prong plug, shall be bonded to the rack bus bar using #12awg cable.

3. Audio Cable Shields

a. All audio cable shields shall be grounded at one point only. There are no exceptions. For inter and intra-rack wiring, this requires that the shield be connected at one end only. For ungrounded portable equipment, such as microphones, the shield shall be connected at both ends but grounded at only one end.

4. Video Receptacles

a. All video receptacles that are provided and installed by the Contractor shall be insulated from the mounting panel, outlet box, or wireway. Unless otherwise detailed herein, this shall be accomplished by using insulated-from-panel type receptacles.

5. Audio Receptacles

a. All audio receptacles that are provided and installed by the Contractor shall be insulated from the mounting panel, outlet box, or wireway. Unless otherwise detailed herein, this shall be accomplished by using insulated-from-panel type receptacles.

3.2 GENERAL SYSTEM PERFORMANCE STANDARDS

A. Unless restricted by the published specifications of a particular piece of equipment, or unless otherwise required under the Detailed Specifications, the following performance standards shall be met by each system. The signal paths for the above Performance Standards shall be as follows: From all source inputs to all signal destinations. See Contractor System Checkout 3.3 for testing procedures.

B. Analog Audio

1. Frequency Response: Within plus or minus 0.5dB, 20 Hz to 20,000 Hz
2. Signal to Noise Ratio: greater than 90dB (including crosstalk and hum at all input/output levels)
3. Total Harmonic Distortion: 0.05% maximum from 20 Hz to 20,000 Hz.
4. Input Levels

a. Microphone (Nominal) ..... -50dbu

b. Overload (Minimum gain) ..... -5dbu

c. Maximum Gain..... -26dbu

d. Line (Nominal) ..... +4dbu

e. Overload (Minimum gain) ..... +24dbu

f. Maximum Gain..... +9dbu

g. Input Common Mode Rejection..... >100db Output Levels

h. Line (Nominal) ..... +4dbu

i. Maximum..... +24dbu

j. Output Impedance..... < 0.5 Ohms

k. Load Impedance..... >150 Ohms

C. 3G SDI – Per SMPTE 424M

D. 12G SDI – Per SMPTE ST-2082

E. HDMI – Per HDMI Ver. 1.4b; HDMI 2.0b

F. DVI – Per DVI Ver. 1.0

G. Display Port Version 1.4

H. Audio Video Bridging (AVB)

1. IEEE 802.1AS: Timing and Synchronization for Time-Sensitive Applications
2. IEEE 802.1Qat: Stream Reservation Protocol (SRP)
3. IEEE 802.1Qav: Forwarding and Queuing for Time-Sensitive Streams
4. IEEE 802.1BA: Audio Video Bridging Systems

I. Audiovisual System, Control System and User Interface Programming

J. Control system user interfaces pages and programming shall be designed for this project exclusively. While there are a great number of design approaches to designing the user interface, the following guidelines shall be adhered to:

1. The use of custom system programming from prior projects and/or ‘modules’ provided by a given manufacturer or programmer may or may not meet the functional intent of the systems and work described herein. It is the responsibility of the contractor to meet the functional intent of the systems in this specification, including any and all necessary modification of program code or creation of custom modules as required.
2. The operation(s) of all system(s) are to match the functional intent already implemented at the owner’s facilities as applicable.
3. All panels are to have the time and date as icons, in the same position on every page.
4. All panels are to have a title, indicating the piece of equipment and/or functionality being controlled.
5. Final programming shall include capability to remotely control all functions of the audiovisual system. Only functions required for normal use shall appear on top level pages while underlying “Tech Pages” shall provide access to full manufacturer’s remote control functionality.
6. Devices similar in nature shall be programmed to operate with a common format.
7. No individual component shall be programmed to function atypically.
8. Whenever the same button appears on more than one page, it will be in the same position on each page.
9. Where feasible, multi-level access to controls should be implemented. See paragraph “e”, above.
10. During performance testing, all equipment shall be operated under standard conditions as recommended by the manufacturer.
11. Please see Detailed Specifications for further information on specific control system programming requirements.

3.3 CONTRACTOR CLOSEOUT DOCUMENTATION

A. Close Out Submittals

B. At the completion of the installation, the Contractor shall provide one (1) set of electronic copies,

and to the Owner one (1) set of hard-copies of each of the following:

1. Test results, in “spreadsheet” format, of electrical audio and/or video performance testing for all systems end-to-end in every room and/or between rooms as applicable.
2. **Note***: It is the sole responsibility of the Contractor to fully test the audiovisual systems prior to Consultant check-out and verification*. Until these test results are provided, no audiovisual systems check-out or verifications (functional or otherwise) will be performed by the Consultant. If any anomalies in system performance are detected, the Contractor shall correct these before performing any other tests.
3. Results of RF Spectrum analysis as used to establish available frequencies for wireless devices included in this contract.
4. Equipment manufacturer’s operation manuals for each piece of equipment.
5. “As-built” drawings for every item indicated in the “Detailed Specification” sections of this specification as installed. A final, approved copy shall be placed in a metal pocket mounted on the inside of the rear door of the rack. Contractor to coordinate the preferred format (hard copy or digital) of these documents with the owner upon completion.
6. System functional block drawings showing all input and output circuit cable and terminal block numbers as well as all jack field circuit I.D. designations. A copy of these drawings shall be framed in protective plastic and mounted near the equipment racks, or as otherwise directed by the owner.
7. A System Operation and Maintenance Manual. This manual shall be produced by the Contractor especially for the systems detailed herein. The “Operation” section shall describe all typical procedures necessary to activate each system to provide for the functional requirements as listed under the Detailed Specifications. Manuals will use graphical representation of touch panel screens, as to easily be identified by user. Owner’s Manuals and/or Operations manuals supplied by manufacturers for a given piece of equipment, though required, are not acceptable substitutes for these materials.
8. The reader of this manual shall be assumed to be technically competent, but unfamiliar with this particular facility. Additionally, the Contractor shall provide a single page of basic operating instructions for each room, and other audio-visually equipped spaces.
9. The “Maintenance” section shall provide a recommended maintenance schedule with reference to the applicable pages in the manufacturer’s maintenance manuals. Where inadequate information is provided by the manufacturer, the Contractor shall provide the information necessary for proper maintenance.
10. In addition to the Operation and Maintenance Manual(s), the contractor shall provide a simplified user’s guide (“cheat sheet”) for each audiovisual system.
11. Copies of all software files and program source-code files, including all source code for: control systems, touch-panels, control-panels, event-controllers, audio and AV DSP platforms. These files shall become the property of the Owner and shall be provided under the agreement that they will not be used by the Owner for outside Work for Hire, but for maintenance and upgrades to the installed systems in the facilities.
12. Finalized IP equipment tables as specified under 1.19.A.1.h., including a record of the last version of firmware installed on each piece of equipment.
13. All and any online account information and login credentials for cloud-based or software services provide to the Owner by the Contractor, for continued support and maintenance.

C. Distribution

1. Three copies of the above documentation will be retained by the Owner.
2. One copy of the above documentation will be retained by the Architect.
3. One copy shall be delivered to the Owner’s Representative prior to the System Commissioning.
4. At least one copy of the above documentation will be retained by the Contractor.

D. Procedure for Resubmitting

1. Make corrections or changes in O & M and/or Record Drawings as required by the Architect

and resubmit when the Architect's stamp requires re-submittal.

2. Clearly identify changes made other than those specifically requested by the Architect when resubmitting Record Drawings. Changes shall be clouded or similarly highlighted as coordinated with the Architect. Only changes that have been specifically requested by the Architect or have been clouded by the Contractor will be reviewed on resubmittals.
3. Any drawing sheets added to the resubmittal shall be clearly identified and clouded, and shall not change the sheet numbering scheme for previously issued Record Drawings.
4. The Contractor shall be responsible for any delays caused by the re-submittal process.

3.4 CONTRACTOR SYSTEM CHECKOUT

A. Before Commissioning Tests are scheduled, the Contractor shall perform his own system checkout based upon an approved testing procedure for the systems. The Contractor shall furnish all required test equipment and shall perform all work necessary to determine and/or modify performance of the system to meet the requirements of this specification. The Contractor shall submit a testing plan (refer to 1.18-A.-15) for approval by the individual or firm representing the Owner during the Audiovisual Installation. At a minimum, the following sub-components of the Audiovisual System shall be tested and verified:

1. Cable and Connectors
    a. All cables and connectors shall be tested and verified to comply with the manufacturer's specifications and design intent.
    b. Cable test results shall be submitted in advance of the Commissioning for review by the Owner's Representative.
2. Devices
    a. All devices shall meet the functionality as specified by manufacturer.
    b. If any device is found to deviate from the manufacturer's functionality it shall be replaced by the Audiovisual Systems Contractor at no cost to the Owner.
3. Signal Types
    a. The Audiovisual System shall be tested to comply with all video and audio standards as specified in the Performance Standards section and described by the design intent.
4. System Function
    a. The cables and connectors, devices, and signal types shall meet the functional requirements as specified by the design intent.
    b. Acceptable testing procedures may include but is not limited to that which is described in the detailed specifications such as (streaming, push-to-talk, annotation, etc.)
5. Document that all matrix switching crosspoints have been tested and verified.
6. Test all audio and video systems for compliance with the Performance Standards, using the example procedure outlined in appendix A:
    a. Test Equipment.
        i. The following test equipment (or submit equivalent for approval) shall be used to test the systems on site:
            a) Video Testing:

i) Digital video and Audio test generator, Extron VTG 400 DVI

ii) Digital Video test generator with EDID and HDCP components, PureLink HDG-8000 PRO

iii) Media and portable hardware (i.e laptop) representative of all types found in the subject system including but not limited to Blu-ray ™ players and discs (provide discs with and without HDCP encrypted content), mobile PC/Tablets.

iv) Video cable

v) Set of terminations, 'T' pieces etc.

b) Audio Testing:

i) Time based measurement system, Goldline TEF20 or SIA Smaartlive with laptop PC, calibrated omnidirectional mic, and appropriate interfaces.

ii) Audio test set, Audio Precision ATS-1DD

iii) Media representative of all types found in the subject system.

iv) Audio cables as required to connect test equipment to the system.

v) Set of terminations, adapters etc.

c) Gain Setting

i) Adjust all systems (end to end within a system) for maximum signal-to-noise ratio. No hiss should be audible through any loudspeaker at the completion of gain structure setting, and all audio gain stages should clip simultaneously.

d) Signal Paths

i) Video/Audio

- Connect the output of the video signal generator to a floor box/table/rack connector and select the "Full Field Color Bar" signal. Connect the combined waveform monitor/vectorscope to a final output point, e.g. an input to a picture monitor or video projector. Ensure that the test signal is routed to the selected output.
- Measure and record the signal amplitudes.
- Repeat item 'i' after selecting the "Multiburst, 50 IRE" test signal.
- Measure and record the signal amplitudes.
- Repeat item 'i' after selecting the "Modulated 5-step" test signal.
- Measure and record the signal differential phase and gain.
- Repeat item #'s 'i' through 'vi' for other video signal paths.
- Repeat item 'i' after selecting the Window test signal.
- Measure and record the signal line and field tilt.
- Repeat item 'i' after connecting the Black Burst signal from a rear mounted connector.
- Measure and record the signal/noise ratio.
- Connect the output of the audio test set to a floor box/table/rack program audio connector and connect the input of the audio test set to a final

output point, e.g. an input to a program speaker power amplifier. Ensure that the test signal is routed to the selected output, that the volume control is set to 100% and that the equalizers are bypassed.

- Measure and record the signal/noise ratio, total harmonic distortion and frequency response.
- Repeat items ‘xii’ and ‘xiii’ for other audio signal paths.
- Connect the output of the audio test set to a floor box/table/rack speech audio connector and connect the input of the audio test set to a final output point, e.g. an input to a speech speaker power amplifier. Ensure that the test signal is routed to the selected output, that the volume control is set to 100% and that the equalizer is bypassed.
- Measure and record the signal/noise ratio, total harmonic distortion and frequency response.
- Repeat items ‘xv’ and ‘xvi’ for other audio signal paths.

e) HDMI

i) Using an appropriate HDMI generator, HDCP enabled, test for correct resolution and timing of all HDMI input signals and signal transmission coming into the display using the entire cabling path to the extent possible.

ii) Test each HDMI input to verify working condition.

iii) Test and verify video type, picture and audio.

iv) Verify HDCP sources can be routed to all destinations.

v) Verify EDID configuration and functionality.

vi) Verify CEC functionality (if being implemented) and that automatic CEC functions do not affect the display.

vii) Verify displays can switch between and display different resolutions and color space.

viii) Verify images are stable, no scaling artifacts or latency.

f) HDMI 2.1

i) Future capabilities to include: 4K@120 up to 8K@60, resolution up to 10K, 48 Gbps b/w uncompressed, backwards compatible, eARC, VRR, QMS, QFT, ALLM.

ii) 4K

1. Test and verify HDMI cables and product can support 4K functionality when connected to a 4K device.
2. Test and verify HDMI can transport 4K video at 50-60 frames per second, support 4096 x 2160 (UHD 3840 x 2160) resolution, color bit depth 10bit up to 12 bit.

iii) Data rates

1. Test and verify HDMI can pass data rates at a minimum of 10.2 Gbit/s and up to 18.0 Gbits/s.

iv) Refresh rates

1. Test and verify product can support common refresh rates up to 120Hz.

g) KVM/USB

i) Test and verify USB-passes high speed, functional, electrical, mechanical and legacy compliance testing.

ii) Can use a USB test tool analyzer or software test package to verify driver and hardware interoperability.

iii) Test and verify USB 2.0, 3.0, or 3.1 performance pertaining to system design.

iv) Test and verify that USB host and endpoint function correctly for its intended application.

v) If using USB as a controller:

vi) Verify that host can recognize attached devices and install appropriate drivers.

vii) Verify power budget if connecting to multiple devices, that power does not exceed manufacture specified power requirements.

viii) If using USB or KVM extenders, test and verify all data cables and connectors pass conformance testing. This includes but not limited to data rates, skew, return loss, resistance etc. according to test manufacture specifications.

h) HD-Base-T

i) Test and verify all data cable and connectors pass conformance testing. This includes but not limited to data rates, skew, return loss, resistance etc. according to test manufacture specifications.
ii) Test and verify audio source and video source from point of origination through HD-Base-T system to the destination functions correctly.
iii) Test and verify rs232 control functionality.
iv) Test and verify HD-Base-T system functions within system configuration.

i) Streaming

i) Bit Rate – image quality, 8-15 Mbps
ii) Latency - ensure that a minimal level of audio quality and latency are sustained so as to not degrade the user experience.
iii) Buffer – how long before the video loads and ready to watch.
iv) Lag – is the playback smooth, watch and wait time.
v) Does the network service provided by the ISP furnish the necessary QOS to acquire, render, search, broadcast and deliver content for the intended application?
ix) Check that the image is correctly displayed on the picture flat panel display(s) and/or by the video projector.

j) Display Set-up and Calibration:

i) Set up display for intended usage per manufacture recommendations.

ii) Allow display to warm up to standard operating temperatures.

iii) Setup and verify that display is set to its native resolution.

iv) Setup and verify correct aspect ratio, verify no overscan or underscan.

v) Bring up a proper test pattern.

vi) Perform colorimetry calibration.

vii) Set pixel clock and phase as required.

viii) Use a black PLUGE pattern, or appropriate test pattern generator to set black level.

ix) Use a white PLUGE pattern, or appropriate test pattern generator to set white level.

B. At the conclusion of the tests, return all equipment settings to previously calibrated positions.

C. Provide written records of all test results in spreadsheet form.

D. Check all control functions, from all controlling devices to all controlled devices, for proper operations.

E. Adjust, balance, and align all equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for all level controls, and record these settings in the "System Operation and Maintenance Manual".

F. Check all optical projection images for average light level, light fall-off, and image alignment and size to comply with the Performance Standards and specifications drawings. Check to determine that all projectors, projector bases, carts, tables, and mirrors are rigid and vibration-less in operation.

G. Maintain documentation of all performance tests for reference by the Owner's Representative during the Commissioning.

3.5 COMMISSIONING TESTS

A. Commissioning Tests will not be performed until the Contractor's System Checkout has been completed and the test results have been reviewed. The Commissioning Tests will be supervised by the Owner's Representative and shall consist of the following at a minimum:

1. A physical inventory of all equipment on site and will be compared to equipment lists in the contract documents.
2. The operation of all system equipment shall be demonstrated by the Contractor.
3. Review of final As-Build documentation as described in the "Contractors Documentation" section of this specification.

B. Both subjective and objective tests will be required by the Owner's Representative to determine compliance with the specifications. The Contractor shall be responsible for providing test equipment for these tests.

C. In the event further adjustment is required, or defective equipment must be repaired or replaced, tests may be suspended or continued at the option of the Owner's Representative.

D. Any charge for additional time incurred by the Owner's Representative required to over-see the system tests, due to improper system installation or previous failed systems, shall be the responsibility of, and charged directly to the contractor.

E. **Note**: As noted in 1.5, “Warranty Statement” and 1.6 “Preventative Maintenance & Service Contract,” Warranty and Preventative Maintenance Periods shall commence after final commissioning by both the Owner and Consultant.

3.6 SERVICE IDENTIFICATION PLATE

A. All installations shall bear the following service identification plate, supplied by this contractor, mounted on the front of the main rack at the top, using the Maven Pro typeface:

SYSTEMS DESIGNED BY:
ABD Engineering & Design, Inc.
833 SW 11th Avenue
Suite 925
Portland, OR 97205
503-444-5656

SYSTEMS FABRICATED, INSTALLED & SERVICED BY:
(This Contractor)

Engraving shall be white filled lettering on a black background or as appropriate to the identification plate material.

PART 4 - APPENDIX A – EQUIPMENT LISTS

A. See the attached Appendix for the equipment lists for the audiovisual systems. These lists are provided for the bidding process.

END OF SECTION 274100

Appendix A

MASTER TABLE OF COSTS - 27 41 00 AUDIOVISUAL SYSTEMS

AREA	QUANTITY of SPACES	EQUIPMENT	ENGINEERING	PRE-INSTALL	INSTALL	G&A	AREA TOTAL
27 41 20 - AUDITORIUM: AUDIOVISUAL SYSTEMS	1						
27 41 25 - BACK OF HOUSE SPACES: AUDIOVISUAL SYSTEMS	1						
TOTALS	2						