PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. The Invitation for Bids, Instruction to Bidders, and General Conditions of the Contract including any Supplementary Conditions apply to all Work under this section.

B. The Contractor acknowledges and warrants that he has closely examined all the Contract Documents, that they are suitable and sufficient to enable the Contractor to complete the Work in the time allotted for the Contract Sum as accepted by the Owner and AV Consultant, and that they include all Work, whether or not shown or described, which reasonably may be inferred to be required or useful for the completion of the Work in full compliance with all applicable codes, laws, ordinances, rules, and regulations.

C. Execution of the Contract by the Contractor is a representation and warranty that the Contractor has carefully examined the Contract Documents and represents and warrants that the Contractor is thoroughly familiar with the nature and location of the Work, the Site, the specific conditions under which the Work is to be performed, and all matters which may in any way affect the Work or its performance. The Contractor further represents that because of such examinations and investigations, the Contractor has thoroughly reviewed and understands the Contract Documents and their intent and purpose, and is familiar with all applicable codes, ordinances, laws, regulations and rules as they apply to the Work, and that the Contractor will abide by same.

D. Claims for additional time or additional compensation because of the Contractor's failure to follow the foregoing procedure and to familiarize itself with all local conditions and the Contract Documents will not be permitted.

E. Related Work Specified Elsewhere:

1. All RFP requirements shall apply to this Section.

1.2 SUMMARY OF WORK

A. Project Coordination

1. Coordinate installation with project Master Schedule milestone to meet Substantial Completion requirements
2. Schedule installation operations in sequence required in order to obtain best completion results.
3. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
4. All specialty sub-Contracting including installation of all telecommunications lines and equipment as shown on the Contract Documents to be coordinated by the Contractor.

B. Scope of Work – General

1. Supply and install audio, video, networking, and control systems including all apparatus and equipment, wiring, termination, labor, and services required to provide systems as specified and shown on drawings.
2. Supply and install any incidental equipment needed to meet the functional requirements stated herein and on drawings. This shall include all support and restraint for the fixed loudspeakers and projection equipment.

3. Set up and adjustment of specified hardware and software.
4. Furnish all test equipment and the services of the project engineer and the project manager to assist the Owner's representative in the acceptance testing.
5. Coordinate remote control system programming with programming vendor.
6. Make any adjustments to any part of the system, including the re-aiming of loudspeakers, which may be found necessary during the acceptance testing.
7. Provide training in the operation of the systems to the person or persons selected by the Owner. Refer to Part 3 paragraph below entitled “Training”.
8. Return to owner any owner-furnished devices not utilized in the integration of the Audiovisual systems.

C. Scope of Work – Project Specific

1. The Southcentral Foundation NUKA Learning Institute in Anchorage, AK is a multi-level facility that consists of a ground floor with a multi-room divisible conferencing space (Gulf), and a Large Therapy Room (Drum), each with dedicated audiovisual systems that require renovation and upgrade to modernize technologies, and bring systems under warranty. The base scope of this RFP is to test and verify functionality of existing equipment and installed cabling, procure and install new equipment to integrate with existing systems.
2. The existing Audiovisual systems shall be taken offline and racked components removed from equipment racks. Functionality tests shall be performed on equipment that is reintegrated per design drawings. Racked equipment assembly will occur on-site with equipment racks in their installed locations.
3. Field cabling entering equipment racks may need to be redistributed into racks per design drawings. Contractor to develop a plan for rack construction that minimizes the need for replacement cable runs from the field. No splicing to extend field cabling is permitted.
4. All existing low voltage lines shall be tested according to Performance Testing requirements described in section 3.2.
    a. Existing conduit infrastructure shall be utilized for new or replacement cable runs when available.
    b. Existing connector plates will be field modified or newly fabricated per design drawings.
5. Contractor to Coordinate with Owner the addition of new devices to the Owner’s Crestron XIO Cloud asset management account.
6. Any necessary modifications to existing finish materials will require repair, patching and paint work to minimize alternation to visible surfaces. This includes, but is not limited to appropriate bushings and grommets in any cable pass throughs in surfaces, drywall patching, and finish painting to match existing surface colors.
7. Area Specific Details
    a. Multi-Room Divisible Conferencing Space (Gulf)
        1) All equipment residing within Comms Room 141 shall be housed within existing AV equipment racks.
        2) The existing Digital Signal Processor (DSP) system is out of warranty, and no longer in production, as such this system will be replaced with new hardware to update technology and provide new warranty.
        3) The existing wireless microphone system will be replaced with newer wideband wireless systems, increasing the total channel count to 40 total

channels. Fifteen of the systems will include both handheld and belt pack transmitters with lapel microphones, the remaining systems will have handheld only transmitters. This system will require careful RF coordination with the wireless microphone systems throughout the facility to ensure interference-free operation. In addition to an antenna distribution system and wireless networking connectivity (for telemetry and control) a fully complimentary battery charging system will be provided.

a) One body pack and one handheld transmitter will be assigned to each conference room as a selectable source, routed within the room as part of the default programming.
b) All Gulf dedicated wireless microphone channels will be available to the production audio mixer via Dante for use when the rooms are combined.

4) A new digital audio mixing system will be designed to provide centralized control of wireless microphones and other audio sources for amplification and distribution throughout the rooms that make up the “Gulf” area.

5) Existing analog audio amplifiers are, aging and out of warranty and will be replaced with new networked amplifiers to update technology and provide new warranty.

6) Existing ceiling loudspeakers will be upgraded to full-range, high performance ceiling loudspeakers. Existing ceiling tiles with loudspeaker cutouts should be modified and reused when possible to minimize the need for replacement tiles. Any modified ceiling tiles removed and not reinstalled will be replaced with new, matching tiles, and not utilize any reserve stock owned by facility.

7) A press feed system will be provided. This functionality will be through the use of portable style Dante distribution unit.

8) The existing video matrix distribution system will be replaced with an AV over IP video distribution system will be designed to allow for an “any video source to any display” system topology. When complete, the new system will video signals can be shared between the Gulf and Drum spaces and beyond via the AV network.

9) The Kayak Room (130G) projection screen will be replaced with new ALR screen material and roller, utilizing the existing casing and low voltage controller.

10) Current ceiling-mounted conferencing cameras will be replaced with 1080p 1Beyond auto-switching cameras with each perimeter room outfitted with one auto-tracking camera at the rear of the room and one auto-switching camera at the front of the room mounted to a pedestal stand on the countertop beneath the projection screen. The center rooms will have one auto-tracking camera at the rear of the room and two auto-switching cameras at the front of the room, one on each side of the projection screen. All 1Beyond cameras will be POE powered, utilizing the existing cabling where possible; new camera positions will have new cabling terminated to new connector plates. New coaxial cabling rated for 4K signals will be installed for compatibility with future technologies.

11) Multi-room combining is a required feature, and will utilize higher I/O count 1Beyond multi-camera switching appliances employing NDI|HX video protocols to allow auto-switching of multiple cameras from combined rooms. Remote control system presets will to facilitate the combining of room systems, selecting the appropriate room layout and audio DSP presets, and routing (via the SDI router) the appropriate video sources to the video

conferencing system for connection to the Teams meeting. The contractor will employ Crestron IV-PROSERVICE-1B manufacturer commissioning services to aid in the development of the multi-room combinations.

12) A modular 4K video switching system with HD input cards and 4K output cards will support in-room presentation, and remote conferencing/broadcast. This system will integrate with the AVoIP system to create a flexible production style system with the ability to easily distribute content across the facility. The ability to store logos, easily create lower 3rds titles and host/present outside video calls as sources for events/presentations will be key functions. A hardware controller for the presentation video switch will allow end-user programmable controls to be configured as needed, in addition to the touchscreen controller. Manufacturer training and commissioning will be coordinated by the contractor following the installation phase of the project.

13) Portable confidence monitors on rolling carts will be provided to allow simple deployment in a variety of room configurations. Integration with the AVoIP system will provide flexibility for desired source video to these monitors and reduce unsightly bulky cable tethers.

14) A main confidence monitor (98”) positioned above the new control booth will replace the aging 90” display. The new display will be sized and mounted appropriately for the standard “Core Concepts” layout of the Gulf area.

15) Five multi-channel ISO recorders are provided with each of the four SDI inputs of each recorder landing on the SDI router to allow any connected video source to be routed and recorded. SDI routing will be available on the Remote Control System touchscreens at the control desk and in the equipment rack.

16) A new 2 channel video recorder will be added via the AVoIP system, recording the program video and a selectable presentation content source for quick generation of editable videos. Archiving of recorded content will be facilitated by LAN connection to the storage server on the network .

17) Video content uploading to storage server will be facilitated by a card media reader connected to the AV Mac computer. A portable card reader will also be provided to allow media to be uploaded via laptop computers.

18) Digital Signage displays on the in-room pillars will remain in current location with the current model. Brightsign digital signage devices will be added at each location, including the large format confidence monitor behind the new AV control booth.

19) The current Barco ClickShare AV wireless screen sharing systems will be replaced with Crestron AirMedia devices.

20) The existing Poly G7500 video conferencing codecs will be replaced with Crestron Flex Teams video conferencing systems, with one additional Crestron Flex Zoom video conferencing system dedicated to the central video conferencing/presentation switching system. The main components of each system will be housed on room-dedicated pull-out shelves within the equipment racks, while the BYOD interfaces and control panels will reside in the rooms or on the portable cart (as shown on drawings).

21) The existing flush mounted countertop and portable cart cable bays will be replaced with new cable bays with the necessary pass through cables that connect to the room systems per design drawings. The existing cutouts are to be field verified for sizing, and appropriate filler material be installed to allow the new cable bays to be correctly mounted.

22) An integration with the existing nLight lighting system via network will allow simple control over the lighting presets for the entire room.

23) The breakout room control panels will be replaced with integrated Crestron/Teams panels as part of each video conferencing system.

24) Digital Signage touchscreens will be added to each breakout room, mounted above the control panels (perimeter rooms) or on an interior pillar (center rooms) as shown on drawings.

25) All rack mounted uninterruptible power supplies will be replaced with new warranted units.

26) The current Crestron XIO Cloud Management platform will be reconfigured to provide for remote management of the updated AV systems through IP connectivity.

27) A semi-permanent control booth will be provided at the rear of the room. The booth will be sized to support 3 operators.

28) Contractor will coordinate with the millwork fabricator on the delivery and installation of the portable AV Production riser/console. The contractor shall also coordinate Owner selected finish materials with the millwork fabricator.

29) The new control booth will have a mid-format control touchscreens for centralized control of various room systems.

30) All un-interruptible power supplies (UPS) will be replaced.

31) Contractor will coordinate with Owner's IT group to integrate new Teams Room systems with the facility resource calendar

b. Large Therapy Room

1) All equipment residing within Comms Room 123 shall be housed within existing AV equipment racks.

2) All racked equipment in the AV control booth shall reside in existing racks within the millwork of the AV control booth.

3) In conjunction with the Gulf, the existing Q-Sys Digital Signal Processor (DSP) will be replaced with redundant DSP cores (one in each area) for increased system reliability. These processors will provide audio processing for both areas within the scope of work, replacing two independent processors. Should either processor fail or fall off-line the redundant core will instantly take over to maintain full functionality of both spaces.

4) The existing wireless microphone system will be replaced with newer wideband wireless systems, increasing the total channel count to 34 total channels. Fifteen of the systems will include both handheld and belt pack transmitters with lapel microphones, the remaining systems will have handheld only transmitters. This system will require careful RF coordination with the wireless microphone systems throughout the facility to ensure interference-free operation. In addition to an antenna distribution system and wireless networking connectivity (for telemetry and control) a fully complimentary battery charging system will be provided.

5) A new digital audio mixing console will replace the existing console, and integrate with the existing rack-installed Dante I/O.

6) Existing analog audio amplifiers are, aging and out of warranty and will be replaced with new networked amplifiers to update technology and provide new warranty.

7) Ceiling loudspeakers will be upgraded to full-range, high performance ceiling loudspeakers.

8) A new AV over IP video distribution system will be designed to allow for an “any video source to any display” system topology. This system will allow video distribution flexibility currently not available to this area. Additionally, when integrated with the Gulf area, video signals can be shared between the two spaces ad hoc.

9) Existing HD PTZ cameras will be replaced with 4K PTZ cameras for event programming. A new PTZ controller will replace the aging unit, and an additional camera remote control panel will provide camera shading control along with access to other camera functions.

10) A new 4K video switching system for the purposes of in-room presentation, and remote conferencing/broadcast format. This system will integrate with the AVoIP system to create a flexible production style system with the ability to easily distribute content across the facility. The ability to store logos, easily create lower 3rds titles and host/present outside video calls as sources for events/presentations will be key functions. Emphasis will be placed on providing a switching system which is feature rich but not overwhelming to learn.

11) The existing five AJA KiPro Ultra digital video recorders will be reutilized for 4K formats with demuxing convertors to convert the 12G-SDI signal to quad-link 3G-SDI for connection to the recorders. Each camera will have a dedicated recorder with the fifth recorder recording the program output of the video processor.

12) Video content uploading to storage server will be facilitated by a card media reader connected to the AV Mac computer. A portable card reader will also be provided to allow media to be uploaded via laptop computers.

13) A new 2 channel video recorder will be added via the AVoIP system, recording the program video and a selectable presentation content source for quick generation of editable videos. Archiving of recorded content will be facilitated by LAN connection to the storage server on the network .

14) The existing 90-inch auxiliary side flanking displays will be replaced with 98” 4K large format displays. New display mounts with supplementary scissor arms and wall-mounted strut will ensure the larger displays will sit proud of the existing cutout, while providing the necessary display articulation for access behind.

15) The existing HD resolution Analog Way Ascender video system processor will be replaced with an Analog Way Zenith 200 video processor operating at 4K resolutions. Audio from the connected video sources will be de-embedded and encoded to the Dante network for control by the digital mixing console.

16) SCF currently utilizes an SNS EVO video storage server. All AV computers will have the ability to upload data to the EVO server via 10G networking connections.

17) The existing Poly G7500 video conferencing codecs will be replaced with Crestron Flex Conferencing systems, one running the Teams Room software, and a 2nd running the Zoom Room software.

18) Existing end-of-life control touch screens and DGE (digital graphics engines) will be replaced with current technology to provide a new warranty. A 2nd control touch screen will be added to the control booth, providing a total of

two mirrored control locations for operators. Both panels will be matched in size and capabilities.

19) A wireless control panel with basic system controls will be provided for ad hoc usage within the room.

20) An integration with the existing ETC lighting system will allow simple control over the lighting presets for the entire room. This integration should provide a lockout of the other control panels throughout the room when the room is being run from the control booth.

21) The current Crestron XIO Cloud Management platform will be reconfigured to provide for remote management of the updated AV systems through IP connectivity.

22) Contractor will coordinate with Owner's IT group to integrate new Teams Room systems with the facility resource calendar

23) All un-interruptible power supplies (UPS) will be replaced.

c. Green Room

1) Existing HD display will be replaced with equivalent sized 4K display and integrated with the AVoIP video distribution system.

d. Lobby/Hallways

1) Existing HD displays on the first and second floors will be replaced with equivalent sized 4K displays and integrated with the AVoIP video distribution system. BrightSign digital signage players will replace the existing Spinetix devices.

e. Lactation Rooms

1) First floor Lactation rooms will have the existing HD displays replaced with equivalently sized 4K displays and integrated with the AVoIP video distribution system.

2) Program audio will be distributed over the AVoIP system in conjunction with the program video signal and be amplified through the display's built-in speakers. Local volume control will be provided through the display controls.

3) These rooms will be able to receive AVoIP audio and video feeds from both the Gulf of Alaska and the Tribal Drum rooms.

f. Executive Conference/Board Room (Eagle 301)

1) The existing 75" HD display will be replaced with 86" 4K display.

2) Poly X70 system will remain, extension mic to be added to the table.

3) A replacement Crestron touch panel will be installed on the wall.

4) This room will be able to receive audio and video feeds from both the Gulf and Drum rooms via the AVoIP system via touch screen controls.

1.3 QUALITY ASSURANCE

A. Product

1. All materials and products shall be new and of professional quality. Unless specifically stated in the drawings or specifications, no existing or pre-owned materials shall be installed. The equipment shall be the latest model or type offered which meets the applicable specifications at the time of submittal.

2. Unless otherwise stated, all electrical, electronic, and optical equipment shall be a product of firms regularly engaged in the manufacture of electrical, electronic, or optical equipment.

3. For custom fabricated items, the quality of workmanship and fabrication of all equipment and components shall be comparable to professional equipment produced by specialized manufacturers. Only firms having a minimum of 5 years' experience in all aspects of the custom fabrication and installation of similar items shall be allowed to perform the work.

B. Product Substitution Requests

1. It shall be the AV Contractor's responsibility to provide the AV Consultant with information regarding discontinued products listed in this specification. If a product listed is discontinued prior to procurement, the AV Contractor shall submit a substitution request to provide the manufacturer's recommended replacement model.

2. Substitution requests will not be considered prior to the award of contract.

3. Substitution requests may be submitted with an AV Contractor's shop drawing package.

4. Substitution Requests shall include the following:

   a. Reason for Proposed Change

   b. Specified Item (manufacturer and model)

   c. Specified Quantity

   d. Specified Item Location

   e. Proposed Item (manufacturer and model)

   f. Proposed Quantity

   g. Proposed Item Location

   h. Proposed Item Availability/Lead Time

   i. Proposed Cost Delta

5. All items including accessories directly related to a proposed change shall be submitted uniquely.

6. All Substitution Requests shall include a comparison of performance characteristics of the proposed substitution product with specified product, including drawings, performance, and test data (in identical units of measure), and other information necessary for an evaluation by the AV Consultant.

7. A statement setting forth changes in other materials, equipment, or other portions of the Work including changes in the Work of other contracts that incorporation of the proposed substitution would require shall be included.

8. The burden of proof of the merit of the proposed substitution is upon the proposer.

C. Workmanship

1. The work specified herein, and in each of the allied sections, shall be accomplished by an AV Contractor experienced in the design, fabrication, installation, checkout, and warranty contract management of systems such as those described in each section.

2. The AV Contractor shall have complete responsibility for the systems described herein and shall be the single contract point for the AV Consultant, and/or the Owner with respect to all work specified herein.

3. Any proposed work to be performed by a sub-contractor to the AV Contractor shall be identified during the submittal process to be approved by the AV Consultant.

D. Contractor Qualifications – Refer to RFP

1.4 PRE-AWARD SUBMITTALS – Refer to RFP

1.5 POST-AWARD SUBMITTALS

A. General Conditions

1. All submittals shall be in accordance with the general provisions of the RFP, including General and Supplementary conditions.
    a. AV Consultant will not review partial submittals.
    b. AV Consultant will review up to two (2) submittals of any one submittal topic.
    c. The cost AV Consultant's time for additional submittal reviews due to non-conformance with the requirements listed herein will be borne completely by the AV Contractor.

B. Schedule

1. In accordance with the RFP, the AV Contractor shall submit an AV Construction Schedule in alignment with the Project Schedule provided by the Owner in electronic document form.
2. All changes to the AV Construction Schedule shall be submitted within one (1) working day for approval from the Owner with notification of a change being submitted to the design team after approval.
3. The AV Construction Schedule shall include the following milestones (dates):
    a. Pre-Construction Phase
        1) Submission of Construction Documentation (as noted in paragraph C below) for AV Consultant review
        2) Submission of samples and layouts for approval by the design team of all finishes/materials which will be visible to the public
        3) Submission of DSP and RC Pre-Program Approval
        4) Completion of all on-site observations for site condition verifications
    b. Construction Phase
        1) Start and Completion of all shop component testing as noted in Part 3, Section 2 below
        2) Start and Completion for shop fabrication work
        3) Completion of in-shop DSP programming and submitted for AV Consultant review as noted in Paragraph D below
        4) Completion of in-shop Control System programming and submitted for AV Consultant review as noted in Paragraph E below
        5) Completion of shop rack construction for AV Consultant in-shop observation as noted in Paragraph F below
        6) Start and Completion for field installation work with the following sub-milestones:
            a) Start and Completion of installation of wire and cable in conduits and cable trays

b) Completion of on-site rack installation
c) Completion of on-site system installation
d) Completion of AV Contractor site testing of all systems

c. Post-Construction Phase

1) Start and Completion of AV Consultant System Observation, Acceptance Testing, and Verification

2) Submission of Close-Out Documentation for AV Consultant Review as noted in Paragraph G Below

3) Start and Completion of AV Training with the Owner

4) Owner System Review Ninety (90) Day Period

5) Owner Final Acceptance

6) Start and Completion of AV Systems Warranty

C. Construction Documentation Submittal

1. Construction Documentation Submittals and Revisions General Conditions

a. In accordance with the RFP the AV Contractor shall submit one (1) electronic set of the Construction Documentation for the AV Consultant to review for approval, per the milestone schedule.

b. Within five (5) calendar days of a returned submittal, the AV Contractor shall submit one (1) electronic set of the Revised Construction Documentation, with each revision clouded and annotated with a delta number matching an updated revision on the title block.

c. All drawings shall be clear and legible.

2. Business Documentation

a. Business Relationship Agreements

1) Submit one (1) electronic document of all statements of subcontractors, franchises, distributorship, dealerships, arrangements, and agreements with manufacturers of equipment to be used for this work.

3. Equipment Documentation

a. Substitution Requests

1) Refer to Subsection 1.3.B Substitution Requests for substitution request process.

b. Bill of Materials

1) Submit one (1) electronic document of a bill of all materials, components, devices, and equipment required for this work.

2) The bill of quantities shall be concisely organized by system and ordered, within each system, in the order of Part 2 of the specifications below.

3) The bill of quantities shall contain the following information for each item listed:

a) Quantity
b) Description
c) Manufacturer's name and model number
d) AV Contractor Unique Item Identification Tag
e) AV Consultant Unique Item Identification Tag

f) Purchasing Route
g) Direct (from Manufacturer)
h) Distribution (list distributor)
i) Other (list from where)

c. Product Data Sheets

1) Submit one (1) electronic document of all product data sheets of all materials, components, devices and equipment required for this work.

2) The product data sheets shall be organized and tabulated respective of each and every system as specified, in the order of the specification Part 2 below with title sheets between each spec section.

3) Product Data Sheets must be manufacturer supplied data sheets, specification sections of a manual or brochure, or cut sheet.

4) Do not supply complete manuals just the spec section of the manual.

5) Provide blank sheets with manufacturer name and model information for equipment without a manufacturer supplied data sheet.

6) If the data sheet references multiple models highlight the specific model for this work.

4. Shop Drawing Documentation

a. Submit one (1) electronic document of all drawings listed below.

b. The minimum text size for all drawings shall be 1/8" high.

c. Permissible scales shall be: 1/8"=1', ¼"=1', 3/8"=1', ½"=1', 1"=1', 1-1/2"=1', 3"=1', 6"=1', and full scale

d. All drawings shall be plotted to full size (30"x42") sheets unless otherwise directed by the Consultant.

e. All references to other pages (callouts, flyoffs, tags, etc) shall be hyperlinked in electronic documents.

f. Functional Diagram

1) Single-line block diagram showing interconnection of all components, receptacles, terminal blocks, controls, transformers, and loudspeakers in addition to the active elements.

2) Include terminal and wire numbers and all system and component labels.

3) The wire labels shall be numbered consecutively with respect to the patch bay with a leading service level designation.

4) If there are no patch bays utilized in the system, the wire labels shall be numbered consecutively with a leading service level designation.

5) Show detailed system component information including but not limited to device tag matching the bill of materials, manufacturer's name, model number, any specialized part number option and all input and output connection information, for each piece of equipment.

6) Show network topology including device tag, manufacturer's name & model number, MAC addresses, and IP addresses (if static).

7) Drawing codes or device tags shall not be permitted alone. Manufacturer's name and model number is required for every block in the single-line diagram.

g. Floor Plans & Reflected Ceiling Plans

1) At scale of Contract Documents, showing the locations throughout the project of all receptacles, conduits, wireways, trays, pull boxes, junction boxes, equipment racks equipment and other devices with appropriate designations and fill.

h. Riser Diagrams and Cable Schedule

1) Show all elevations, room numbers, conduit sizes, types and fills, box sizes and types, devices, equipment, and rack designations.

2) Cable schedules and run sheets, associates with each equipment rack and/or any isolated piece of equipment or device, including cable designation, type, manufacturer and manufacturer's type number, wire color, device and terminal designation and device location, keyed to both the system single-line block diagram and equipment rack elevation drawings.

i. Equipment Rack Elevations

1) Drawings scaled (1-1/2" = 1'-0" or larger)

2) Front Elevations

a) Include equipment designation, manufacturer's name, model number, rack location and rack designation.

3) Rear Elevations

a) Include AC power wireways and route of wiring harnesses.

4) Sections

a) Include depth of all equipment components.

5) Patch bay elevations

a) Showing all patch bay appearances and designations.

j. Detail Drawings

1) Contractor fabricated items

a) Detailed drawings showing all components, devices and equipment, including dimensions, component values, terminal designations, types, locations, manufacturer's name and model number.

2) Structural Mounting Details

a) All components, devices, and equipment that are required to mount to structure shall be shown in full detail including all appropriate related mounting devices with callouts of manufacturer’s name and model number
b) Included, but not limited to, items that shall have fully detailed structural mounting details are as follows:
c) Individual Loudspeakers
d) Loudspeakers Arrays
e) Projection Screens
f) Projectors (and enclosures)
g) Displays
h) Equipment Racks
i) Ceiling Storage

3) Loudspeaker Details

a) Loudspeaker arrays and loudspeaker supports shall be stamped and signed by an engineer licensed in the project state. Include all loads, location of attachment to building structure, complete layout of all components, devices, and equipment, including dimensions, methods of assembly, and connections to supporting construction, details of hardware, locations, manufacturer's name and model number. All design calculations, loads, etc. shall be shown.

b) Ceiling flush mounted and wall or ceiling surface mounted loudspeakers mounting to structure detail drawings showing all components, devices and equipment, including dimensions, component values, terminal designations, types, locations, manufacturer's name and model number

4) Network Topology

a) Show all AV network switching equipment
b) Indicate all VLANs and type of dedicated network traffic
c) Show all switch uplinks and associated bandwith
d) Show in-use port counts for each switch
e) Calculate PoE budget for each switch
f) Identify the IGMP querier

D. Digital Signal Processor (DSP) System Submittal

1. Pre-Program Approval

a. Prior to programming the Digital Signal Processing (DSP) system, the AV Contractor shall submit shop drawings showing all screen layouts and control descriptions of all system functions.

b. Submittal shall include screen layouts of the DSP software “Control Pages” for all “configuration presets” and “parameter presets”.

c. Submit all information in electronic document to the AV Consultant for review and approval.

d. The contractor shall incorporate all AV Consultant and Owner comments into the programming of the system.

2. Program Approval

a. Prior to delivery of the systems to the job site, the AV Contractor shall demonstrate fully functioning systems in the AV Contractor’s facilities that include the DSP system programming. This demonstration shall coincide with the AV Consultant observation of Completed Sub-Assemblies (Refer to Part 3 paragraph entitled “System Performance Tests”).

b. The AV Consultant will review and comment upon the DSP programming.

c. The AV Contractor shall incorporate all AV Consultant comments into the programming of the systems and submit final in-shop test results to the AV Consultant.

3. DSP Program Installation and Confirmation

a. After the installation of the AV Systems, the AV Consultant will review and test the DSP system programming.

b. The AV Contractor shall incorporate all AV Consultant comments into the programming of the systems.

c. After the installation of the AV systems has been deemed substantially complete, but prior to final acceptance of the system, the Owner shall have a review period of ninety (90) days to observe the operation of the DSP system. At the end of this review period, the Owner may request programming changes relating to the look and feel of the operation pages or the functionality of commands. The AV Contractor shall make these changes prior to acceptance of the systems at no additional cost to the owner.

E. Remote Control (RC) System Submittal

1. Pre-Program Approval

a. Prior to programming the remote-control system, the AV Contractor shall submit shop drawings per the project standards showing all control screen layouts, graphical user interfaces (GUI) and control descriptions of all remote-control system functions to the AV Consultant for review and comment prior to actual programming of the system.

b. Submit all information in electronic document to the AV Consultant for review and approval.

c. The contractor shall incorporate all AV Consultant and Owner comments into the programming of the system.

2. Program Approval

a. Prior to delivery of the systems to the job site, the AV Contractor shall demonstrate fully functioning systems in the AV Contractor's facilities that include the remote-control programming.

b. This demonstration shall coincide with the AV Consultant observation of Completed Sub-Assemblies (Refer to Part 3 paragraph entitled "System Performance Tests").

c. The AV Consultant will review and comment on the remote-control programming submittal.

d. The AV Contractor shall incorporate all AV Consultant comments into the programming of the systems and submit final in-shop test results to the AV Consultant.

3. RC Program Installation and Confirmation

a. After the installation of the AV Systems, the AV Consultant will review and test the remote-control system programming.

b. The AV Contractor shall incorporate all AV Consultant comments into the programming of the systems.

c. After the installation of the AV systems has been deemed substantially complete, but prior to final acceptance of the system, the Owner shall have a review period of ninety (90) days to observe the operation of the Remote Control system. At the end of this review period, the Owner may request programming changes relating to minor functionality adjustments, and/or look and feel of the user interface. The AV Contractor shall make these changes prior to acceptance of the systems at no additional cost to the owner.

F. Project Change Orders

1. For any Project Change Orders issued pertaining to this specification section the AVC shall provide the following information in addition to any other required information by the contractor:

a. For each equipment item listed:

1) Quantity

2) Description

3) Manufacturer's name and model number

4) AV Contractor Unique Item Identification Tag

5) AV Consultant Unique Item Identification Tag

6) Line Item Equipment Costs

b. Labor Costs including:

1) Engineering

2) Project Management

3) Installation

G. Shop Test Submittal

1. Submit one (1) electronic document of the following prior to shipping fabricated equipment racks to the Project site:

a. All test procedures specified in Part 3 paragraph entitled “System(s) Performance Tests”.

b. Submit a written request for equipment rack observation certifying that equipment racks are completely assembled, tested and ready for inspection.

c. Detailed interior and exterior photos of assembly supporting claim for readiness for inspection.

1) Example Shop Test Statement submittal templates are available from the Consultant upon request.

H. Field Test Submittal

1. Submit one (1) electronic document, a minimum of 2 weeks prior to scheduling AV Consultant for on-site completion review, to include all test procedures specified in Part 3 paragraph entitled “Performance Tests”.

I. Closeout Documentation

1. Record Drawings Submittal

a. Within thirty (30) calendar days after Acceptance Testing is completed by the AV Consultant, the AV Contractor shall submit As-Built Drawings developed from the final “as-built” systems, including the documents and files listed below.

b. One (1) electronic document consisting of the block diagrams, plans, risers, patch bay drawings, rack elevations, cable schedules and detail drawings

c. One (1) electronic document of a final Bill of Materials with the following:

1) Quantity

2) Description

3) Make

4) Model

5) Device ID from Single Lines

6) Purchase Route (for warranty purposes)

7) Serial Number (if applicable)

8) Mac Address (if applicable)

9) IP Address (if applicable)

10) VLAN ID (if applicable)

d. One (1) file folder containing electronic document manuals for all equipment in the Bill of Materials, organized by manufacturer with each manual clearly and concisely labelled for easy navigation.

e. One (1) file folder containing electronic document warranty information for all equipment in the Bill of Materials, organized by manufacturer with each warranty clearly and concisely labelled for easy navigation. Include a spreadsheet “cheat sheet” detailing start and end for warranty for each piece of equipment.

f. One (1) file folder containing electronic documents of all licenses, certificates of operation and/or compliance as required.

g. One (1) file folder containing the following unlocked files:

1) DSP System files

2) Remote-Control System files

3) Touchpanel Configuration files

4) AV Network Configuration files

5) Amplifier Configuration files

6) RF Configuration files

7) Intercom Configuration files

8) All baseline configuration files for all other equipment as pertaining to the project scope

9) One (1) file folder containing electronic documents of all the test reports, neatly organized and titled for clarity, including any re-testing done after System Observation, Acceptance Testing, and Verification.

J. Owner Record Submittal

1. Prior to Final Acceptance, the AV Contractor shall supply the following to the Owner

a. One (1) complete set of half-size (15”x21”) Functional Diagrams, including network topology, for each system, dry mounted to matte board and set under a clear acrylic cover attached to the wall in the associated system rack room as directed by the Owner.

b. One (1) clear laminated rack elevation (all sides of the rack elevation shown) drawing for the associated rack, mounted on the inside of the rear door. If the rack does not have a rear door, attach the laminated sheet to the rear of the rack with a beaded chain long enough to move the sheet out of the way for rack work.

c. Two (2) USB thumb drives each with a complete set of Record Drawings, including all the system and configuration files. There shall be nothing else on the thumb drives.

d. One (1) complete set of Record Drawings, including all the system and configuration files, shall be installed on the associated AVPC in a folder on the desktop. If no AVPC, locate an additional thumb drive in a secure location in the main system rack.

2. The Final Acceptance will not be provided to the AV Contractor until Owner Record Submittal is accepted by the Owner.

1.6 WARRANTY AND SERVICE

A. General Conditions

1. The AV Contractor shall warrant the installation free of faulty workmanship.

2. All components, including solid-state devices, are warranted free of defects for a period of one (1) year from date of Final Acceptance. This minimum warranty provision shall not diminish the terms of individual equipment manufacturers' warranties.

3. Paint and exterior finishes, fuses and lamps are excluded from above warranty statement except when damage or failure results from defective materials or workmanship covered by warranty.

B. Warranty Service Period

1. Provide warranty maintenance service for a period of one (1) year after Final Acceptance. Service to consist of at least two (2) semiannual visits to the site for checking and adjustment of equipment.

2. Contractor shall allocate 5 days of on-site technical support in the form of a qualified technician(s) familiar with the warranted systems, to assist the operation of public events scheduled by Owner.

3. Provide telephone response to service requests within two (2) business hours during the warranty period. Provide the on-site response to service requests not addressable by telephone within forty-eight (48) business hours during the warranty period.

PART 2 - PRODUCTS

2.1 GENERAL

A. OWNER FURNISHED; CONTRACTOR INSTALLED EQUIPMENT (OFCI)

1. The owner intends to furnish the following pieces of equipment. The contractor shall provide all necessary cable, connectors, miscellaneous hardware, engineering and installation labor, and depot level support for all owner furnished, contractor installed equipment for the duration of the project warranty as described above.

a. All existing equipment in equipment rack shall be uninstalled and tested prior to reintegration per design documents

2. The following items are currently in-service and shall be reintegrated per design documents

a. (S2) LOUDSPEAKER, SURFACE MOUNT, 70V

1) Tannoy DI6 DCT

2) Contractor to test device in installed location as part of the Audio System Performance Tests (section 3.2.F)

b. (S3) LOUDSPEAKER, CEILING, 70V

1) Tannoy CMS 501C

2) Contractor to test device in installed location as part of the Audio System Performance Tests (section 3.2.F)

c. (S4) LOUDSPEAKER, 12 INCH POINT SOURCE

1) Tannoy DC12i

2) Contractor to test device in installed location as part of the Audio System Performance Tests (section 3.2.F)

d. (S5) LOUDSPEAKER, CEILING, 70V

1) Tannoy CMS 801DC PI

2) Contractor to test device in installed location as part of the Audio System Performance Tests (section 3.2.F)

e. (S7) LOUDSPEAKER, 8-INCH POINT SOURCE

1) Community W2-218T-B

2) Contractor to test device in installed location as part of the Audio System Performance Tests (section 3.2.F)

f. (MIC1) MICROPHONE, CEILING ARRAY

1) Shure MXA910

2) Contractor to verify complete functionality of all devices and prepare device configurations for commissioning with auto-switching camera systems.

g. (MIC2) MICROPHONE, GOOSENECK

1) AKG CK47

h. (DSP3) DIGITAL SINGAL PROCESSOR I/O

1) QSC Q-SYS I/O-22

i. (CLIO1) MIXER IO, DANTE 32x24

1) Yamaha Rio3224

2) Contractor to verify functionality and update device and Dante firmware to latest versions compatible with specified audio mixer.

j. (CLIO2) MIXER IO, DANTE 0x8

1) Yamaha Rio8D

2) Contractor to verify functionality and update device and Dante firmware to latest versions compatible with specified audio mixer.

k. (VP1) VIDEO PROJECTOR

1) Christie Digital DWU850-GS

l. (LIFT) PROJECTOR LIFT

1) Unknown manufacturer

m. (DSW1) DATA NETWORK SWITCH, 48 PORT, POE

1) Juniper Networks EX4300-48P

2) Contractor to provide necessary modules to connect switches to new network topology.

n. (DSW2) DATA NETWORK SWITCH, 24 PORT, POE

1) Juniper Networks EX4300-24P

2) Contractor to provide necessary modules to connect switches to new network topology.

o. (DSW3) DATA NETWORK SWITCH, 10 PORT, POE

1) DLINK DGS1210P

p. (ISO2) VIDEO RECORDER, 4CH, HD

1) AJA KI PRO Ultra

2) Recorders will be reintegrated as single channel 4K recorders utilizing 12-SDI to 4x 3G-SDI demux convertors

q. (BLU) BLURAY PLAYER

1) OPPO BDP-103

r. (VWALL) VIDEO WALL

1) Christie Microtile

2) Contractor to coordinate an onsite recommissioning of the two LED walls with manufacturer

s. (SYNC) VIDEO SYNC GENERATOR

1) Ensemble Designs Card Frame

a) 7400 Card

2) Contractor to integrate with new PTZ cameras

t. (VB1) VIDEO BAR

1) Poly X70

2) Contractor to reinstall video bar under new display per design drawings

u. (TSC5) TOUCHSCREEN, VIDEO CONFERENCING

1) Poly TC8

v. (ADA) AUDIO DISTRUBTION AMP

1) Jensen Transformers DIN-AMP

w. (AMP5) AMPLIFIER, 70V

1) Extron XPA 2001-70V

2) Contractor to verify functionality as part of the Audio System Performance Tests (section 3.2.F)

x. (RC1) REMOTE CONTROL PROCESSOR

1) Crestron PRO4

2) Contractor to maintain connectivity of relay card connections to projection screen controllers

y. (PWRC) RACK POWER CONDITIONER

1) SURGEX SX-1120-RT

2) Contractor to utilize existing power conditioners across equipment rack, and supplement as necessary with additional specified versions.

z. Lighting Control Processor

1) ETC Paradigm Architectural Control Processor (Drum)

a) Contractor to furnish interfaces as necessary to allow Audiovisual Remote Control system integration.
b) Coordinate Remote Control system programming for Drum lighting system with programming vendor

aa. Network Lighting Gateway (Gulf)

1) nLight nGWY2 System Controller

a) Contractor to furnish interfaces as necessary to allow Audiovisual Remote Control system integration
b) Coordinate Remote Control system programming for Gulf network lighting system with programming vendor

3. AV Contractor shall develop a schedule indicating delivery dates necessary for the receipt of all Owner Furnished equipment to ensure an on-time completion of the Work of this section. This schedule shall be coordinated with the Owner, GC and Consultant.

B. MASTER QUOTES

1. Master quotes have been generated for the following items:

a. PRESENTATION VIDEO SYSTEMS

1) Contact: Analog Way, Joe Rivas, 916-320-6184
joe.rivas@analogway.com

b. PRODUCTION BOOTH MILLWORK AND PLATFORMS

1) Contact: High Tech Furnishings, Doug Kanczuzewski, 951-279-5770
doug@hightechfurnishings.com

2) This is a long lead time item that will require early submittal for review by Consultant.

c. REMOTE CONTROL SYSTEM PROGRAMMING

1) Contact: BMA Software Solutions, Marc Laveccia 714-455-2717
marc@bmasoftwaresolutions.com

C. ADDITIVE ALTERNATES

1. Provide additive alternate unit pricing for the following items where indicated on drawings (include necessary cable, connectors, miscellaneous hardware, and engineering and installation labor for a complete and fully operational system.):

a. WARRANTY EXTENSION 1-YEAR

1) Provide a one year extension to the Warranty period described in Section 1.6

b. WARRANTY EXTENSION 2-YEAR

1) Provide a two year extension to the Warranty period described in Section 1.6

c. (VP2) VIDEO PROJECTOR, 4K

1) Christie Digital 4K22-HS

a) Furnish with lens appropriate to fill projection screen from projector position.
b) Integrate with existing projector lift and control system

d. (SCN1) PROJECTION SCREEN ROLLER & MATERIAL

1) Draper Access V TVX 77-1/2” x 138” XH900X ALR

a) Install into existing projection screen housing
b) Contact: Draper Inc, Sam Nord, 801-349-0838 sam.nord@DraperInc.com

D. DEDUCTIVE ALTERNATES

1. Provide deductive alternate unit pricing for the following items where indicated on drawings. Provide infrastructure and rough in (fully documented on as-built drawings) for future fit out by Owner’s preferred vendor.

a. NONE

E. Safety Laboratory Listings: All equipment powered from the mains shall be labeled as listed by a testing laboratory acceptable to the local code authority. Underwriters Laboratories, Edison Testing Laboratories, or the City of Los Angeles testing lab usually meet this requirement.

2.2 AUDIO AMPLIFIERS AND SIGNAL PROCESSORS

A. (AMP1) AMPLIFIER, 4CH (500W)

1. Features

a. 4x analog inputs

b. 4x Dante inputs

c. Dante and Ethernet ports

d. Onboard DSP Processing

2. Acceptable

a. Theory Professional DLC-250.4d

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

B. (AMP2) AMPLIFIER, 4CH (500W)

1. Features

a. 8x analog inputs

b. Ethernet ports

c. Onboard DSP Processing

2. Acceptable

a. Theory Professional DLC-250.8

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

C. (AMP3) AMPLIFIER, 4 CH (2500W)
   1. Features
      a. 4x analog inputs
      b. 2x ethernet ports
      c. 8x bi-directional GPIO
      d. Class-D hybrid power design
   2. Acceptable
      a. QSC Q-Sys CX-Q 2K4
      b. Consultant Approved Equal
   3. Quantity
      a. As shown on drawings

D. (DSP1) DIGITAL SIGNAL PROCESSOR, COTS
   1. Features
      a. 256 x 256 network audio channels
      b. 64x AEC processors
      c. Dual gigabit Ethernet ports for redundant networked audio
      d. Onboard 480 GB media drive
      e. 1RU form factor
   2. Acceptable
      a. Q-Sys Core 610
         1) Furnish with (1) SLDAN-128-P Dante license
         2) Furnish (1) SLQSE-610-P scripting license
         3) Furnish (1) SLQUD-610-P UCI Deployment license
      b. No alternative equivalent available
   3. Quantity
      a. As shown on drawings

E. (DSP2) DIGITAL SIGNAL PROCESSOR
   1. Features
      a. 128 networked audio channels (Q-LAN/AES67)
      b. 24 Channels of Analog I/O
      c. 8 configurable Flex Channels
      d. 16x AEC processors
      e. USB AV Bridging
      f. Q-SYS Control Engine
      g. 4x VoIP
      h. 8x8 Dante included

2. Acceptable
    a. Q-Sys Core 110f
        1) Furnish (1) SLQSE-110-P scripting license
    b. Consultant Approved Equal
3. Quantity
    a. As shown on drawings

F. (QIO) NETWORK AUDIO OUTPUT EXPANDER
1. Features
    a. Q-SYS connectivity
    b. Four line outputs
    c. IEEE 802.3af Type 1 POE powered
2. Acceptable
    a. Q-SYS QIO-L4o
        1) Furnish with QIO-RMK rack mount trays sufficient to house all racked devices
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

G. (MIX1) MIXING CONSOLE, 28 FADER
1. Features
    a. 120 input channels
    b. 48 mix buses
    c. 12 Matrices
    d. 32 analog inputs
    e. 16 analog outputs
    f. 2x2 AES3
    g. 144 x 144 Dante I/O
    h. 2x 12.1 touch screens, 1x 7” touch screen
    i. 96Khz sample rate
2. Acceptable
    a. Yamaha DM7
    b. Consultant Approved Equal
3. Quantity
    a. As shown on drawings

H. (MIX2) MIXING CONSOLE, 16 FADER
1. Features
    a. 72 input channels

b. 48 mix buses
c. 12 Matrices
d. 16 analog inputs
e. 16 analog outputs
f. 144 x 144 Dante I/O
g. 1x 12.1 touch screens, 1x 7” touch screen
h. 96Khz sample rate

2. Acceptable
a. Yamaha DM7 Compact
b. Consultant approved equal

3. Quantity
a. As shown on drawings

I. (MIXIO) STAGE BOX, 16x8, DANTE

1. Features
a. 16 microphone preamps
b. 8 analog audio outputs
c. Dante Primary & Secondary ethernet ports
d. 96Khz sample rate
e. 3RU

2. Acceptable
a. Yamaha Rio1608-D3
b. No alternative equivalent available

3. Quantity
a. As shown on drawings

J. (AVBR) AUDIO VIDEO MEDIA BRIDGE

1. Features
a. Driverless USB 2.0 connection
b. Emulates computer soundcard
c. External Power supply or POE powered
d. QLAN bridging to USB

2. Acceptable
a. Q-Sys I/O-USB Bridge
b. No alternative equivalent available

3. Quantity
a. As shown on drawings

K. (PRESS) PORTABLE PRESSBOX, DANTE

1. Features
    a. 1 channel Dante input
    b. 12 transformer isolated XLR outputs
    c. PoE powered
2. Acceptable
    a. AudioPressBox APB-112 SB-D
    b. Consultant approved equal
3. Quantity
    a. As shown on drawings

2.3 AUDIO TRANSDUCERS

A. (S1) LOUDSPEAKER, CEILING, FLUSH MOUNT 6”

1. Features
    a. Multi-tap 70v transformer
    b. Furnish mfg optional rough-in kit
    c. coordinate custom grille color with Owner
2. Acceptable
    a. Theory Professional iC6
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

B. (WLS1) WIRELESS MICROPHONE RECEIVER, 4CH

1. Features
    a. Wide tuning range up to 184 MHz
    b. 4x BNC antenna connectors for Quadversity mode
    c. 4 port Ethernet switch for Redundant Dante and data network connections
    d. Switchable Analog/AES3 XLR outputs
2. Acceptable
    a. Shure Wireless Axient AD4Q
        1) Furnish (4) Shure ADX2/SM58=-G57 handheld transmitters per rack unit
            a) Furnish (1) additional SB920A battery per handheld transmitter (for a total of 2)
        2) Furnish a total of thirty (30) ADX1=-G57 body pack transmitters across entire wireless system (15 for Drum & 15 for Gulf)
            a) Furnish each body pack transmitter with (1) Shure MX153 earset microphone and (1) Shure UL4 lavalier microphone
    b. No alternative equivalent available

3. Quantity
    a. As shown on drawings

C. (WLS2) WIRELESS MICROPHONE RECEIVER, 2CH
1. Features
    a. Wide tuning range up to 184 MHz
    b. 4x BNC antenna connectors for Quadversity mode
    c. 4 port Ethernet switch for Redundant Dante and data network connections
    d. Analog XLR outputs
    e. AES3 XLR output
2. Acceptable
    a. Shure Wireless Axient AD4D
        1) Furnish two Shure ADX2/SM58 transmitters per rack unit
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

D. (RFWAP) RF WIRELESS ACCESS POINT
1. Features
    a. Enables wireless remote control of 24 transmitters per access point
    b. 2.4GHz operation
    c. Automatic channel selection in 2.4GHz range
    d. Compatible with Axient Digital ADX systems
    e. PoE Powered
2. Acceptable
    a. Shure AD610
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

E. (BATC) RACK BATTERY CHARGER
1. Features
    a. 1RU
    b. Front status display with percentage and time-to-full readings
    c. 4 slots for interchangeable 2 battery charging modules

2. Acceptable
    a. Shure SBRC Rack charger
        1) Furnish the following modules to be fitted across entire battery charging system:
            a) SBM920 (qty: 38)
            b) SBM910 (qty: 16)
3. Quantity
    a. As shown on drawings

F. (ANTD) ANTENNA DISTRIBUTION
1. Features
    a. 2x Diversity antenna inputs
    b. 9x antenna outputs per antenna
    c. 1RU
2. Acceptable
    a. FR Venue DISTRO9 HDR
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

G. (DARCH) RF ANTENNA, ARCHITECTURAL
1. Features
    a. Dual feed antenna design
    b. Diversity Flood Pattern
    c. Wall mounted
    d. Operating frequency: 470-698 MHz
    e. 2x BMC female connectors
2. Acceptable
    a. RF Venue D-ARC
    b. Consultant approved equal
3. Quantity
    a. As shown on drawings

2.4 VIDEO

A. (VSW1) PRESENTATION VIDEO SWITCHER, MODULAR FORMAT
1. Features
    a. 5RU
    b. 4K/8K operation
    c. Field Swapable input and output cards

d. Dante Audio Networking

e. 2x HDMI Multiviewer outputs

f. 500 master memories, 1000 screen memories and 50 layer memories

g. Up to 12x configurable mixing and split layers

2. Acceptable

a. Analog Way Aquilon C+

1) Furnish with the following hardware options:

a) Eight HDMI 1.4 input card [CRD1] (Qty. 3)
b) Four HDMI 2.0 input card [CRD2] (Qty. 3)
c) Four HDMI 2.0 output card [CRD3] (Qty. 2)
d) Video Processing card (Qty. 2)
e) Still Image card (Qty. 1)

2) Furnish with the following Warranty & Service Options

a) 2- Year warranty extension
b) Protect Advantage for LivePremier 5RU, 5 year subscription

3) Product commissioning by Manufacturer to be provided and coordinated by contractor as per manufacturer requirements

4) No alternative equivalent available

3. Quantity:

a. As shown on drawings

B. (VSW2) PRESENTATION VIDEO SWITCHER, FIXED FORMAT

1. Features

a. 3RU

b. 4K60 operation

c. 16 inputs

d. 6 outputs

e. Dedicated Multiviewer output

f. 8x split layers

g. Background live image for each Program output

2. Acceptable

a. Analog Way Zenith 200

1) Furnish with the following options:

a) 32 x 32 Dante networking card (OPT- ALTA4K-DANTE)
b) 2- Year warranty extension
c) Protect Advantage for Alta 4K, 5 year subscription

2) Product commissioning by Manufacturer to be provided and coordinated by contractor as per manufacturer requirements

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

C. (VSWC) VIDEO SWITCHER CONTROLLER

1. Features
    a. High-Resolution T-Bar
    b. Three-axis joystick
    c. 56 user-programmable buttons
    d. Ethernet network interface
    e. 4-pin XLR connector for LED Lamp
2. Acceptable
    a. Analog Way RC400T
        1) Furnish with the following options:
            a) 2- Year warranty extension
            b) Protect Advantage for RC400T, 5 year subscription
    b. No alternative equivalent available
3. Quantity:
    a. As shown on drawings

D. (SDIR) SDI ROUTER, 64X64

1. Features
    a. 64x64 Crosspoint / 12G SDI I/O
    b. Full size 75 ohm BNC connectors
    c. SW-P-08 & PESA PNET remote control protocol
    d. Redundant power supply connections
2. Acceptable
    a. Cobalt Wave RTR-64x64
    b. Consultant approved equal
3. Quantity
    a. As shown on drawings

E. (VPRO1) CAMERA SWITCHING VIDEO PROCESSOR, 5 INPUT

1. Features
    a. 2RU
    b. 3x BNC 3G-SDI inputs
    c. 1x BNC 3G-SDI output
    d. 5 NDI HX inputs
    e. 1 NDI HX output
    f. Ships with Inogeni SDI2USB3 (VCON4) video convertor
2. Acceptable
    a. Crestron Automate VX IV-SAM-VX2-S Switching solution
        1) Provide Crestron IV-PROSERVICE-1B manufacturer commissioning

b. No alternative equivalent available

3. Quantity
   a. As shown on drawings

F. (VPRO2) CAMERA SWITCHING VIDEO PROCESSOR, 12 INPUT

1. Features
   a. 2RU
   b. 7x BNC 3G-SDI inputs
   c. 1x BNC 3G-SDI output
   d. 12 NDI HX inputs
   e. 1 NDI HX output
2. Acceptable
   a. Crestron Automate VX IV-SAM-VX2-P Switching solution
      1) Provide Crestron IV-PROSERVICE-1B manufacturer commissioning
   b. No alternative equivalent available
3. Quantity
   a. As shown on drawings

G. (NVE1) NETWORK VIDEO ENCODER, APPLIANCE

1. Features
   a. 4K60 4:4:4 video over standard Gigabit Ethernet
   b. HDR (High Dynamic Range) video support (HDR10)
   c. One HDMI input
   d. Analog audio stereo output
   e. 200 to 950 Mbps bit rates
   f. RDP and SDP streaming protocols, MPEG-2 transport
   g. HDCP 2.3, AES-128, PKI copy protection
   h. 802.at Type 2 powered
2. Acceptable
   a. Crestron DM-NVX-E30
   b. Consultant Approved Equal
3. Quantity:
   a. As shown on drawings.

H. (NVE2) NETWORK VIDEO ENCODER, CARD

1. Features
   a. 4K60 4:4:4 video over standard Gigabit Ethernet
   b. HDR (High Dynamic Range) video support (HDR10)
   c. One HDMI input

d. Analog audio stereo output
e. 200 to 950 Mbps bit rates
f. RDP and SDP streaming protocols, MPEG-2 transport
g. HDCP 2.3, AES-128, PKI copy protection
h. 802.at Type 2 powered

2. Acceptable
a. Crestron DM-NVX-E30C
b. Consultant Approved Equal

3. Quantity:
a. As shown on drawings.

I. (NVE3) NETWORK VIDEO ENCODER, WALL PLATE

1. Features
a. 4K60 4:2:0 video over standard Gigabit Ethernet
b. 2-gang with Decora style faceplate
c. One HDMI input
d. Analog audio stereo output
e. 200 to 950 Mbps bit rates
f. RDP and SDP streaming protocols, MPEG-2 transport
g. HDCP 2.3, AES-128, PKI copy protection
h. 802.af Type 1 powered

2. Acceptable
a. Crestron DM-NVX-E20-2G-B-T
b. Consultant Approved Equal

3. Quantity:
a. As shown on drawings.

J. (NVD1) NETWORK VIDEO DECODER, APPLIANCE

1. Features
a. 4K60 4:4:4 video over standard Gigabit Ethernet
b. HDR (High Dynamic Range) video support (HDR10)
c. One HDMI output
d. Analog audio stereo output
e. 200 to 950 Mbps bit rates
f. RDP and SDP streaming protocols, MPEG-2 transport
g. HDCP 2.3, AES-128, PKI copy protection
h. 802.at Type 2 powered

2. Acceptable
    a. Crestron DM-NVX-D30
    b. Consultant Approved Equal
3. Quantity:
    a. As shown on drawings.

K. (NVD2) NETWORK VIDEO DECODER, CARD
1. Features
    a. 4K60 4:4:4 video over standard Gigabit Ethernet
    b. HDR (High Dynamic Range) video support (HDR10)
    c. One HDMI output
    d. Analog audio stereo output
    e. 200 to 950 Mbps bit rates
    f. RDP and SDP streaming protocols, MPEG-2 transport
    g. HDCP 2.3, AES-128, PKI copy protection
    h. 802.at Type 2 powered
2. Acceptable
    a. Crestron DM-NVX-D30C
    b. Consultant Approved Equal
3. Quantity:
    a. As shown on drawings.

L. (NVT1) NETWORK VIDEO TRANSCIEVER
1. Features
    a. Configurable as an encoder or decoder
    b. 4K60 4:4:4 video over standard Gigabit Ethernet
    c. HDR (High Dynamic Range) video support (HDR10)
    d. Two auto-switching HDMI inputs
    e. One HDMI output with 4K60 4:4:4 scaler
    f. AES67 support
    g. Analog audio configurable as a balanced stereo input or output
    h. AES67 audio embedding and de-embedding
    i. 200 to 950 Mbps bit rates
    j. RDP and SDP streaming protocols, MPEG-2 transport
    k. HDCP 2.3, AES-128, PKI copy protection
    l. 802.3bt Type 3 powered
2. Acceptable
    a. Crestron DM-NVX-360

b. Consultant Approved Equal

3. Quantity:
   a. As shown on drawings.

M. (NVT2) NETWORK VIDEO TRANSCIEVER, SWITCHER

1. Features
   a. Configurable as an encoder or decoder
   b. 5K Super-Wide 60hz 4:4:4 video over standard Gigabit Ethernet
   c. HDR (High Dynamic Range) video support (HDR10)
   d. 4x1 in encoder mode (2x HDMI, 2x USB-C
   e. One HDMI output with 4K60 4:4:4 scaler
   f. AES67 support
   g. Analog audio configurable as a balanced stereo input or output
   h. AES67 audio embedding and de-embedding
   i. 200 to 950 Mbps bit rates
   j. RDP and SDP streaming protocols, MPEG-2 transport
   k. HDCP 2.3, AES-128, PKI copy protection
   l. 802.3bt Type 3 powered
2. Acceptable
   a. Crestron DM-NVX-384
   b. Consultant Approved Equal
3. Quantity
   a. As shown on drawings

N. (DIR) NETWORK VIDEO DIRECTOR, APPLIANCE

1. Features
   a. Supports 1000 DM NVX devices
   b. Supports 240 domains
2. Acceptable
   a. Crestron DM-NVX-DIR-ENT
      1) Furnish with SFP-10G modules as necessary
   b. Consultant Approved Equal
3. Quantity:
   a. As shown on drawings

O. (NVXC) NETWORK VIDEO CARD CHASSIS

1. Features
   a. Eight-slot card frame for Crestron DM-NVX-C cards
   b. Hot-swappable card serviceability

c. Front panel 2 inch color LCD display and status indicators
d. Variable-speed fan cooling
e. 2RU

2. Acceptable
a. Crestron DMF-CI-8
b. No acceptable alternative available

3. Quantity
a. As shown on drawings

P. (DMTX) DIGITAL MEDIA TRANSMITTER

1. Features
a. Extends 1080P signals up to 230-ft over CATx cable
b. HDCP 2.3
c. EDID & CEC pass-through capability
d. Powers remote receiver over cable

2. Acceptable
a. Crestron HD-TXC-4KZ-101
b. Consultant approved equal

3. Quantity
a. As shown on drawings

Q. (DMRX) DIGITAL MEDIA RECEIVER

1. Features
a. Extends 1080P signals up to 230-ft over CATx cable
b. HDCP 2.3
c. EDID & CEC pass-through capability
d. Powered by remote transmitter over cable

2. Acceptable
a. Crestron HD-RXC-4KZ-101
b. Consultant approved equal

3. Quantity
a. As shown on drawings

R. (CAM1) PTZ CAMERA, 4K

1. Features
a. 1-type (1”) 4K MOS×1 (Effective size)
b. 20x optical zoom
c. PoE++ IEEE802.3bt standard
d. RJ45 LAN connector

e. 12G SDI output
f. NDI|HX2/NDI High Bandwith

2. Acceptable
a. Panasonic AV-UE160K
b. Consultant approved equal

3. Quantity
a. As shown on drawings

S. (CAM2) AUTOTRACKING PTZ CAMERA, HD, NDI

1. Features
a. Visual AI for Presenter Tracking
b. 1080p60
c. 20x optical zoom
d. POE powered
e. NDI HX video
f. 3G-SDI

2. Acceptable
a. Crestron IV-CAM-I20-W
1) Furnish with IVA-CMT-BRKTJ-1B J-mount ceiling bracket
b. No alternative equivalent available

3. Quantity
a. As shown on drawings

T. (CAM3) PTZ CAMERA, HD, NDI, 12X

1. Features
a. 12x optical zoom
b. 1080p60
c. Inverted mounting compatible
d. POE powered
e. NDI HX video
f. 3G-SDI

2. Acceptable
a. Crestron IV-CAM-P12-W

3. Quantity
a. As shown on drawings

U. (CAM4) PTZ CAMERA, HD, NDI, 20X

1. Features
a. 20x optical zoom

b. 1080p60

c. Inverted mounting compatible

d. POE powered

e. NDI HX video

f. 3G-SDI

2. Acceptable

a. Crestron IV-CAM-P20-W

1) Furnish with Vaddio 535-2000-290 drop down mount, and Vaddio 535-2000-300W drop pipe camera adapter (130E, 130F, 130G)

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

V. (PTZC) PTZ CAMERA CONTROLLER

1. Features

a. Joystick controller for smooth and responsive PTZ camera operation

b. 3.5" LCD screen displays menu and key camera information such as iris, zoom and focus

c. Supports PoE IEEE802.3af standard

2. Acceptable

a. Panasonic AW-RP60GJ

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

W. (RCP) CAMERA SHADER

1. Features

a. Universal control of multiple 3rd party devices

b. Programmable 4-way buttons with OLED screens

c. RGB backlit encoders with OLED screens

d. 4 motorized faders

e. Ethernet port with PoE EEE802.3at standard

2. Acceptable

a. Skaarhoj Color Fly w/Blue Pill

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

X. (ISO1) VIDEO RECORDER, 4CH 4K

1. Features
    a. 4K/UltraHD/2K/HD Recorder and Player
    b. Supports Apple ProRes, Avid DNx in both single an multi-channel recording modes
    c. Genlock-free multi-channel HD recording up to 1080 60p
    d. 1280x720 LCD display
    e. Single channel recording up to 4K 60p
    f. 1x 12G-SDI I/O, 3x 3G-SDI I/O
    g. HDMI 2.0 I/O
    h. 2x PAK media bays
    i. Analog audio I/O (DB-25 loom connectivity)
2. Acceptable
    a. Aja Ki Pro Ultra 12G
        1) Furnish (2) Aja PAK 1000 per device
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

Y. (ISO2) VIDEO RECORDER, 4CH, HD

1. Acceptable
    a. AJA KI PRO Ultra
        1) Contractor to furnish (2) AJA PAK 1000 per device
2. Quantity
    a. Four (4) units furnished by Owner, and reintegrated by contractor

Z. (REC), VIDEO RECORDER, 2CH, 4K

1. Features
    a. Front screen for basic configuration/control and confidence monitoring
    b. H.265/HVEC compression
    c. HDMI & SDI video inputs
    d. Analog Line level and embedded audio
    e. HDMI pass through
    f. 4K recording to SD, USB drive and internal M.2 drive
    g. PoE+ power
2. Acceptable
    a. Epiphan Pearl Nano
        1) Furnish the following with each unit:
            a) Pearl Nano 4K feature
            b) Pearl Nano Rack Shelf

c) Samsung 990 PRO 1TB M.2 2280 SSD

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

AA. (OGF) OPEN GEAR FRAME

1. Features

a. RU frame with capacity for up to 20 openGear cards

b. 600 watt power supply with integral cooling, optional 2nd power supply

c. Front LCD display for name, IP address and fault identification

2. Acceptable

a. Aja OG-X-FR openGear rack frame

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

BB. (VCON1) VIDEO CONVERTOR, CARD

1. Features

a. Low latency HD/3G/UHD SDI to HDMI 2.0b conversion (dual encode channels)

b. Relocked coaxial SDI output with support up to UHD

c. 2 x HDBNC

d. 2 x HDMI 2.0b

2. Acceptable

a. Ross SHC-8932-F

1) Furnish (1) Ross 8322AR-336 rear module per card

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

CC. (VCON2) VIDEO CONVERTOR, APPLIANCE

1. Features

a. Quad, Dual, and Single type conversions

b. 4x SDI BNC input connections

c. 4x SDI BNC output connections

d. USB port for configuration

2. Acceptable

a. Aja 12GM

b. Consultant approved alternative

3. Quantity
    a. As shown on drawings

DD. (VCON3) VIDEO CONVERTOR, SDI/HDMI
1. Features
    a. 1x SDI input, 1X SDI output
    b. 1x HDMI input, 1X HDMI output
    c. USBC port for configuration & power
    d. 1080p60, 4:2:2
2. Acceptable
    a. BlackMagic Design Micro Converter BiDirectional SDI/HDMI 3G
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

EE. (CONV2) HDMI TO USB CONVERTOR
1. Features
    a. Converts a 4K60 4:4:4 HDMI input to a USB 3.0 output
    b. Supports deep-color and HDR up to 12-bit
    c. HDCP 2.2 and HDCP 1.x compliant on HDMI input and output
    d. Automatically downscales 4K sources to 1080p for USB capture
    e. HDMI Loop out
2. Acceptable
    a. Crestron CONV-USB-300
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

FF. (DA1) HDMI DISTRIBUTION AMPLIFIER
1. Features
    a. 4K/UHD 24/25/30/50/60Hz
    b. HDMI 2.0/HDCP 2.2/HDCP 1.4
    c. 1x HDMI input
    d. 2x HDMI output
2. Acceptable
    a. Apantac HDM2.0-1x2-II
    b. Consultant approved equal
3. Quantity
    a. As shown on drawings

GG. (UCT1) VIDEO CONFERENCING SYSTEM, TEAMS ROOM, WALL MOUNT TS

1. Features
    a. Mini PC, Intel Core® processor with Windows® 10 IoT Edition OS and 100/1000 Mbps Ethernet connectivity
    b. Microsoft Teams Rooms UC Client
    c. HDMI to USB conversion via HD-CONV-USB-260 (CONV1)
    d. Content Ingest via UC-PR BYOD input appliance (UC-PR)
    e. User interface via TSW-1070-B-S-T-V touchscreen (TSC1)
2. Acceptable
    a. Crestron UC-CX100-T-WM
        1) Furnish with Rack Solutions 1U Dry Sliding Computer shelf for rack mounted components
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

HH. (UCT2) VIDEO CONFERENCING SYSTEM, TEAMS ROOM, TABLE TS

1. Features
    a. Mini PC, Intel Core® processor with Windows® 10 IoT Edition OS and 100/1000 Mbps Ethernet connectivity
    b. Microsoft Teams Rooms UC Client
    c. HDMI to USB conversion via HD-CONV-USB-260 (CONV1)
    d. Content Ingest via UC-PR BYOD input appliance (UC-PR)
    e. User interface via TS-1070-B-S-T-V touchscreen (TSC2)
2. Acceptable
    a. Crestron UC-CX100-T
        1) Furnish with Rack Solutions 1U Dry Sliding Computer shelf for rack mounted components
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

II. (UCZ) VIDEO CONFERENCING SYSTEM, ZOOM ROOM

1. Features
    a. Mini PC, Intel Core® processor with Windows® 10 IoT Edition OS and 100/1000 Mbps Ethernet connectivity
    b. Zoom Rooms software UC Client
    c. HDMI to USB conversion via HD-CONV-USB-260 (CONV1)
    d. Content Ingest via UC-PR BYOD input appliance (UC-PR)
    e. User interface via TS-1070-B-S-T-V touchscreen (TSC2)

2. Acceptable
    a. Crestron UC-CX100-Z
        1) Furnish with Rack Solutions 1U Dry Sliding Computer shelf for rack mounted components
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

JJ. (COLLAB) WIRELESS COLLABORATION SYSTEM

1. Features
    a. 1 Gb Ethernet port
    b. Dual-Band Wifi
    c. USB port for connecting a USB conferencing peripheral
    d. HDMI port with HDCP 2.2, EDID, CEC
    e. MS Teams Software and Zoom software compatible
2. Acceptable
    a. Crestron AM-3100-WF
        1) Furnish (2) AM-TX3-100 AirMedia Connect adapters
        2) Furnish (1) AM-TX3-100-CRADLE
        3) Furnish with PW-2412WU power supply
        4) Furnish (1) 6-ft USB-A male to USB-C Male cable (per 2.9.O.2.b)
        5) Furnish (1) 6-ft HDMI cable (per 2.9.O.2.a)
    b. Consultant approved alternative
3. Quantity
    a. As shown on drawings

2.5 DISPLAYS

A. (FPD1) FLAT PANEL DISPLAY, 98 INCH

1. Features
    a. 3840 x 2160 4K panel
    b. 400 cd/m^2
    c. 3x HDMI 2.0 with HDCP 2.2
    d. 600 x 400 VESA mounting
    e. Ethernet port
    f. RS-232
2. Acceptable
    a. NEC E988
        1) Furnish Chief XTM1U mount

2) Furnish above mount with FCAXV1U scissor arms (Drum locations)

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

B. (FPD2) FLAT PANEL DISPLAY, 86 INCH

1. Features

a. 3840 x 2160 4K panel

b. 400 cd/m^2

c. 3x HDMI 2.0 with HDCP 2.2

d. 600 x 400 VESA mounting

e. Ethernet port

f. RS-232

2. Acceptable

a. NEC E868

b. No acceptable alternative available

3. Quantity

a. As shown on drawings

C. (FPD3) FLAT PANEL DISPLAY, 49 INCH

1. Features

a. 3840 x 2160 4K panel

b. 500 cd/m^2

c. 2x HDMI 2.0 with HDCP 2.2

d. 300 x 300 VESA mounting

e. Ethernet port

f. RS-232

2. Acceptable

a. NEC MA491

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

D. (FPD4) FLAT PANEL DISPLAY, 32 INCH

1. Features

a. 1920 X 1080 panel

b. 450 cd/m^2

c. 2x HDMI 2.0 with HDCP 2.2

d. 100 X 100 VESA mounting

e. Ethernet port
f. RS-232

2. Acceptable
   a. NEC M321
   b. No alternative equivalent available
3. Quantity
   a. As shown on drawings

E. (DSTS1) DIGITAL SIGNAGE TOUCHSCREEN, 15.6”
1. Features
   a. 15.6" LCD touchcreen, 300 nits
   b. 1920x1080 resolution
   c. Integrated Brightsign HS145
   d. PoE 802.3at powered
2. Acceptable
   a. Bluefin 15.6 Brightsign BSBI (part# 20-3008-1095)
      1) Furnish with Vidabox fixed VESA slim wall mount (pat# VB00000000498)
   b. No acceptable alternative available
3. Quantity
   a. As shown on drawings

F. (DSTS2) DIGITAL SIGNAGE TOUCHSCREEN, 21.5”
1. Features
   a. 21.5" LCD touchcreen, 300 nits
   b. 1920x1080 resolution
   c. Integrated Brightsign HS145
   d. PoE 802.3bt powered
2. Acceptable
   a. Bluefin 21.5 Brightsign BSBI (part# 20-3008-1032)
      1) Furnish with Vidabox fixed VESA slim wall mount (pat# VB00000000498)
   b. No acceptable alternative available
3. Quantity
   a. As shown on drawings

G. (MON1) MONITOR, 27 INCH
1. Features
   a. 27-inch 4K (3840 x 2160) HDR IPS panel
   b. 99% DCI-P3 and 99% Adobe RGB coverage
   c. Calman Verified and factory pre-calibrated to Delta E < 2 color accuracy

d. 1x USBC (DP Alt mode), 2x HDMI 2.0, 2x DP1.4 (daisy-chain)

e. 100x100 VESA mounting

2. Acceptable

a. Asus PA279CRV

1) Furnish with black Ergotron LX Desk Monitor Arm (part# 45-241-224)

b. No acceptable alternative available

3. Quantity

a. As shown on drawings

2.6 REMOTE CONTROL

A. General: The Control Systems consist of three (3) parts: Remote Control and Monitoring, and DSP Control and Monitoring.

1. The contractor shall provide programming for the remote control systems as described below and shown on the Category AV drawings. The Contractor shall submit shop drawings of all control screen layouts and control descriptions to the Architect for review and comment prior to actual final programming and installation.

2. Provide bi-directional feedback on all screens for all devices.

3. Labels and Text: Avoid abbreviations and acronyms. Device selection and control buttons will be labeled with clear text descriptions. Transport control buttons will use graphical icons. Lettering is 1/8” minimum sans serif font, maintaining background to text contrast. Use contrasting color to highlight function or feedback status.

4. Use positive logic. Avoid conditions that may cause command synchronization conflicts. Provide power sensors or other devices to ensure that positive logic conditions are maintained. Use RS-232 or RS-422 devices that provide feedback of equipment status to the control system.

5. Feedback shall be indicated in a logical manner on the touch screen at all times. The status of each controllable device shall be polled to reflect the most accurate state of the overall system condition at all times.

6. Link functions to require the fewest number of use actions to control the audiovisual equipment.

7. Each media selection clears the previous audio and visual selection (i.e. “CD SELECT” clears the audio as well as video selection of “DVD SELECT”).

8. Default conditions shall be established for the system at power-up including device, warm-up routine, power conditions, switcher status and other default conditions.

9. Buttons (hard and soft) shall incorporate pilot lights or inverted illumination capabilities.

10. The programming shall be “foolproof” to the extent that each operation or sequence of operations does not cause the control system to become inoperable to interfere with further procession, correct operations or execution of commands.

11. Provide the following modules for control as required:

a. Relays.

b. Serial and Infrared (IR).

c. RS 232 and RS 422 with adjustable baud rate.

d. Logic Input Control.

12. Provide the following control system accessories as required:
    a. Terminal blocks, wiring hardware
    b. Power Supplies, submit for approval.
    c. Supply Com ports, IR ports and/or modules as necessary.
    d. Provide additional accessories, including sync and power sensors, as required to provide a fully operational system.
    e. Provide minimum 15-minute UPS backup for the RC units.
13. The Contractor shall be responsible for developing and implementing, with the assistance and oversight of the Consultant and Owners Information Services personnel, a Web-based Asset Resource Management solution.
    a. Acceptable: This solution must include Crestron Fusion and at least the following features:
        1) Furnish mfg. recommended server hardware or at the discretion of the Owner software may reside on a virtualized server provided and maintained by the Owner.
        2) Remote monitoring and control of all applicable AV devices furnished under this scope. Furnish interfaces as necessary.
        3) Multiple customizable layers or levels of organization.
        4) Equipment scheduling capabilities such as turn on / turn off at specific times.
        5) Provide Web client interfaces.
        6) Email Notification.
        7) Database integration.
        8) Ability to generate customized reports.
        9) Mobile Device integration.
        10) Furnish licenses for all applicable control system devices.
14. Mobile Device integration, including desktop-based X-Panels
15. Furnish licenses for all applicable control system devices.

B. Remote Control Submittals and Owner Review:
1. Prior to programming the remote control system, the Contractor shall submit shop drawings per the project standards showing all control screen layouts and control descriptions of all remote control system functions to the Owner’s Representative and AV Consultant for review and comment prior to actual programming of the system. Shop drawings shall include control screen layouts of the touch panel pages for each panel, remote layouts (accessible by authorized PC computer on the AV network), DSP software "Control pages" for all preset configurations. Submit electronic versions of the software and to the Consultant for review and approval. The Contractor shall incorporate all Owner comments into the programming of the systems.
2. Prior to delivery of the systems to the job site, the Contractor shall demonstrate fully functioning systems in the Contractor’s facilities that include the remote control programming. This demonstration shall coincide with the Owner’s Representatives observation of Completed Sub Assemblies (Refer to Section 3.2). The Owner will review and comment upon the remote control programming, and the Contractor shall incorporate all Owner comments into the programming of the systems.

3. After the installation of the AV systems has been deemed substantially complete, but prior to final acceptance of the system, the Owner shall have a review period of forty-five days to observe the operation of the remote control system. At the end of this review period, the Owner may request programming changes relating to the look and feel of the remote control panels or the functionality of commands. The Contractor shall make these changes prior to final acceptance of the systems.

C. Control System Help Menu:

1. Provide a detailed context sensitive help section to aid the operation and use of the media system. The help section shall provide a “novice” user with enough information to use every aspect of the programmed, controllable devices.

2. Provide a help button on every “page”.

3. The help button on each “page” shall open the section of the help menu specific to that “page”. Every button on that “page” shall be detailed in such section of the help menu.

D. Touch Screen Layout Description:

1. Programming: System Screens shall be ordered, mapped, and the buttons defined as deemed necessary by the Consultant. The goal of the remote control system programming is to provide a simple, user-friendly interface to the audio-visual system. With this in mind, each button on the remote control panels may initiate control of multiple devices to streamline operation of the system.

2. Template: Layout shall be clear, uncluttered, professional, and up to date.

3. Title Screen: Contractor shall obtain bitmap file of the Owner’s logo for this screen. Touching the screen in any location will bring user to the Main Menu screen. This is the default start up screen for power up and sleep mode.

E. Remote Control Software Programming:

1. To ensure the quality and consistency of the controls program and its wide range of responsibilities, the Consultant has worked with BMA Software Solutions to develop the control system programming and user interface for this project. Contractor shall engage BMA Software Solutions to provide the programming of the Audiovusial Remote Control System. BMA Software Solutions can be contacted at (714) 455.2717 or via email at marc@bmasoftwaresolutions.com for a master quote.

2. When working with BMA, the Audiovisual Contractor shall coordinate and adhere to the following:

a. The Audiovisual Contractor must provide complete system engineering to BMA prior to the beginning of code development.

b. The Audiovisual Contractor must coordinate installation schedule with BMA, and arrange for staging, initial upload and testing at the Audiovisual Contractor's facility prior to delivery to client.

c. The Audiovisual Contractor must involve BMA in deciding any equipment/connection changes before the changes are confirmed.

d. BMA will go on-site for loading and troubleshooting only if an engineer employed by the Audiovisual Contractor accompanies them.

e. Where possible, the Audiovisual Contractor should coordinate to provide Internet connection at job site to allow remote access and programming.

f. As needed and where reasonable, the Audiovisual Contractor will provide needed hardware to BMA for software development.

g. The Audiovisual Contractor must be an authorized CRESTRON dealer in good standing.

h. BMA and the Audiovisual Contractor must provide required controls software programming to access all commonly used features for each item to be controlled;

i. BMA and the Audiovisual Contractor must submit touch panel layouts to consultant and client for approval, either electronically or as printed screen copies;

j. BMA and the Audiovisual Contractor must revise touch panels as required prior to the acceptance of the system and provide at no extra charge any reprogramming of the control system or touch panels requested by the Owner within thirty days of acceptance of the system for user functionality issues;

k. The final programming product must incorporate the Owner's logo as part of the start-up screen; Contact Owner for appropriate graphics sources.

F. (RC2) REMOTE CONTROL PROCESSOR

1. Features

a. Enterprise-class control system

b. Onboard 2GB RAM & 8GB Flash memory

c. Dedicated local network for AV devices

d. 3 RS-232 COM, 8 IR/serial, 8 relay, 8 I/O ports

e. SD memory card slot

f. XPanel for computer and web-based control

g. iPhone, iPad, and Android control app support

2. Acceptable:

a. Crestron CP4N

b. No alternative equivalent available

3. Quantity

a. As shown on drawings

G. (TSC3) TOUCH SCREEN PANEL, 21 INCH

1. Features

a. 21 inch 1920 x 1080 resolution panel

b. HDMI input

c. USB port

d. 10-point multitouch capable

e. VESA 100x100 mount compatible

2. Acceptable

a. Crestron TSD-2220-B

1) Furnish with Ergotron Neo-Flex Touchscreen Stand (part# 33-387-085)

3. Quantity

a. As shown on drawings

H. (TSC4) TOUCHSCREEN CONTROLLER, WIRELESS
   1. Features
      a. 10.1 in. LED backlit color LCD Capacitive touch screen display
      b. 802.11ac/b/g/n/ax Wifi connectivity on 2.4 and 5 Ghz bands
      c. H.265, H.264, or MJPEG streaming video display
      d. Large-capacity Lithium Ion battery pack
      e. H.265, H.264, or MJPEG streaming video display
      f. Built-in web browsing
      g. Support for XiO Cloud® provisioning and management service
   2. Acceptable
      a. Crestron TST-1080
      b. No alternative equivalent available
   3. Quantity
      a. 2 units (one dedicated to the Drum, one dedicated to the Gulf)

I. (GENG) DIGITAL GRAPHICS ENGINE
   1. Features
      a. HDMI output with HDCP 1.4, EDID, CEC compatibility
      b. USB connection for control
      c. Decodes H.264, MJPEG streaming protocols
      d. 100 Mbps Ethernet port with PoE 802.3at Type 1
      e. RS-232, 2x IR/serial ports
   2. Acceptable
      a. Crestron DGE-100
      b. No alternative equivalent available
   3. Quantity
      a. As shown on drawings

J. (AVPC) AUDIO VISUAL CONTROL PC
   1. Features
      a. Intel Core i5 14600 processor
      b. Windows 11 Pro
      c. 16GB RAM
      d. 256GB SSD
      e. HDMI port
      f. 180W power supply

2. Acceptable
    a. Dell Optiplex 7020 SFF PC
        1) Furnish with Acnodes KDF8170 (MON/KB) rack LCD console
    b. Consultant Approved Equal
3. Quantity
    a. As shown on drawings

2.7 NOT USED

2.8 A/V DATA NETWORK DISTRIBUTION SYSTEM

A. (DSW4) DATA NETWORK SWITCH, 48 PORT, POE++
1. Features
    a. 1RU
    b. 48x1Gb access ports
    c. 3600W POE budget for 90W POE++
    d. Dual power supplies
2. Acceptable
    a. Juniper Networks EX4400-48XP
        1) Furnish (1) 4 x 1/10/25GbE SFP28 extension module with required number of SFP28 transceivers for connectivity shown on drawings
        2) Furnish with 100GbE DACs to stack switches as shown on drawings
        3) Configure with (2) 2000W power supplies, one sourced from UPS and other from alternate AC circuit.
        4) Furnish with Mist Wired Assurance And Marvis Virtual Network Assistant 5 year license, to be installed by Owner.
        5) Furnish with Advanced Layer 2 switching and Layer 3 routing license+ (perpetual), to be installed by Owner.
        6) Coordinate delivery to Owner for pre-configuration prior to installation onsite
    b. No alternative equivalent available
3. Quantity
    a. As shown on drawings

B. (DSW5) DATA NETWORK SWITCH, 24 PORT, POE++
1. Features
    a. 1RU
    b. 24x1Gb access ports
    c. 1440W POE budget for 90W POE++
    d. Dual power supplies
2. Acceptable
    a. Juniper Networks EX4400-24P

1) Furnish (1) 4 x 1/10/25GbE SFP28 extension module with required number of SFP28 transceivers for connectivity shown on drawings
2) Furnish with 100GbE DACs to stack switches as shown on drawings
3) Configure with (2) 1600W power supplies, one sourced from UPS and other from alternate AC circuit.
4) Furnish with Mist Wired Assurance And Marvis Virtual Network Assistant 5 year license, to be installed by Owner.
5) Furnish with Advanced Layer 2 switching and Layer 3 routing license+ (perpetual), to be installed by Owner.
6) Coordinate delivery to Owner for pre-configuration prior to installation onsite

b. No alternative equivalent available

3. Quantity
   a. As shown on drawings

C. (NRTR) NETWORK FIBER ROUTER
1. Features
   a. 1RU
   b. 48 x 10/25Gb and 8 x 40/100Gb fiber ports
   c. Dual power supplies
   d. Redundant fans
2. Acceptable
   a. Juniper Networks EX4650
      1) Furnish with required number of SFP+/SPF28 transceivers for connectivity shown drawings
      2) Furnish with Mist Wired Assurance And Marvis Virtual Network Assistant 5 year license, to be installed by Owner.
      3) Furnish with Advanced Layer 2 switching and Layer 3 routing license+ (perpetual), to be installed by Owner.
      4) Coordinate delivery to Owner for pre-configuration prior to installation onsite
   b. No alternative equivalent available
3. Quantity
   a. As shown on drawings

D. (MAC) APPLE MACINTOSH MINI
1. Features
   a. M4 Pro14-core processor
   b. 64GB RAM
   c. 2TB SSD
   d. 10 Gigabit Ethernet
   e. Apple Care, 2Y

2. Acceptable
    a. Apple Mac Mini – Custom specification
    b. Furnish with (1) Asus PA279CRV [MON1]
    c. Furnish and install with Captivate Broadcast Production Suite software (perpetual license)
    d. Furnish (1) Sonnettech SF3-2AJAPK AJA PAK Media Pro Card Reader
3. Quantity
    a. As shown on drawings

2.9 RACKS, WIRE,CONNECTORS AND MISCELLANEOUS

A. (D-#) DATA PATCHBAYS
1. Features:
    a. 48-port, 2RU
    b. Leviton Quickport compatible
2. Acceptable:
    a. Leviton 49255-48N
        1) Furnish Leviton Extreme Cat 6 Quickport jacks, color coded
        2) Shielded CAT6A Quickport jacks to be used for point to point non-networked data runs to field
            a) All shielded terminations shall land on dedicated patchbay frames
        3) Furnish factory terminated and certified T568B patchcords with integrated strain relief
            a) Must support IEEE 802.3bt PoE Type 1, 2, 3, 4
            b) Must match the category level and shielding of the installed cabling
    b. Consultant approved equal.
3. Quantity:
    a. As shown on drawings

B. (CONPNT) CONSOLIDATION POINT
1. Features
    a. 24-port
    b. Leviton Quickport compatible
    c. Steel construction
2. Acceptable
    a. Leviton 49225-24E
        1) Furnish Leviton Extreme Cat 6 Quickport jacks, color coded
        2) Furnish factory terminated and certified T568B patchcords with integrated strain relief
            a) Must support IEEE 802.3bt PoE Type 1, 2, 3, 4
            b) Must match the category level and shielding of the installed cabling

b. Consultant approved equal

3. Quantity
   a. As shown on drawings

C. (F-#) FIBER OPTIC PATCH PANEL
1. Features:
   a. 1-, 2-, or 3RU
2. Acceptable:
   a. Leviton 500i SDX Enclosure
      1) Furnish appropriate Leviton SDX Modules or Adapter Plates
      2) Furnish appropriate cable management
      3) Furnish Leviton PRMPT 1-meter pigtails
   b. Consultant approved equal.
3. Quantity:
   a. As shown on drawings

D. (FFT) FIBER OPTIC FIELD TERMINATION BOX
1. Features:
   a. Leviton Quickport compatible
2. Acceptable:
   a. Leviton 5WMNT-01C
      1) Furnish appropriate Leviton SDX Adapter Plates
      2) Furnish appropriate cable management
      3) Furnish Leviton PRMPT 1-meter pigtails
      4) Furnish fiber patch cables per specifications from FFT to panel receptacles
      5) Mount FFT inside AV backbox
   b. Consultant approved equal.
3. Quantity:
   a. Provide within each AV backbox with Fiber Optic Connectors

E. (V-#) VIDEO PATCHBAYS
1. Features:
   a. 32x2 mini-WECO jacks
   b. 24 GHz high-bandwidth performance
   c. Staggered BNC Rear Interface
2. Acceptable:
   a. Bittree S64S-1MWNBK
   b. Consultant approved equal.

3. Quantity:
    a. As shown on drawings
    b. Furnish (2) 36” Mini-WECO (Midsize) to BNC 75 Ohm patch cables
    c. Furnish (2) Mini-WECO (Midsize) to Female BNC Adaptor Plug, Short
    d. Furnish (2) Mini-WECO (Midsize) to Female BNC Adaptor Plug, Long

F. (VAMP) SDI VIDEO DISTRIBUTION AMPLIFIER
1. Features
    a. 1x12G/ 6G/ 3G/ 1.5G/ 270Mb input
    b. 2x12G/ 6G/ 3G/ 1.5G/ 270Mb output
    c. Auto-selectable SDI
    d. Equalization and Re-clocking output
    e. Meets and exceeds SMPTE-424, SMPTE-292, SMPTE-259
2. Acceptable Products
    a. Freakshow MSX2O
    b. Consultant approved equal
3. Quantity
    a. As shown on drawings

G. (CUBBY) CABLE BAY, SURFACE RECESSED
1. Features
    a. Mechanical configuration
    b. Crestron FT2A-CBL-PT-4K-HD HDMI to HDMI pass through type cable
    c. USB-A male to USB-B mini cable (per 2.9.O.2.b.1)
        1) Custom fabricated to operate in FT2A-PLT-PT pass-through plate
    d. 6-ft USB-C male to USB-C male cable (per 2.9.O.2.b.2)
        1) Custom fabricated to operate in FT2A-PLT-PT pass-through plate
    e. NEMA 5, Type B power outlet module
2. Acceptable
    a. Crestron FT2-500-PTL
    b. No acceptable alternative available
3. Quantity
    a. As shown on drawings

H. RACK PANELS
1. Features:
    a. 1/8" anodized brushed aluminum finish.
    b. 19" standard EIA width.
    c. 60% Minimum Open Area for Vent Panels

2. Acceptable Products:
    a. Lowell, Middle Atlantic
    b. Consultant Approved Equal
3. Quantity:
    a. As shown on drawings

I. CARD READER
1. Features
    a. Compatible with Aja PAK Media
    b. USB3.2 Gen 2 transfer speeds
    c. USB-C connector
    d. Bus Powered
2. Acceptable
    a. PAK Dock Pro
    b. No acceptable alternative available
3. Quantity
    a. Furnish 2 units

J. (ABAL) LINE INPUT TRANSFORMER +4dB OUTPUT TO -10dB INPUT
1. Features:
    a. Unbalances "Pro" to "Consumer IHF" Outputs.
    b. Transformer isolation.
    c. Passive device.
2. Electrical Characteristics:
    a. Bandwidth: -3dB at 0.25 Hz and 100 kHz.
    b. Input impedance: 13Kohm.
    c. Common Mode Rejection: greater than 60dB.
    d. Insertion loss: 14dB
3. Acceptable Products:
    a. Jensen ISO-MAX PC-2XR
    b. Consultant Approved Equal
4. Quantity:
    a. As shown on drawings + (1) per unbalanced stereo input pair as needed

K. (UBAL/BAL) UNBALANCED/BALANCED TRANSFORMER
1. Features:
    a. Provides transformer isolation between balanced line and unbalanced input
    b. Level trimpot adjusts output 4 to 24 dB below input level
    c. Input may be 10 kΩ bridging or 600 Ω terminated

2. Acceptable Products:
    a. RDL TX-1A
    b. Consultant Approved Equal
3. Quantity:
    a. As shown on drawings

L. (ISO-A) 1:1 LINE TRANSFORMER
1. Features:
    a. 1:1 turn ratio.
    b. Transformer isolation.
    c. Passive device.
2. Electrical Characteristics:
    a. Bandwidth: -3dB at 0.25 Hz and 100 kHz.
    b. Distortion: > 0.001% THD
    c. Common Mode Rejection: greater than 60dB
    d. Insertion loss: less than 1.5 dB
    e. Hum Rejection: greater than 60 dB
3. Acceptable Products:
    a. Jensen ISO-MAX DM2-2XX
    b. Consultant Approved Equal
4. Quantity:
    a. Use as required.

M. AUDIO TERMINAL BLOCKS
1. Features:
    a. Rated for stranded 20 GA - 24 GA wire.
2. Acceptable Products:
    a. WAGO Style modular DIN rail terminal blocks
        1) Furnish cable end ferrules and mfg. recommended tooling
    b. Consultant Approved Equal
3. Quantity:
    a. AVC shall furnish terminal blocks in sufficient quantity to fulfill the functional intent of the drawings

N. INSTALLED WIRING
1. (NOTE: Only Non-plenum versions listed, furnish plenum equivalents as required by Code.)
2. Loudspeaker lines in conduit: standard electrical wire, stranded copper, color-coded, THHN/THWN type.
    a. Low Z (Loudspeaker Clusters): AWG #10 unless otherwise noted

b. Low Z (Utility and Surround Loudspeakers): AWG #12 unless otherwise noted

c. High Z (Distributed Loudspeakers): AWG #14 unless otherwise noted

3. Loudspeaker lines not in conduit:

a. Low Z: AWG #10 equal to WestPenn/CDT HA210 or consultant approved equal.

b. High Z: AWG #14 equal to WestPenn/CDT 226 or consultant approved equal.

4. Mic and Line (Analog): twisted, shielded pair #22: equal to Belden 8761 or WestPenn/CDT (x)454 or consultant approved equal.

5. Mic and Line (Digital): AES/EBU capable, twisted, shielded pair #24AWG/110 Ohm: equal to Belden 1800F or consultant approved equal. (Note: only 110 Ohm versions will be considered)

6. Production communication: Twinax shielded pair #20 equal to Belden 9207 or consultant approved equal by WestPenn/CDT.

7. Video 75 ohm COAX 12G-SDI runs >200 feet:

a. BOD: Belden 4694R

b. Consultant approved equal

8. Video 75 ohm COAX, 12G-SDI runs >125 feet / less than 200 feet:

a. BOD Belden 4505R

b. Consultant approved equal

9. Video 75 ohm COAX, 12G-SDI runs less than 125 feet:

a. BOD: Belden 4855R

b. Consultant approved equal

10. DC Control Lines:

a. low current loads (<2A) (mute, relays, VCA, LED): AWG #20.

b. medium current loads (>2A) (actuators, illuminators): AWG #18.

11. RF: 50 ohm (Remote antennae).

a. (runs <25') Acceptable: Belden 8240 or approved equal.

b. (runs >25') Acceptable: Belden 8214 or approved equal.

12. RF: 75 ohm.

a. RG-6/U Acceptable: Comm/Scope F690BV or approved equal.

b. RG-11/U Acceptable: Comm/Scope 5912 or approved equal.

13. Digital Remote Control Lines:

a. Acceptable: Carol 1130, West Penn 271, or approved equal.

14. Unshielded, Twisted Pair:

a. Category 6

1) Runs up to 90M

a) Acceptable: Berk-Tek LanMark-1000, or approved equal.

2) Runs > 90M

a) Acceptable: Paige GameChanger Cable (must be pre-approved for location by consultant)

15. Shielded, Twisted Pair:
    a. Category 6A
        1) Runs up to 90M
            a) Berk-Tek LANmark-10G FTP Riser Category 6A, F/UTP
        2) Runs > 90M
            a) Acceptable: Paige GameChanger Cable (must be pre-approved for location by consultant)
16. Fiber Optic Cable
    a. Duplex OM4 (3.0mm)
        1) Submit for approval
    b. Distribution Cable
        1) 12-strand OM4 (submit for approval)
        2) 24-strand OM4 (submit for approval)
17. Power and Signal Multi-core cable:
    a. Acceptable: Belden 1502

O. PORTABLE CABLES
1. Reusable Portable Cable Tie
    a. Quantity:
        1) 1 per portable cable provided.
    b. Acceptable:
        1) Rip-Tie 1-Inch Wide Rip-Lock CableWrap
        2) Consultant Approved Equal
2. Additional Cable Stock
    a. HDMI Cable
        1) Only pre-made factory terminated and V2.1 certified cable assemblies shall be permitted. HDMI runs longer than 25’ shall not be permitted.
            a) (runs <30’) Active Ultra High Speed 8K 48G: Acceptable: Comprehensive MicroFlex Pro AV/IT Integrator Series
        2) Furnish (4) 6’ HDMI cables
        3) Furnish (4) 12’ HDMI cables
    b. USB Cable
        1) USB3
            a) Acceptable: Comprehensive Pro AV/IT Series USB3.0 (3.2 Gen1)
            b) Furnish (2) 10’ USBA to USBC cables
        2) USB4
            a) Acceptable: CalDigit Thunderbolt 4 Cable 2.0m
            b) Furnish (2) 6’ USBC to USBC USB4 cables

c. Digital Media Extension Cables: Ruggedized, High-flex, Tactical Style Cable STP Ethercon to Shielded RJ-45 in various lengths.

1) Quantity:

a) 12’ cables (qty.4)
b) 25’ cables (qty.4)

2) Acceptable:

a) Submit for Approval

P. CONNECTORS AND RECEPTACLES

1. Only metal connector shells and bodies are permitted.
2. Mic and Line:
   a. Solder only. No IDC, 1-piece compression or screw terminal versions permitted.
   b. Input: 3 pin female XLR type and 1/4" TRS jacks where shown on drawings. Insulate 1/4" jacks from plate, do not ground pin 1 on XLRs.
   c. Output: 3 pin male XLR type and 1/4" TRS as above.
   d. RCA: Only solder style, metal connector shells and bodies are permitted., no "molded assemblies" shall be permitted
3. Loudspeaker:
   a. Only Neutrik Speakon® devices are acceptable.
   b. Wire all terminals unless otherwise noted.
   c. Panel: Neutrik NL4MP or NL2MP as required.
   d. Cords: NL4FC.
   e. Cable couplers: Neutrik NL4MM.
   f. Wooden box mounting: Neutrik NL4MPR.
   g. All NL4 devices shall be cabled for two channel operation unless otherwise noted.
4. Video: 75 ohm Coax
   a. Only 3-piece BNC devices are acceptable.
   b. No IDC, compression or screw terminal versions permitted.
   c. Extron BNC's shall not be permitted
   d. Panel-mount recessed BNC: Neutrik D-Series
   e. Cable:
      1) Canare BCP C3B for Vx 3C series cables.
      2) Canare BCP C4B for use with RG 59 cables.
      3) Canare BCP C77A for use with LV 77S cables.
   f. Cable couplers: BNC male/male barrel
   g. HDMI: Cables shall be Cat-2 certified for 10.2 Gb/s and shall carry the HDMI logo.
5. Control: submit cut sheets.
6. Production Communications: 3 pin and 6 pin male XLR type as shown on drawings

7. Digital Media (RJ45 style):
    a. Only punch down style (female jack) connectors shall be acceptable.
    b. No feed-thru's will be allowed except where noted in design documents
    c. Any male (plug) terminations shall be factory performed and certified.
    d. Male RJ45 terminations performed in the field shall utilize Belden RevConnect CAT6+ FlexPlug MPTL when conditions do not permit the use of a plate with female RJ45 punch down style connectors

Q. RECEPTACLE PANELS, ALUMINUM
1. Field verify panel sizes required for backboxes.
    a. Oversize flush panels sufficient to trim wall openings but not less than ½"
    b. Size surface mount panels exactly to backbox yielding no sharp corners and chamfering edges
2. Aluminum panels with labels engraved and back filled in black
3. Anodized, horizontal brushed finish
4. Submit engraved sample for approval by Owner.

R. DC Power Supplies:
1. 12, 24 volt, capacity as required with 100% extra, UL (or other) listed: Condor linear, submit cut sheets.
2. Provide and install in shielded metal chassis with fused LED status indicators.

S. (RPC) RACK POWER CONDITIONER
1. Features:
    a. Power line filters for spite and RFI control.
    b. 20 amp power conditioning capacity.
2. Acceptable:
    a. SurgeX SX1120-RT
3. Quantity: Provide per rack as necessary for power distribution requirements

T. (UPS) UNINTERRUPTIBLE POWER SUPPLY
1. Features:
    a. Rack Mounted
    b. Pure sine wave output
    c. Online Topology
    d. Surge protection
    e. 15 minute battery back up for the following devices:
        1) In-rack PCs
        2) Remote Control Processors
        3) Digital Signal Processors

4) Data Switches

5) Digital Media

2. Acceptable Products:

a. APC SRT2200RMXLAUS

1) Furnish APC SRT72RMBP as necessary to meet runtime requirement of 15 minutes

2) AVC shall submit full rack power calculations with battery runtime calculations

b. Consultant Approved Equal

3. Quantity:

a. Furnish (1) per equipment rack with devices requiring battery backup

U. CONFIDENCE MONITOR CARTS

1. Features

a. Supports displays with VESA 200 to VESA 600 horizontal

b. 4-inch casters

c. Adjustable screen angle from 30 to 60 degrees

2. Acceptable

a. Heckler Designs H1010-BK

b. Consultant Approved Equal

3. Quantity

a. Furnish 2 units

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Standards

1. The following installation requirements shall govern the design, fabrication and installation of the system(s) specified herein. In case of a discrepancy between these overall system standards and the individual equipment item specifications, the latter shall govern:

a. The equipment specified shall be installed according to standards of good human engineering practice and the conditions specified herein.

b. Workmanship on the installed systems shall be of professional quality, best commercial practice and accomplished by persons experienced in the techniques and standards of the particular industries involved.

c. The specifications describe required performance. The specifications with the contract drawings indicate a general design; it is the intention of the specifications that the AV Contractor will supply from his background of experience and knowledge the necessary supporting details; for example, the implementation of specific components into functioning sub-systems.

d. In general, the drawings show dimensions, positions, and kind of construction. The specifications describe materials, qualities, and methods. Any work called for on the drawings and not mentioned in the specifications, or vice versa, shall be performed

as though fully set forth in both. In case of differences between the drawings and the specifications, the decision of the AV Consultant shall govern. Work not particularly detailed, marked or specified, shall be construed to be the same as similar parts or areas that are detailed, marked, or specified.

B. The Conduit and Box System

1. General Requirements

a. The conduit diagrams indicate conceptually the functions served by the conduit system.

b. The conduit diagrams may indicate the locations at which functions are served at several locations in the facility.

c. See the General Installation Notes on the AV Design Drawings for further information.

d. Free-air cable runs are permissible for above ceiling installations when necessary, utilizing BICSI standards for installation. Contractor to use BICSI/EIA/TIA approved supports, and adhere to spacing requirements for EMI source exposed cabling described on design drawings (TA002 – AV Conduit Spacing Requirements)

2. Conduit Design Review

a. The AV Design Drawings indicate the number, type and location of the receptacle, wire and cable requirements and Equipment Room layouts.

b. The AV Contractor shall verify the quantity and sizing of all conduit in the AV Design Drawings prior to conduit installation by the Electrical Contractor.

c. The AV Contractor shall be responsible for notifying the AV Consultant, and Owner of any discrepancies of location, fill, or functionality of the conduit riser immediately.

3. Conduit Installation Requirements – when applicable

a. The Electrical Contractor shall provide and install the conduit system as shown in the approved AV Construction Documentation Submittal from the AV Contractor.

b. If the conduit installation is concurrent with the present contract, the AV Contractor shall inspect the work at appropriate times during construction and report any discrepancies to the AV Consultant and Owner in writing.

c. The AV Contractor shall coordinate the exact location of intermediate collector boxes with the Electrical Contractor.

d. The Electrical Contractor shall verify continuity of all conduits as described in the AV drawings with a yellow pull string.

e. The AV Contractor shall be responsible for supplying any additional conduit that may be required to complete the system installation in accordance with the drawings.

f. The AV Contractor shall also verify that conduits are adequate for the wiring and functions specified.

g. If the AV Contractor substitutes the specified wiring the AV Contractor shall bear the sole responsibility for reengineering the conduit system.

h. Each conduit shall contain wires or cable of the same signal level or the same type of circuitry only.

i. Each separate service level designation shown on the AV conduit riser shall be run in their respective, separate conduits and all conduit landings in backboxes or equipment racks shall be grouped by service level.

j. All conduits which pass through or into acoustically isolated areas, such as sound locks and studios, shall be suitably sealed after the wire and cable has been installed.

k. Conduit Spacing Requirements

1) AV Signal Conduit shall be separated no less than 6 inches from conduit carrying an EMI.

2) Refer to the Conduit Separation Requirements detail on the AV Design Drawings for further information.

4. Device, Specialty, and Pull Boxes

a. The Electrical Contractor shall provide and install all standard boxes.

b. The AV Contractor shall provide all specialty boxes for the project to the Electrical Contractor for installation.

c. The AV Contractor shall field-verify all devices and pull box installation conditions on site. Notify the AV Consultant of any discrepancies between approved AV Construction Documentation Submittal drawings and installation conditions.

d. The AV Contactor shall size connection panels as described below.

1) Surface Mounted Back Boxes

a) Connection panels shall be sized to match the outer edges of the installed back box and shall have smooth edges.

2) Recessed Mounted Back Boxes

a) Connection panels shall be sized to overlap the outer edges of the installed back box by 1” in both horizontal and vertical directions and shall be installed tightly against the wall surface finish.

e. Pull boxes are not shown on the risers but must be installed after each 270 degrees of bend.

f. Every 50 feet of straight conduit length shall be considered equal to 90 degrees of conduit bend.

C. Equipment Room(s) Arrangement

1. The general layout for these rooms is indicated in the AV Design drawings and shall be replicated in the Construction Documentation Submittal.

2. Maintain accessibility to the rear of the equipment racks.

3. In the event that the equipment room is not large enough to maintain minimum rear access clearance as mandated by National Electric Code, local code requirements and herein, the equipment racks shall be mounted on 3" casters or use an extension system. If casters are used the AV Contractor shall engineer a locking mechanism and submit it for approval by the AV Consultant. See specification section 3.1.D.5 for minimum clearance information.

D. Equipment Rack(s) Assemblies

1. General Installation Requirements

a. After the equipment racks are self-tested the AV Contractor shall notify the AV Consultant in writing that the equipment rack assemblies are ready for observation and approval.

b. Allow adequate time for any modifications necessary to satisfy the contract drawings and specifications.

c. Use rear and mid rails for intermediate terminations. Maintain accessibility to the rear of the equipment.

d. Mid rails must be used to support equipment weighing more than 50 pounds.

2. Wiring Harnesses

a. Equipment rack wiring shall be "Harness" style.

b. "Point to Point" rack wiring is not acceptable.

c. The individual wiring harnesses shall be located at the front of the equipment rack and individual pairs of cable shall be broken out around the side of the equipment to the rear where the connectors are located.

d. Electrical service levels shall not be mixed in an individual harness. It is the intent that there will be a separate harness for each electrical service level.

e. Great care shall be exercised to keep low level signal harnesses separated from the AC power lines and high-level signal harnesses.

f. Harness Restraint

1) All cable clamps shall be non-conducting or have soft insulating covers.

2) Zip tie cable harnessing shall not be used on any category or HDMI cables

3) Velcro ties shall be used to harness all category and HDMI cables

g. Inter-Rack Connections

1) All inter-rack connections shall be harnessed together with like signal levels and separated by power levels

2) Inter-rack connections through a high voltage cable-chase are not acceptable.

3) When three (3) or more racks are combined in an Equipment Rack System, inter-rack connections through low voltage cable chases are only allowed between immediately adjacent racks and shall not exceed a quantity of three (3) cable harnesses.

4) When three (3) or more racks are combined in an Equipment Rack System, inter-rack connections between non-adjacent racks must enter and exit the rack vertically through the low voltage cable-chase for the corresponding racks and traverse horizontally in the signal appropriate cable tray exterior to the rack system.

5) When two (2) racks are combined in an Equipment Rack System, no more than three (3) cable harnesses shall transverse the low voltage cable chase for inter-rack connections.

h. Each rack shall be a complete stand-alone assembly allowing the system to be completely tested in the AV Contractor's facility.

3. Equipment Labels

a. Rack-mounted equipment shall be labeled on front and back with the Device Tag as defined in the Bill of Materials, Single Line Drawings, and Rack Elevations of the approved Construction Documentation Submittal

b. Use permanent professional quality labels such as "Lamacoid" or approved equal.

c. Stick-on strip labels such as those from Dyno, Brother or Kroy are not acceptable.

4. Internal A/C Receptacles

a. Maintain grounding as shown on contract drawings and described in the herein.

b. In general, locate all internal AC receptacles and high voltage harnesses on the left side of the rack and all low voltage harnesses on the right side of the rack.

c. In the event that there are two (2) or more equipment racks side by side locate the A/C receptacles in the middle of the equipment racks and the wiring harnesses to the outer sides.

d. Furnish each equipment rack with a full height AC plug strip with receptacles sufficient for powering all equipment contained with plus 20% for future expansion.

e. The use of Waber strip style plug strips, commercial or consumer grade is strictly prohibited.

f. All “wall-wart” style power supplies shall be firmly secured to the plug strip using 3M Dual-Lock™ re-closeable fastener strips or single Ty-wraps, joined or linked ty-wraps are not permitted.

g. Provide one (1) 40-Watt lamp, or equivalent, top rear of the rack, for each equipment rack.

5. Installation

a. No equipment racks may be installed on site prior to prior to the following:

1) The AV Consultant has performed the AV Equipment Rack Observation in the AV Contractor’s Facility

2) All punch list items described as ‘minimum to enable rack delivery to site’ have been addressed, proof has been submitted to AV Consultant, and AV Consultant has approved rack delivery to site.

3) Notice has been filed with the Owner, and the Consultant that a ‘dust-free’ environment has been achieved in the project in all areas where audiovisual system equipment is to be installed.

4) Dust-free shall be defined as follows: all floor, wall, ceiling construction, millwork, finishes (including paint), carpet, hardware, electrical, and HVAC is absolutely complete (and tested and fully operational in the case of electrical and HVAC systems) before AV equipment racks may be delivered to the site.

b. The equipment rack(s) shall be installed in the Equipment Room(s) in the configuration shown in the drawings.

c. The plan shall allow for an absolute minimum of 36 inches, preferably 42 inches, of clear space measured from the front of the rack(s) and from the rear of the equipment rack(s) to any installed equipment or walls.

d. All stationary equipment rack(s) shall be secured to the building structure to meet seismic and code requirements.

e. Interconnecting multi-channel cabling shall be led laterally from equipment rack to the vertical rack member, opposite from the AC power and then run vertically, remaining as exposed and accessible as possible. Wherever corners in multi-channel cabling occur strain relief spiral covering shall be used.

f. All audio field lines entering the Equipment Racks shall be connected with an intermediate terminal block or patchbay.

g. In the event that a patchbay with an E3 or E90 connectors is used, the patch bay may serve as the terminal block. This will also facilitate the testing of the systems in the AV Contractor's Facility.

h. Video field lines may be connected directly to the video switcher, router, or patchbays.

i. All connections of lines at terminal blocks, as well as at signal receptacles, shall be mechanically secured and then soldered. No unsoldered connections shall be permitted.

j. Where lines approach the racks and terminal blocks they shall also be mechanically anchored at the rack, and provided with sufficient slack length to avoid strain, abrasion, or wear

E. Field Wiring and Cabling

1. General Installation Requirements

a. Extreme care must be taken to physically segregate and separate all high-level lines from lower-level lines.

b. Control cables and power distribution wiring shall not be installed adjacent to signal cables.

c. A wall location near the racks shall be chosen and suitable suspension "fingers" provided so that all patch cords of a given type can be grouped and suspended.

2. Wire and Cable Jacketing

a. The AV Contractor shall take the responsibility to confirm and submit the appropriately rated wire and cable jacketing as code requires for approval from the AV Consultant (ie Plenum vs non-Plenum)

b. The AV Contractor shall confirm and submit the appropriately rated wire and cable jacketing for all outdoor and direct burial applications for approval from the AV Consultant (ie waterblock)

3. Wire Labels

a. During installation both ends of all wires or cables shall be clearly labeled with approved wire labels clearly referenced to labels on the approved AV Construction Documentation single line drawings.

b. The wire labels shall not be more than 8 inches or less than 4 inches from the connector or termination at each end of the cable.

c. Wire labels shall utilize plastic shrink-wrap, protecting the text and ensuring they remain affixed to the wiring.

d. Approved: Thomas and Betts or approved equal, submit sample to the Owner's Representative.

4. Field Documentation

a. Maintain a careful running log of route and terminations for each cable during the installation process for maintaining red lines to be transferred to the Record Submittal

b. All spare, unterminated cable shall be shown on the Record Submittal

5. Cable Management

a. Cabling and wiring within the Equipment Room(s), that are semi-permanent (i.e., those leading from rack to rack, rack to conduit terminus or rack to equipment

locations) shall be carried not within conduit, but rather within ducts, troughs or cable trays mounted along walls or below the ceiling.

b. Appropriate hooks along the wall or on the ceiling will aid in running occasional or frequently changed extension cables to use position.

c. Cables shall be grouped and bundled by type and routed from source to termination in a uniform manner throughout all equipment housings.

d. Care shall be taken not to break the insulation or deform the cable by harness supports.

e. Cables shall not change relative position in a cable group throughout a cable route.

f. Cable support bars shall be installed to support cables in areas of dense harness breakouts such as behind patch panels, distribution amplifiers and other multiple input/output devices.

g. Edge protection material ("cat track") or grommets shall be installed on the edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edges.

6. Terminations

a. The Audio-Visual Contractor shall employ the latest termination practices and materials.

b. Signal and control cable ends shall be neatly formed, and shrinkable tubing shall be applied where necessary to secure the insulation against fraying or raveling.

c. Punch block terminations are not acceptable and shall not be allowed.

d. Audio and control wires shall be terminated with crimp-on lugs, and then soldered.

e. All bare wire shall be tinned prior to termination unless the connector manufacturer recommends otherwise.

f. Unused line level shields shall be individually insulated using shrinkable tubing and attached to the cable using an additional piece of shrinkable tubing.

g. Premade, molded cable assemblies, the sorts of which are typically supplied with consumer grade electronics are not permitted for use on this project. Only custom-made and commercial grade, factory certified assemblies shall be accepted. The Consultant shall be the final judge on the acceptability of any given cable assembly.

h. All panel mount connectors shall be secured with Kep® style lock nuts having integral external tooth lock washers and treated with LocTite® 242-Blue thread locking compound.

i. For connector specific terminations review Connectors and Receptacles in Part 2 – Products

F. System Grounding

1. The "spider" concept, as indicated in the Technical Power Grounding Detail in the AV Design drawings, is designed to avoid ground loops and inductive coupling.

2. The earth ground shall be made at only one point in the system as indicated and shall be in accordance with National Electric Code 2002 paragraphs 250.146(D), 406.2(D) and 480.20 Exception.

3. The grounding method shall insure that the system is free of the following problems under any mode of operation:

a. RF oscillation, pickup and interference.

b. Distortion.

c. Crosstalk.

d. Signal Leakage.

e. Very high frequency feedback.

f. Audio Hum.

4. Ground power conduits to the power system ground. Do not connect power system conduits to the racks or to the audio system ground.

5. Major wiring ducts or trays in the Equipment Room(s) shall be grounded to the conduit system.

6. The equipment racks shall be isolated from, and not electrically bonded to, the building conduit system. This means that the conduit system shall not be electrically connected to the equipment racks and that the equipment racks shall be installed so that they are electrically isolated from the building structural steel.

7. The racks shall be electrically bonded at only one point to the isolated grounding system as shown on the category AV drawings.

8. The Electrical Contactor shall provide and install isolation bushings to all conduit connected to the AV Equipment Rack(s).

9. Permanently installed Equipment Racks shall be isolated from the floor by a minimum 1/2" reconstituted rubber pad

G. Seismic Restraint

1. All hanging or free-standing equipment and cabinets furnished including but not limited to racks, loudspeakers, projection screens, and TV monitors shall be secured to substantial building structures.

2. The equipment described shall resist seismic acceleration in any direction up to a limit of the greater of 1.0 G or the limit prescribed by the local governing codes.

3. Maintain electrical isolation between the equipment racks and building steel.

4. Loudspeaker hanging details, rack bracing, and other seismic restraints are not shown on the AV Design drawings

5. The AV Contractor shall be responsible for developing these drawings showing seismic restraint of all required equipment to be restrained.

6. Submit loudspeaker mounting (rigging) drawings to the AV Consultant for review after they have been stamped and signed by a licensed structural engineer engaged in regular practice in the Project's State.

H. Remote Control and Monitoring

1. Provide bi-directional feedback on all screens for all devices.

2. Labels and Text

a. Avoid abbreviations and acronyms.

b. Device selection and control buttons will be labeled with clear text descriptions.

c. Transport control buttons will use graphical icons.

d. Lettering is 1/8” minimum sans serif font, maintaining background to text contrast.

e. Use contrasting color to highlight function or feedback status.

3. Use positive logic
    a. Avoid conditions that may cause command synchronization conflicts.
    b. Provide power sensors or other devices to ensure that positive logic conditions are maintained.
    c. Use RS-232 or RS-422 devices that provide feedback of equipment status to the control system.
4. Feedback shall be indicated in a logical manner on the touch screen at all times. The status of each controllable device shall be polled to reflect the most accurate state of the overall system condition at all times.
5. Link functions require the fewest number of use actions to control the audiovisual equipment.
6. Each media selection clears the previous audio and visual selection (i.e., “CD SELECT” clears the audio as well as video selection of “DVD SELECT”).
7. Default conditions shall be established for the system at power-up including device, warm-up routine, power conditions, switcher status and other default conditions.
8. Buttons (hard and soft) shall incorporate pilot lights or inverted illumination capabilities.
9. The programming shall be “foolproof” to the extent that each operation or sequence of operations does not cause the control system to become inoperable to interfere with further procession, correct operations or execution of commands.
10. Provide the following modules for control as required:
    a. Relays.
    b. Serial and Infrared (IR).
    c. RS 232 and RS 422 with adjustable baud rate.
    d. Logic Input Control.
11. Provide the following control system accessories as required:
    a. Terminal blocks, wiring hardware
    b. Power Supplies, submit for approval.
    c. Supply Com ports, IR ports and/or modules as necessary.
    d. Provide additional accessories, including sync and power sensors, as required to provide a fully operational system.
    e. Provide minimum 30-minute UPS backup for the RC units.
12. Control System Help Menu:
    a. Provide a detailed context sensitive help section to aid the operation and use of the media system.
    b. The help section shall provide a “novice” user with enough information to use every aspect of the programmed, controllable devices.
    c. Provide a help button on every “page”.
    d. The help button on each “page” shall open the section of the help menu specific to that “page”.
    e. Every button on that “page” shall be detailed in such section of the help menu.

13. Touch Screen Layout Description:

    a. Programming

        1) System Screens shall be ordered and mapped to provide a simple, user-friendly interface to the audio-visual system

        2) Each button on the remote-control panels may initiate control of multiple devices to streamline operation of the system.

    b. Template

        1) Layout shall be clear, uncluttered, professional, and up to date.

    c. Title Screen

    d. Contractor shall obtain bitmap file of the Owner's logo for this screen. Touching the screen in any location will bring user to the Main Menu screen. This is the default start up screen for power up and sleep mode.

I. DSP Control and Monitoring

1. Base Line DSP Settings

    a. Flat frequency response and time alignment of the direct sound from the loudspeakers will be considered a base line requirement for determining substantial completion of the audio system.

    b. The AV Contractor shall program the DSP system to include filters adjusted such that the loudspeaker zone(s) effected by same are measured to exhibit uniform (flat) frequency response (less than +/- 3 dB) at the listening location for the frequencies the transducer is designed/intended to address.

    c. Measurements utilized for determining filter adjustments shall be made on axis with respect to a single transducer (representative of the zone) in its intended field of coverage.

    d. Loudspeaker cross-over filters shall be provided first for all actively crossed transducers per loudspeaker manufacturer's instructions.

    e. Additional filters will still be required to achieve uniform frequency response measured at the various listening locations.

    f. For loudspeaker zones of small transducers, utilize high-pass filters first and foremost and then utilize parametric EQ filters to flatten the measured response.

    g. For loudspeaker zones of large transducers, where other transducers in the system will address higher frequencies, utilize low-pass filters first and foremost and then utilize parametric EQ filters to flatten the measured response.

2. Delay Speaker DSP Setting

    a. The AV Contractor shall program the DSP system to include delay settings adjusted so that the direct sound from the main loudspeaker clusters and the delay zone transducers in question arrives simultaneously at the listening plane served by the delay zone transducers.

    b. The AV Consultant may add additional delay to address 'imaging / Haas effect preferences' as appropriate.

3. DSP Tuning Preferences

    a. The AV Consultant may add additional filters and delay (as required) to address 'tuning preferences', but such 'tuning preferences' shall not be considered as part of

the base line requirements for determining substantial completion of the audio system.

J. AVoIP Network Configuration

1. Refer to Crestron DM NVX AV-over-IP System Design Guide – DOC. 7977L (2003) for all AVoIP networking guidelines.
2. VLANs or MPTLs must be properly implemented to segregate network traffic types. AVoIP must be isolated from other network traffic types.
3. IGMPv2 snooping enabled on AVoIP leaf switches
4. IGMPv2 querier enabled on spine switch
5. Properly size switch uplinks to ensure sufficient bandwidth for all encoders and decoders connected.
    a. Switch uplinks must be configured properly to support multicast traffic
6. Fast-leave enabled to effectively manage multicast traffic

K. Loudspeaker Installation

1. General Installation Requirements
    a. The design of the loudspeaker system is governed by the functional requirements of the system and the design criteria established as a result of the functional requirements.
    b. The functional requirements for the project are based upon the programmed uses of the project space.
    c. The design criteria is provided below to establish the minimum performance characteristics of the main loudspeaker system.
2. Sound Output
    a. The loudspeaker system shall provide a calculated long term RMS direct sound pressure levels of not less than 102 dB SPL on the listening plane of seating area.
    b. This figure is the calculated output of the center cluster alone or the left and right clusters together with no contribution from the reverberant response of the room.
    c. This level will be maintained +/- 3dB throughout the seating area.
3. Peak to Average Ratio
    a. The loudspeaker system shall maintain an available peak to average sound pressure output of not less than 6 dB, i.e., the system will be capable of peak output levels of not less than 108 dB (+/-3dB) throughout the seating area.
4. Loudspeaker Coverage
    a. The output of the loudspeaker system will not vary by more than +/- 3dB throughout the entire seating area.
    b. This criterion applies for either the center cluster operating alone or both the left and right clusters operating together
    c. The AV Contractor shall build in ±5º of adjustability in all axis for each rigged loudspeaker.

d. During commissioning, the Consultant may request that the AV Contractor adjust the aiming of cabinets to optimize coverage.

e. The AV Contractor shall undertake these changes w/o additional costs to the Project.

5. Frequency Response

a. The overall system response must be at minimum 40 Hz to 18,000 Hz.

6. System Components

a. The individual components of the loudspeaker clusters shall be engineered to function together as an arrayed system.

b. Individual components shall be standard off-the-shelf models from a single manufacturer.

c. All high frequency horns shall be built into cabinets: exposed horns are not acceptable.

d. The overall response of the system will maximize consistency throughout the specified frequency response for all seats.

e. Within the nominal coverage pattern of the loudspeaker, the frequency response shall exhibit a high degree of uniformity throughout the rated horizontal and vertical angles of coverage.

f. Additionally, the phase interaction between the individual components comprising the clusters shall be minimized by limiting the overlapping areas of coverage between components within a single cluster.

7. Loudspeaker Cluster/Array Footprint

a. The overall footprint of the individual loudspeaker clusters shall limit the size of the clusters so that they have sufficient clearance as shown on the drawings.

8. Ceiling Loudspeaker Support

a. All loudspeaker back cans must be secured to the building structure by qualified personnel in accordance with safe installations practices.

b. Use suspension materials, connection fixturing and methods that are appropriate for the building structure and installation conditions.

c. Employ a minimum 5:1 safety factor for each suspension point or greater as may be required by local code.

L. Video Projector Installation

1. All video projectors shall be converged, registered and color balanced.

2. Obtain from the owner all frame rates and resolutions that are to be used and properly converge the projector for all possible inputs.

3. In addition, the AV Contractor shall optimize the projector for the following standard resolutions and frame rates:

a. SDTV

1) Resolution(s): 720x480

2) Frame Rate(s): 24 Hz, 30 Hz

b. HDTV

1) Resolution(s): 1280x1080, 1920x1080

2) Frame Rate(s): 24 Hz, 25 Hz, 30 Hz

c. UHDTV

1) Resolution(s): 2560x1440, 3840x2160, 7680x4320

2) Frame Rate(s): 24 Hz, 25 Hz, 30 Hz, 50 Hz, 60 Hz, 100 Hz, 120 Hz

d. XGA

1) Resolution(s): 1280x800, 1440x900, 1680x1050, 1900x1200, 2560x1600, 3840x2400

2) Frame Rate(s): 24 Hz, 25 Hz, 30 Hz, 50 Hz, 60 Hz, 100 Hz, 120 Hz

e. DCI

1) Resolution(s): 2048x1080, 4096x2160

2) Frame Rate(s): 24 Hz, 25 Hz, 30 Hz, 50 Hz, 60 Hz, 100 Hz, 120 Hz

3.2 PERFORMANCE TESTING

A. General Testing Requirements

1. The AV Contractor shall pre-assemble and test all systems and sub-systems in their own facility before completed assemblies are delivered to the project site.
2. Tests shall include but are not limited to those listed below in order to verify that the system meets all design requirements.
3. The AV Contractor shall perform the initial system testing and adjustment prior to scheduling the AV Consultant on-site System Observation, Acceptance Testing, and Verification
4. The AV Consultant shall provide forms in electronic form for the documentation of all test results.
5. All tests shall be fully documented, and a neat copy presented for review by the AV Consultant
6. Specific attention is directed to the following for each system:
   a. Projection Equipment.
   b. Video Transports.
   c. Video Matrix Switchers.
   d. Remote Control Components.
   e. Video Distribution Amplifiers.
   f. Audio Amplifiers.
7. All these tests, and any others that the AV Contractor may wish for his own satisfaction, shall have been performed and successfully achieved a minimum of 2 weeks before on-site observation is requested.
8. The AV Consultant may request repetition and demonstration during observation of certain of these tests or other critical tests if problems become apparent.
9. If specifications are not met, further observations will be at the AV Contractor's expense.

B. Backbone Infrastructure

1. Perform in the venue prior to installation of field devices.
2. All category cables shall be certified utilizing a calibrated “Certification” tester equal to Fluke DSX-5000. Testing with “Validation” or “Qualification” meters is not sufficient and will not be considered an acceptable alternative to Certification testing.
3. Submit full and complete testing reports for all Category cables for review by the AV Consultant prior to scheduling any field observations.

C. Individual Components

1. Perform in AV Contractor's facility.
2. Verify that the manufacturer's specifications are met.
3. Measure and record the impedance on each driver and verify the acoustical output and freedom from rattles and distortion of all loudspeakers.

D. Completed Component Sub-assemblies

1. Perform in Audio-Visual Contractor's facilities.
2. Before delivery of the equipment to the project site, the AV Contractor shall demonstrate to AV Consultant at the AV Contractor's facilities that all sub-assemblies are operating as specified.
3. Verify the achievement of the specifications for each electronic component in situ, i.e., as assembled in its console, rack or other enclosure, powered by the system power supply and with all other components also activated, i.e., powered and interconnected.
    a. The magnitude and character of the threshold noise shall be observed for appearance of hum in excess of that present with individual activation, or the appearance of high frequency oscillation.
4. Projection equipment shall be tested to verify that the manufacturer's specifications are met after it has been incorporated into a complete subassembly.
5. Video equipment shall be tested to verify that its operation meets the manufacturer's specifications and EIA RS-170A after assembly into complete subsystems.

E. Complete System

1. Verify that all wiring is correctly and completely installed.
2. Verify that there are no short circuits between conductors within any cable, or from cable to cable.
3. Verify the integrity of each conductor, i.e., that the conductor is not open circuited, that the correct polarity of each connector, including those in patch panels, shall be verified and the color-coding scheme shall be recorded and included in the documentation provided to the AV Consultant.
4. Verify that the entire system performance is in accordance with the design requirements.

F. Audio System

1. The complete audio system shall be tested in the following manner:
    a. The threshold noise output of the system, measured at the output of the power amplifier, must equal the input when its gain control is full on, and of the line or booster amplifier input when all channel controls are off.

b. No hum shall be audible in the system within the noise signal, or with the inputs terminated in microphone impedance and all controls full on.

c. No high frequency oscillation shall be observed at the system output

d. No audible radio signal shall be detectable in the system at any control setting. Depending upon the proximity of a local radio station, or upon the cable configuration of the system, RF oscillation or leakage may be a problem and the AV Contractor shall be prepared to install a RF low pass filter appropriately in the system as a final remedy.

e. Cross talk between channels shall be measured with signal equivalent to 1.0 Volts output into one channel with its gain off and the gain of each other channel varied over their full range. Maximum signal leakage at the system output must be equivalent to -70 dB re 1.0 Volt at the pre-amp output at 1 kHz, increasing to -52 dB at 8 kHz.

f. The general performance of each loudspeaker unit as installed shall be verified by applying pink noise signal at 10.0 Volt level and verifying the specified output SPL at a distance of 1 foot.

g. Normal undistorted sound quality shall be verified by headphone listening at the output of the calibrated system.

h. Each loudspeaker shall also be fed with an oscillator signal at 10.0 Volt level within its intended frequency range, verifying absence or abnormal distortion of rattles due to installation.

i. The audio system shall be adjusted as specified above in paragraph entitled “DSP Control and Monitoring” where minimum requirements for establishing readiness for the substantial completion observation of an audio system are specified.

G. Video System

1. The complete video system shall be tested in the following manner:

a. All video outputs of the system shall conform to EIA RS-170A when typical inputs to the system are fed with a "known good signal" from a video signal generator.

b. Images shall properly fill their respective screens to full size without "cropping" or overshoot.

c. Projection equipment shall be tested to verify that the manufacturer's specifications are met after it has been incorporated into a complete subassembly.

d. Projection lenses shall provide distortion free images without color fringing or aberration.

e. Screen brightness and screen brightness ratio shall reasonably approach the theoretical value based on the projector's specified light output value with the necessary light loss corrections.

f. Test procedures for video systems shall conform to the following basic guidelines:

g. All video monitors shall be setup and adjusted following the manufacturer's guidelines including the following (with or without blue gun only):

1) Black level (using the brightness control)

2) White level (using the contrast control)

3) Correct Hue

h. All video cameras shall be setup and adjusted for the following:

1) Black balance

2) White balance

3) Range of zoom and iris function

H. AVoIP Network

1. Contractor shall verify the function of the AVoIP network in the following manner:

a. Verify all AVoIP switch hardware is configured per section 3.1.J above.

b. Observe all video endpoints receiving PoE are properly powered and functional.

c. All decoded video images shall be artifact free and meet the visual standard described in section 3.2.G above.

d. All deployable AVoIP transcoders are configured to be connected to and powered by the AVoIP network ad-hoc via any available AVoIP network port on AV plates.

3.3 OBSERVATION, ACCEPTANCE TESTING, AND VERIFICATION

A. System Observation and Acceptance Testing

1. The AV Contractor shall file a written notice with the Owner when all the aids to use described in paragraph above entitled “Submittals”, above, have been submitted for approval, all tests described in paragraph above entitled “System Performance Tests”, are complete and the test reports have been submitted for review and approval and the systems and sub-systems are ready for the Substantial Completion Observation.

2. The Consultant shall provide a checklist in electronic form for the AVC to fill out, certifying that they have completed all requisite tests and checks and have performed remedial corrections. These forms must be completed and submitted for review along with the written notice of readiness indicated above.

3. The Audio-Visual Contractor shall be prepared to demonstrate the overall system performance including but not limited to functionality, control system programming, operation, optics performance and DSP software control (where applicable). The Audio-Visual Contractor shall be prepared to demonstrate proper gain structure and that base line EQ (uniform frequency response) settings and delay filters (time alignment) have been set. In addition, the Substantial Completion Observation of the systems may include repetition or demonstration of any or all of the tests described in paragraph above entitled “System Performance Tests” above or other critical tests if problems become apparent and the specifications are not met.

4. The following personnel shall be on-site during Substantial Completion Observations:

a. Project Site Supervisor

b. Project Engineer

c. Project Remote Control Systems Programmer

d. Project DSP programmer

e. Additional technical support as needed to fully demonstrate the operation of all Audiovisual systems under this scope.

5. After the Substantial Completion Observation, written notice noting whether the systems meet the criteria set forth in the RFP for Substantial Completion, along with a list of items for the Audio-Visual Contractor to correct shall be provided to the Audio-Visual Contractor.

6. In the event that the systems are found not to be Substantially Complete, all of the costs including fees, travel and living expenses in connection with subsequent observations or

corrective work shall be borne solely by the Audio-Visual Contractor. This includes new problems that arise during the course of the subsequent observations.

B. Final Acceptance and Verification

1. After the systems have been certified as Substantially Complete, and the Audio-Visual Contractor has filed written notice with the Owner that the corrections ordered have been completed, a Final Acceptance Observation shall be scheduled.

2. During the Final Acceptance Observation of the systems repetition or demonstration of any of the tests described in paragraph above entitled “System Performance Tests”, above, or other critical tests if problems become apparent and the specifications are not met, may be requested.

3. Assist in performing final system adjustments and acceptance tests. Provide all labor, materials, and tools necessary for these tests and adjustments. Provide all necessary test equipment to complete the tests.

4. Budget 24 working hours for the performance of these tests and adjustments. If final acceptance is delayed beyond this period because the installation is not in proper working order or is incomplete, the Audio-Visual Contractor shall pay for all additional time and expenses for any resultant extension or re-scheduling of the acceptance testing period.

5. Any measurements of frequency response, distortion, noise or other characteristics and any adjustments deemed necessary may be performed on any item or group of items, including re-orientation of loudspeakers, to insure optimum performance of the system.

6. In the event that the corrections have not been completed to the satisfaction of the Owner's Representative, or new problems arise at the time of the Acceptance Observation, all costs including consulting fees, travel and living expenses in connection with subsequent observations or corrective work shall be borne solely by the Audio-Visual System Contractor.

C. Acceptance

1. After observations and tests indicate that the entire Audio-Visual system and sub systems as specified herein and indicated on the drawings are in total compliance with the drawings and specifications, a letter indicating said compliance shall be issued.

2. Acceptance of the system shall be accomplished as described in the General Conditions.

3. Final acceptance of the installation will be granted when it is clear to the Owner's Representative that the following conditions have been met:

   a. All fixed equipment has been furnished and installed according to the drawings and specifications.

   b. All portable equipment has been turned over to the Owner.

   c. All equipment and installation have been tested and shown to perform as specified.

   d. All instruction manuals, software source code and as-built documentation have been completed and delivered to the Owner's Representative.

   e. All wall-mounted diagrams are installed to the satisfaction of the Owner's representative.

4. The Warranty period will begin only when all of the above listed items have been performed to the satisfaction of the Owner and Owner's Representative.

3.4 TRAINING

A. Submit all training materials to the owner's representative for approval prior to scheduling training sessions.

B. Provide 24 hours of hands-on training practical operation of the system to the Owner's Representative. Address in the training, the general configuration of the system, basic functionality, correct operation procedures, routine maintenance, and upkeep.

C. Provide 4 hours of follow-up training within 3 months of the initial training to review aspects of the original training and provide instruction on specific troubleshooting issues the Owner's Representative raises during the training.

D. Video record all training sessions and provide 3 copies to the Owner on thumb drives in .mp4 format.

END OF SECTION