

Attachment C: Audiovisual Requirements

PlanNet Consulting is the audiovisual design consultant for the project representing the Owners, State Bar of California. This RFP represents the audiovisual design intent for the project communicated by way of narrative descriptions of intended functionality and single line drawings indicating likely equipment connectivity to achieve that functionality. The designs in this RFP do not represent fully engineered technical solutions. Bidders are required to review the designs presented in the RFP closely, submit any questions and clarifications on the design intent through the RFI process and develop their own engineered solutions representing a fully functional turn-key solution in their bid responses. These solutions shall be based on the designs communicated in the RFP, but shall include any additional equipment, materials, software and/or labor required for the bidder to deliver a fully functional turn-key system solution that meets intended operational performance requirements (for example, signal converters, signal extenders, interface devices, labor for coordinating with the Owner and other trades, post-cutover application performance testing, and training in real-life client situations, etc.). The Owner will not accept or approve Change Orders for additional equipment, materials, software, or labor determined to be necessary post-award for the selected bidder to achieve functionality and performance levels represented in the RFP. Bidders are advised to scrutinize their bill of materials, bid margins and contingencies accordingly. New and existing audiovisual equipment will be used in all spaces. All Existing AV equipment that is being used as a part of this scope is Owner-Furnished, AV Contractor-Installed (OFICI). In order to keep operation and user experiences consistent in various spaces throughout the floor, the AV design includes the use of similar equipment from similar manufacturers in each room.

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I. GENERAL REQUIREMENTS

A. Definition of terms

Definitions of terminology used in this Specification are as follows:

1. Owner: State Bar of California
2. Audiovisual Consultant: PlanNet Consulting
3. Work: Engineering, design-verification, procurement, fabrication, programming, testing, installation and commissioning of the AV systems for the Project.
4. Specification: The complete set of documented designs, specifications, and performance and delivery requirements delineated in this document and all referenced project documentation.
5. Integrator or Contractor: The AV systems integration company responsible for carrying out the Work and contracted under the Owner.
6. Audiovisual System: Includes all audio, video, control and other integrated electronic components and software related to supporting the audiovisual functionality described in this Specification and related Bid Documents.
7. Provide: Supply, deliver, install, configure, test and commission.
8. Furnish: Supply, deliver, install, configure, test and commission.
9. Manufacturer: The original manufacturer of the individual audiovisual equipment components.
10. Commissioning Date: The date at which a system is formally accepted by the Owner.
11. Owner Furnished Equipment (OFE): AV equipment and other material (new or existing) to be provided by the Owner and integrated as part of the Project.
12. Owner Furnished Owner Installed (OFOI): AV equipment and other material (new or existing) to be provided and installed by the Owner. The Integrator will still be responsible for testing and commissioning this equipment.
13. Owner Furnished Contractor Installed (OFCI): AV equipment and other material (new or existing) to be provided by the Owner and installed by the Integrator.
14. Contractor Furnished Contractor Installed (CFCI): AV equipment that is to be provided as new by the Integrator and installed by the Integrator. All equipment without the suffix "OFE," "OFOI," or "OFCI" shall be CFCI.

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B. Approach

The Integrator shall be responsible for the engineering and provision of completely operational, integrated systems according to the functional descriptions prescribed within this Specification. Any and all incidental components or piece parts not specifically called out in this document, but required for the function of the Audiovisual System, shall be provided by the Integrator without additional cost to the Owner. Delivery of the work described in this Specification shall include, but not be limited to, the following Basic Services:

1. Engineering and Design: The Integrator shall provide all system engineering necessary to develop the complete systems described herein. Engineering and Design shall include verification, coordination, and preparation of all necessary conduit routes and risers, wireways, backbox details, structural backing and mounting points, electronic schematics, hardware drawings, systems diagrams, schedules, and lists.
2. Assembly: The Integrator shall procure and assemble all hardware and equipment and any additional materials as required to deliver the completely functioning AV system.
3. Software Programming: The Integrator shall perform all required software setup, configuration, and programming required to develop a complete operating system in accordance with these Specifications, including all control logic, touch panel GUI and artwork design, and push button component faceplate or interface programming.
4. Installation: The Integrator shall furnish and install all required mounts, structural support infrastructure, inter-rack and intra-rack cable, wiring of equipment, connectors, plates, and other material at the Project site per the Integrator's approved designs. Integrator shall obtain approval stamps by a licensed structural engineer at no additional cost to the Owner for any Integrator-designed support and mounting structure as required by local codes.
5. Testing and Adjustment: The Integrator shall perform all tests and adjustments, furnish all test equipment necessary, and perform all work required to properly configure the systems and to verify their performance in accordance with the information in this Specification and the Integrator's approved engineered designs.
6. Acceptance Testing: Prior to Owner acceptance and hand-over of the completed AV system, the Integrator shall demonstrate the operation of the complete systems, including all individual devices and specified control functions. Both subjective and objective tests may be required by the Owner to determine compliance with the information in this Specification and the Integrator's approved designs.
7. Training: The Integrator shall provide technical training of Owner's staff, instructing them on AV system operation, maintenance and troubleshooting per the requirements in the below sections.
8. Warranty: The Integrator shall warrant the AV system in accordance with the terms of this Specification and accompanying contractual documents.

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C. Permits and Fees

The Integrator shall coordinate with the Owner to obtain any permits and pay any fees required for the installation of AV system for this project.

D. Material and Code Compliance

1. All materials and practices shall be in accordance with the governing standards, requirements and recommendations of all laws, orders, codes and regulations applicable to the Integrator and to the work being performed.
2. If in the opinion of the Integrator, an installation practice is required which is contrary to the Request for Proposals or associated documentation, such installation shall not commence until a written request for change or clarification has been made to the Owner and a response issued.
3. If an item of recommended equipment, a field condition or installation practice as specified does not meet governing code requirements, the Integrator shall bring such conflict to the attention of the Owner, and shall facilitate resolution of conflict with all parties concerned.
4. Integrator shall have a thorough knowledge of governing codes and standards. Lack of awareness of any of the relevant codes and standards will not be accepted as a reason for non-compliance.
5. The Integrator shall be responsible for providing cable and materials that comply with applicable Codes and requirements of regulating bodies. The cost for these materials shall be included in the Proposal price, as the Owner shall not accept change orders for changes in materials.

E. Related Work by Others

The Integrator shall be responsible for coordinating and assuring the compatibility of the AV systems with all related work, materials, and/or equipment being furnished and/or installed by others. This shall include, but not be limited to, the following:

1. Cable Containment: All conduit, wireways, connection boxes, pull boxes, junction boxes, pathways, and other accommodations for routing of low voltage signal cabling, shall be supplied by others except where explicitly noted in this Specification. The Integrator is responsible for verifying that the designed infrastructure is adequate for the needs of the AV installation and for periodically observing the infrastructure installation to ensure that it is being installed correctly according to the design documents.
2. Technical Power Service: All electrical panels, power receptacles, lighting fixtures, dimmers, lighting controls, and interconnecting wiring shall be supplied by others.

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3. **Equipment Support Structures:** Design, fabrication and installation of all structural supports required for rigid connection of equipment items to the building structure shall be supplied by others. This does not relieve the Integrator from the responsibility for providing equipment mounting hardware and attachment to structural supports provided by any subcontractor performing this Work.
4. **Millwork and Cabinetry:** All millwork and millwork modifications required to accommodate installation of the Media System equipment and related cabling and connections, except as may be individually identified in this Specification, shall be provided by others. However, the Integrator is responsible for coordinating with the millwork vendor and the Architect to ensure that the required ventilation holes have been provided.
5. **Owner Furnished Equipment (OFE):** Some AV systems equipment may be provided and installed by others as part of the building construction. Such building related equipment shall be as described in the Project construction documents. Additionally, there may be equipment provided by the Owner or others (e.g., new equipment purchased by Owner, existing equipment to be reintegrated) that shall require installation and integration by the Integrator (OFICI).
6. **Building Controls & Security:** Including environmental control, fire-detection, fire alarm, fire suppression and security systems by others.
7. **Telephone:** Provision of telephone services and handsets are by others.
8. **Furniture:** Includes procurement and installation of furniture and furniture systems that are part of the building construction. The Integrator shall be responsible for providing electronic equipment racks, installing them into furniture items, and providing cooling and exhaust ventilation holes in this furniture as described in this Specification.

F. Scheduling and Project Management

1. The Integrator shall prepare and maintain a detailed AV Systems Implementation Schedule based on the overall project schedule and the Owner's stated delivery requirements. The Schedule shall identify all primary tasks associated with the Work and shall indicate planned beginning and ending dates for each task.
2. The Schedule shall be coordinated with the General Contractor and shall be subject to review and approval by the Owner. The Integrator shall be obligated to comply with the agreed upon installation and completion dates and shall be liable for all extraordinary costs incurred by the Integrator in meeting the Schedule.
3. The delivery dates for all required documentation shall be included in the Schedule.
4. The Integrator shall ensure that all material furnished by them as part of the Work is procured, delivered and installed in accordance with the Schedule and the overall Project schedule.

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5. The Integrator's Project Manager shall attend regular scheduled coordination meetings at the job site to coordinate system issues during the course of the Project.
6. The Integrator shall make Project progress/status reports to the Owner on a regular basis as deemed appropriate by the Owner. The formal Schedule shall also be updated and re-issued upon request by the Owner.

G. Design and Engineering

1. General System Design Procedures

The Integrator shall coordinate appropriate design review meetings with the Audiovisual Consultant during the engineering stage of the Project. All submittals shall be presented to the Audiovisual Consultant for review, comment, and approval prior to proceeding with work on the subsequent stages of development in order to ensure that the AV system capabilities fulfill the Owner's expectations. The date of the design review meeting will be shown in the Project schedule supplied by the Integrator.

2. Control Software Development

The following submittals and procedures shall be followed by the Integrator when developing the software and programming for the AV systems. All submittals shall be presented to the Audiovisual Consultant and Owner for review, comment, and approval prior to proceeding with work on the subsequent stages of development in order to ensure that the Control System capabilities and user interface designs fulfill the Owner's expectations.

- a) In general, the Integrator shall follow the guidelines for creation of touchpanel control interfaces presented in the Dashboard for Controls Design Guide by Infocomm International, and its companion Design Reference and Integrators Guide documents.
- b) Prior to commencement of Graphical User Interface (GUI) and master processor programming, the Programming Integrator shall meet one time with the Owner, AV Consultant, and AV Contractor for a design criteria meeting.
- c) After receiving information and direction pertaining to the control functionality and GUI layout at this meeting, the Integrator shall submit for approval a functional narrative and/or other documentation showing the proposed GUI pages as necessary to describe the capabilities and operation of the Control System. The Owner and Consultant will provide feedback to the Programmer so that he/she may further refine the system.

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- d) Prior to commencement of GUI and master processor programming, the Integrator shall submit for approval a 2nd updated version of the proposed graphical layouts for all Control System touch screen control panels to ensure that the artistic layout is acceptable to the Owner. The submittal shall utilize an interactive HTML-based graphical model that emulates the functional and logical capabilities of the actual user interface by showing the interactive HTML-based screens and the proposed structure and page sequencing for each interface. Alternately, the Programmer may bring a working version of the programmed GUI on a real touch panel for the Owner's approval.
- e) Once approved, the Programmer may proceed with the Programming effort (linking the buttons to equipment functions, etc). The Programmer shall submit HTML-based graphical versions of the software at 50% and 75% completion to ensure the Owner approves the progress of the Programming Work.
- f) The Programmer shall plan to have a final meeting with the Owner after the installed systems are operational to determine if any small-scale final adjustments are necessary.
- g) Any deviation in the GUI review process from the above shall be agreed in advance with the Owner and the Audiovisual Consultant.

H. Documentation

1. Design and Test Documentation

Following award of the contract and in accordance with the agreed Project schedule, the Integrator shall submit the documentation identified below to the Audiovisual Consultant. Drawings shall be provided in AutoCAD (version 2006 or later) and PDF format that is current at time of installation.

- a) The AV contractor is responsible for fully understanding the design and functionality of the AV system. Consequently, he/she is responsible for undertaking the comprehensive engineering efforts necessary to validate and deliver a turn-key end product. The AV contractor is responsible for demonstrating this understanding of the AV system requirements in their fully-engineered submittal documents and their eventual integration efforts.
- b) The AV Contractor is responsible for developing completely original CAD drawings as a part of this scope. As such, PlanNet will not provide to the Contractor our CAD drawings or backgrounds. This helps mitigate the temptation for the Contractor to copy the drawings and not perform the required engineering via the drawing process.

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- c) The AV Contractor shall use the same infrastructure and device naming codes/acronym's (i.e. "COL1" for a collector box, "VMX" for a video matrix, etc) in their submittal drawings that the Consultant uses in their design drawings. This helps the Consultant cross-check submittal drawings and provides the Owner with easy references to both the Design and Construction drawings.
- d) AV infrastructure drawings, showing all required horizontal and vertical conduit paths, sizes, quantities, and signal types, as well as backbox locations, types, and sizes, and structural support infrastructure details for all mounted device conditions.
- e) Single-line system diagrams, showing the engineered configuration and system architecture of the AV systems, including all equipment components.
- f) Physical and logical system diagrams to port-level detail showing topology, configuration and capacity information including spare capacity for future upgrades.
- g) Database templates or other documentation identifying any information required from the Owner to complete the configuration of the AV systems.
- h) Connectivity diagrams to demonstrate that all cabling interfaces are adequately defined.
- i) Proposed logical diagrams and layouts for all Control System touch screens.
- j) All control panels, connector plates, and designation strips to be punched, engraved, or silk-screened. Drawings shall specify all relevant terminology, engraving, finishes, colors, and materials.
- k) Schematic drawings of custom circuits. (Owner approval of schematic drawings of custom circuits shall not imply acceptance of design to perform desired task.)
- l) All proposed equipment modifications. (Owner approval of equipment modifications shall not imply acceptance of design to perform desired function.)
- m) Shop and field wiring diagrams, including cable types and functional description.
- n) Final equipment rack elevations for all AV system equipment that identify all individual equipment components.
- o) Shop drawings for special equipment, including fabrication and installation requirements.
- p) Specification sheets with dimensions and photo / rendering of all equipment deemed to have an impact on the appearance of the facilities. The integrator shall coordinate with the Audiovisual Consultant to identify all such items.

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- q) Manufacturer's specification sheets (cut sheets) for all network and ancillary equipment such as optical fiber patch cables, equipment cabinets, etc.
- r) A logical network diagram, showing the network configuration including basic VLAN configuration, proposed addressing scheme, location of routing services etc. for the Network.
- s) A test plan for cabling, connections, equipment and system functionality and performance. The test plan shall be submitted by the Contractor for approval from the Audiovisual Consultant and shall include stated system performance criteria.

2. Completion Documentation

Upon completion of the installation, the Integrator shall submit the following documentation to the Audiovisual Consultant:

- a) **Installed System:** The Integrator shall provide a complete set of as-built AV systems diagrams in hard-copy and electronic format (AutoCAD version 2006 or later version that is current at time of installation and PDF). These drawings shall identify all AV system equipment components provided by the Integrator and the final system configuration at the time of system handover to the Owner, and shall also clearly identify any OFE components in the system.
- b) **Control System Submittals:** Upon completion of the Project, the Integrator shall submit a complete set of system software, software programming code, and documentation as follows:
 - i. Final Software Programming Code, Program Source Code including any pre-compiled module code and documentation
 - ii. Control System As-built Schematic Connection Diagrams
 - iii. In the case of non-commercial or custom software, a complete set of software and related documentation and information is required, including license (if applicable) and documentation for all devices, utilities, and tools used in the operation and maintenance of the AV systems. Documentation shall be presented in such a way as to allow the Owner the ability to perform unassisted operation, maintenance, troubleshooting and programming.
 - iv. In the case of any other commercial software, a complete set of software including the license and documentation for all devices, utilities, current firmware version, and tools used in the operation and maintenance of the AV systems. Provide list of manufacturer or publisher, version, product name or model, technical and warranty support contact, purchase date, and reseller (if not Integrator).

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- v. The Integrator shall provide an electronic copy of the final working software/hardware configurations all configurable AV equipment saved to a CD-R, labeled, and accompanied by a total and complete reload procedure that has been tested by the Integrator and the Owner.
 - vi. The Integrator shall provide a documented disaster recovery plan or procedure for reference by the Owner.
 - vii. The Integrator shall provide a document outlining suggested maintenance of the systems and component manufacturer warranty durations.
- c) Hardware Documentation: The Integrator shall supply two hard copies of the items identified below for each installed product. The Integrator shall also provide electronic copies of such documentation in a readily accessible format if available from the manufacturer.
- i. User Manuals
 - ii. Technical Manuals
 - iii. Product Data Sheets
- d) As-built Equipment Inventory: The Integrator shall provide a complete inventory of installed equipment components detailing the actual installation of equipment in each room. This inventory shall include:
- i. Any Network Address assigned to IP configurable equipment.
 - ii. Number of inputs/outputs ports and connection types available upon completion of installation.
 - iii. Modules/blades/cards installed in each component.
 - iv. Serial numbers for each component
 - v. Spare parts available
- e) Warranty and/or Maintenance Contract Information: The Integrator shall provide all information appropriate for the Owner to make use of the supplied warranty and/or maintenance contract. At a minimum, this shall include:
- i. Warranty and/or Maintenance Contract identification numbers when required.
 - ii. Contact information necessary to take advantage of Warranty and/or Maintenance contracts.
 - iii. Coverage dates for each system element installed.
 - iv.

I. Delivery and Storage

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1. Costs of shipping all AV system equipment and related materials (including shipping material to the site as well as costs of unusual off-site storage requirements) shall be borne by the Integrator. It shall be the responsibility of the Integrator to make appropriate arrangements with the authorized personnel at the site for the acceptance, handling, protection, and storage of equipment delivered to the site. The Integrator retains ownership of the equipment until Final Acceptance of Systems.
2. The Integrator shall make every reasonable effort to protect the Integrator's finished and unfinished work against damage or loss during delivery and storage.
3. The security of any equipment and/or tools provided by the Integrator for the purpose of installing this system shall be the responsibility of the Integrator.
4. The Owner shall retain the right to inspect all systems and equipment stored off site.

J. Training

1. The Integrator shall provide at least 12 hours of training for the Owner's Users and Technical Staff to become proficient in the operation, routine maintenance, troubleshooting and other basic AV system support functions.
2. The Integrator shall submit a proposed training plan and schedule for review and acceptance by the Owner and Audiovisual Consultant. This plan shall identify a proposed training plan for User groups of different technical skill levels and for Technical Staff responsible for operation, support and maintenance of the AV systems.
3. The Integrator shall provide an Operations & Maintenance Manual to trainees for review either at or before their allotted training session. Trainees will be permitted to keep these Manuals and annotated them with personal notes from the training session for their future reference.
4. The Integrator shall record (video and audio) at least one full training session and provide two (2) copies in DVD format to the Owner, and one (1) copy to the Audiovisual Consultant.

K. Basic Warranty:

1. The Integrator shall warrant the Audiovisual Systems as follows:
 - a) The Integrator shall warrant the AV systems to be free from faults and defects in system design and workmanship. This Basic Warranty coverage shall include all custom designed equipment and the overall AV systems installation. Basic Warranty shall be effective for a period of one (1) year from the date of acceptance of the AV system acceptance by the Owner.

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- b) Within the period of Basic Warranty coverage, individual manufacturers' equipment warranties shall apply to all purchased equipment. In the event that the manufacturer's warranty has expired on a failed device (i.e., equipment warranty of less than one year), the Owner shall be responsible for the actual cost of any required repairs. All manufacturers' equipment warranties shall be effective as of the date of Owner Acceptance.
 - c) Response time for Basic Warranty service work shall be no longer than two (2) business days from the time a request for service is submitted to the Integrator by the Owner.
 - d) The Integrator shall warrant that all equipment, materials and components installed are new at the time of installation. No used or re-conditioned equipment shall be acceptable.
 - e) If equipment modification by the Integrator voids the manufacturers' warranty, the Integrator shall assume the equivalent equipment warranty.
2. Extended and Premium Warranty Options
- a) The Integrator shall propose to the Owner the offer of Extended Warranty coverage for the Media Systems. The Integrator shall list the costs associated with extended warranty coverage for each additional year after the basic warranty expires. Extended Warranty shall be optional warranty services offered by the Integrator and accepted by the Owner that extend, expand on and/or complement the Basic Warranty coverage required by this Specification. Any provisions of Extended Warranty coverage shall not release the Integrator from responsibility for performance of all requirements under the Basic Warranty coverage.
 - b) The Integrator shall propose to the Owner the offer of Premium Warranty coverage for the Media Systems. The Integrator shall list the costs associated with a Premium Warranty that would replace the Basic Warranty Coverage. The Premium Warranty shall be the Basic Warranty coverage as described above, but with a 4-hour technician phone response and next-day on-site service or product replacement (as determined by the availability of the replacement equipment).

II. AUDIOVISUAL SYSTEMS

Sections below provide a brief narrative description of the specific functional, technical and operational requirements and capabilities of the Audiovisual Systems for each of the rooms listed below. Refer to Appendix D for audiovisual systems drawings and Appendix A for the associated AV equipment list.

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A. General Infrastructure Requirements:

1. Infrastructure: The AV Contractor is responsible for verifying all floor, wall, and ceiling box locations to determine if they are appropriate with their engineered solutions. The AVC shall coordinate with the Architect any re-locations, box size changes, or other infrastructure changes required to implement the Designed AV systems.
2. Connector Plates and Floorbox Components: The AVC is responsible for verifying and furnishing all AV connector plates and internal floorbox components to ensure a professional, symmetrical, and seamless appearance. The AVC shall coordinate all plate finishes, engraving, brushing direction, and back-filled text colors with Architect.
3. Cabling and Connectors: The AVC is responsible for all AV cabling, connectors, termination, piece-parts, labels, heat-shrink, cable dressing materials, power supplies, and testing. The AVC shall use Neutrik D-Series connectors on all plates unless otherwise noted, unless size restrictions occur, or unless the required connector type is not fabricated by Neutrik in the D-Series format. All product substitution requests shall be submitted to the AV consultant.
4. Furniture Coordination: The AVC shall coordinate with the Architect ventilation holes for any enclosed furniture that houses an AV equipment rack. The AVC shall ensure that at least two adequately sized ventilation holes are drilled in every credenza containing an AV equipment rack. We recommend a “cool air intake” hole in the base of the credenza near the toe-kick, a “hot air exhaust” hole at the top rear of the credenza, an intake-style rack-mounted fan in the bottom RU of the rack within each credenza, and (if required) an extraction fan mounted to the hot-air exhaust location in the credenza. The AVC shall coordinate all cable routes, tie-backs, dressing, and holes in furniture with Architect and Owner.
5. Electrical and Heat Load Coordination: The AVC shall verify all expected electrical loads for AV equipment with what is shown in the Appendix A drawings and adjust the AC power circuit quantity, receptacle size, and/or locations accordingly. The AVC shall also calculate the expected heat loads for their equipment racks and equipment located in an enclosed space. The AVC shall coordinate this information with the Mechanical Engineer to ensure proper cooling and assist with developing ventilation methods.
6. Rack Power Methodology:
 - a) Non Full-height Equipment Racks: The AVC shall furnish sequencing power strips and/or power conditioners to ensure correct order of power on/off. Middle Atlantic or Lowell power strips and Furman, Middle Atlantic, or Lowell keyed sequencing rack-mounted power conditioners are recommended.

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b) Power Circuit sequencing: Control System devices like the control processor, touch panels, and all interfaces shall always be powered on as long as the rack is receiving power. The AVC shall plug other equipment according to Infocomm Best-Practices regarding sequencing order. Audio amplifiers shall always be the last device powered on and the first device powered off. If the AV systems need to be connected to the Fire Life Safety or HVAC systems for automated activity, the AVC shall coordinate the control cable connection between the AV control processor and the FLS/HVAC control processor.

7. Portable Cabling

a) The AVC shall furnish portable AV cabling for each room. This includes 10' cables of the following types:

- (1) 1 x HDMI
- (2) 1 x VGA with attached 3.5mm stereo audio cable
- (3) 1 x USB cable for the Keyboard/Mouse
- (4) 1 x CAT6 RJ45 cable
- (5) 1 x DVI to HDMI adapter.
- (6) Any other adapters/transmitters/receivers required to ensure full-functionality.

b) The AVC shall furnish RJ45 CAT6 patch cables for all AV data switch connections to the data wall outlets as well as all local data patch cables within the rack.

c) The AVC shall furnish RJ45 CAT6 and/or POTS RJ11 patch cables to the wall outlets for the VTC systems.

d) The AVC shall furnish Coax patch cables with F-connectors and splitters for the TV tuners in all applicable rooms.

8. AV Network:

a) All AV devices with network functionality, AV control systems, and AV switches shall reside on a VLAN that is dedicated to AV systems only. All AV data switches shall be 10/100/1000 Mbps managed switches, and shall be OFCI. The AVC shall coordinate all port counts, IP addresses, and VLAN characteristics with the Owner's IT staff.

B. AV Space Requirements:

1. **Digital Displays Public Space:** Reception 100, 2nd floor conference center entrance, SBC Lobby 351

- a. Each space shall have an existing owner furnished (OFE) wall mounted 40" flat panel display and a digital signage player mounted behind the display. The content source shall be provided by the client.

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2. Conference Rooms 203, 324, 458, 507, 531, 539, 549 :

- a. Each conference room shall have an existing OFE 46" flat panel display with the exception of room 507 which shall receive a new 46" display. Each display shall be wall mounted with a new wall mount.
- b. Room 531 shall have a separate wall mounted Smartboard and short throw projector with a dedicated OFE PC with the Smartboard software loaded on it. Control of the projector shall be with the IR remote control.
- c. The inputs to the display shall be a HDMI and VGA / stereo audio from a table input cubby and using a CAT5 converter transmitter and scaler receiver in the millwork below the display.
- d. There shall be an OFE video teleconference system (VTC) system in each room, with the exception of room 531 which shall receive a new VTC system.
- e. There shall be a HDMI cable connected to the display for use with a portable DVD/Blu-ray player when required. The cable shall be coiled and hung on the wall next to the display when not used.
- f. Audio reproduction shall be through the speakers built into the display.
- g. Control of the display, VTC system and DVD player shall be with the manufactures hand held inferred (IR) remote control.
- h. Each room shall receive a new table top VoIP conference phone with the exception of rooms 203 and 549 which shall receive existing OFE units.

3. Huddle Room 228:

- a. The Huddle rooms shall have an OFE 40" flat panel display and a new wall mount.
- b. The inputs to the display shall be from a media input panel (MIP) with HDMI and VGA / stereo audio. The MIP shall be located below the display.

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- c. Audio reproduction shall be through the speakers built into the display.
- d. Control of the display shall be with the manufactures hand held IR remote control.
- e. The room shall have shall receive a new table top VoIP conference phone.

4. Second Floor Conference Center Rooms A – 236 and B – 235:

- a. Rooms A and B shall receive new 70” flat panel displays, Room A shall receive a pullout wall mount in a recessed wall opening, and room B shall have a credenza with a display lift built in to raise the display up for use and down for storage when not in use, the millwork and lift shall be provided by others. Coordination with the millwork provider shall be required to provide openings inside of the credenza for a cable path and heat ventilation from the equipment portion of the credenza to the display portion of the credenza.
- b. The inputs to the display shall be from two low profile floor boxes in each room. One floor box shall have a HDMI 1 gang CAT5 transmitter and 1 gang plate with a XLR-F connector for the VTC system; the second floor box shall have VGA / stereo audio 1 gang CAT5 transmitter and 1 gang plate with a XLR-F connector for the VTC system; The HDMI and VGA / stereo audio signals shall go through a switcher / scaler set for auto switching then go to the input in the display. In room A the PTZ camera shall be mounted on a wall shelf below the display, in room B the PTZ camera shall be on the millwork or a camera shelf mounted to the display mount. The CAT5 receivers shall be located in the credenza / millwork. There shall be a new VTC system in each room. These inputs shall be directly connected to the display inputs, adaptors may be required to convert the HDMI connection to one of the ports on the display. There shall be a HDMI cable connected to the display for use with a portable DVD/Blu-ray player when required. The cable shall be coiled and hung on the wall next to the display when not used. There shall be a DM receiver from the conference center head end to supply an overflow video feed from the other conference rooms in the conference center.

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- c. Audio reproduction shall be through the speakers built into the display for the main functionality of the room. There shall be four ceiling speakers for use with the overflow usage of the room, control of the volume level shall be from the master control panel in the head end system rack.
- d. Control of the display shall be with the manufactures hand held IR remote control.
- e. The room shall have shall receive a new table top VoIP conference phone.
- f. There shall be a FM assisted listening system (ALS) with FM receivers with both ears speakers and neck loops.
- g. There shall be a pullout rotating equipment rack located in the credenzas.

5. Second Floor Conference Center Rooms C – 234 through G – 230:

- a. The conference rooms can operate in single room mode or room combined mode, the room combinations shall need to be confirmed with the client. Each room shall receive new 70” flat panel displays with pull out wall mount, for rooms C, E, G shall have the displays in in a recessed wall opening, and rooms D and F shall have a credenza with a display lift built in to raise the display up for use and down for storage when not in use, the millwork and lift shall be provided by others. Coordination with the millwork provider shall be required to provide openings inside of the credenza for a cable path and heat ventilation from the equipment portion of the credenza to the display portion of the credenza.

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- b. The inputs to the AV system shall be from two low profile floor boxes in each room. One floor box shall have a HDMI 1 gang CAT5 transmitter and 1 gang plate with a XLR-F connector for the VTC system; the second floor box shall have VGA / stereo audio 1 gang CAT5 transmitter and 1 gang plate with a XLR-F connector for the VTC system. The CAT5 receivers shall be located in the credenza / millwork. There shall be new VTC systems in rooms C, E, and G, the PTZ cameras shall be mounted on a shelf below the display in line with the conference room table in single mode configuration. These inputs shall be connected an AV controller / switcher. There shall be a HDMI cable connected to the display for use with a portable DVD/Blu-ray player when required. The cable shall be coiled and hung on the wall next to the display when not used. There shall be a DM receiver from the conference center head end to supply an overflow video feed from the other conference rooms in the conference center.
- c. Audio reproduction shall be through the speakers built into the display for the main functionality of the room. There shall be four ceiling speakers for use with the system and with overflow usage of the room, control of the volume level shall be from the rooms wall mounted control panel and the master control panel in the head end system rack.
- d. Control of the display and VTC system shall be with control system / AV switcher, there shall be a wall mounted 7" LCD panel, the control panel shall be located near the door to the room. Control of the portable DVD player shall be with the IR remote control.
- e. The room shall have shall receive a new table top VoIP conference phone for use for small meetings in single room configuration.
- f. There shall be a wireless delegate conferencing system with six (6) wireless goose neck microphone transmitters assigned to each room. Each of the microphone stations has a built-in speaker for local voice support around the table.
- g. There shall be a wireless microphone system with a hand held transmitter for use during meeting in single and combined modes.
- h. There shall be an audio mixer / DSP processor in each room to process the audio from the system inputs. The signal from the local processor shall be sent over CAT5 cable using AVB technology to the conference center head end system for distribution to the other rooms through the ceiling speakers in each room as required

Attachment C: Audiovisual Requirements

- i. There shall be a FM assisted listening system (ALS) with FM receivers with both ears speakers and neck loops.
- j. There shall be a pullout rotating equipment rack located in the credenzas for the AV equipment.
- k. There shall be a digital DM output from the AV system controller / switcher to the head end AV system for use as an overflow feed to other rooms when the rooms are combined.

6. Conference Center Head End Room 237:

- a. There shall be a ceiling mounted projector and electric roll down screen (screen provided and installed by others) located in room C (234) for use when the rooms are combined for large meetings. The signal for the projector shall come from the video matrix switcher in the head end system.
- b. The inputs for the system shall be AV feeds from rooms C through G, a local DVD / Blu-ray player, dedicated PC, and VTC system. The VTC system shall receive camera signals through the matrix from two wall mounted PTZ cameras, one located in room C and the second in room G.
- c. The video system shall have a 16 x 16 video matrix with DM inputs and HDMI, and DVI/VGA inputs. There outputs of the matrix shall be DM signals to rooms A through G for overflow usage, HDMI for the VTC system and HDMI for recording and streaming.
- d. There shall be two media recorders and one digital server for storage and streaming of content from the conference center rooms in the AV rack. The server will also store information from other rooms (422 and 560) that shall have recorders in them.

Attachment C: Audiovisual Requirements

- e. There shall be a digital audio mixer / DSP processor with AVB technology to receive audio signals from rooms C through G, local DVD player VTC system and a wireless microphone. The outputs of the processor shall have seven channels feeding a multichannel 70V audio amplifier and the ceiling speakers in the seven conference rooms A through G, VTC system and recorder. There shall be a 24 port 1 gig network switch provided for the digital audio signal routing. There shall be six (6) VoIP modules in the processor for audio conferencing in rooms C through G and the head end system; the VoIP connections can be connected to the 24 port network switch. The VoIP modules shall require 12 IP addresses for the VoIP connections.
- f. The control of the head end system shall be from a dedicated control processor with a 10” rack mounted control panel. The control system shall be the master controller for rooms C through G and the head end. It shall be used to set up room configurations when being combined, volume control, video switching, and signals being sent to the recorders.
- g. There shall be at least one AV equipment rack for the AV equipment, there are two on the equipment list; the number of racks should be confirmed by rack elevations before ordering the racks. There shall be cable trays above the racks for the cables going to and from the head end system.

7. Conference rooms 422 / 423 (single / divisible):

- a. Both rooms shall have a 60” flat panel display with a pull out wall mount. Rooms 422 shall also have a ceiling mounted projector and screen (screen provided and installed by others) for use when the rooms are combined, and a wall mounted Smartboard and short throw projector.
- b. The inputs to the AV system shall be a HDMI and VGA / stereo audio from a table input cubby and using a CAT5 converter transmitter to the AV video switcher / controller located in the millwork below the display. In room 423 the table inputs shall go directly to the display inputs. Room 422 shall have a DVD / Blu-ray player in the AV rack, room 423 shall have a dedicated cable connected to the display for use with a portable DVD player. There shall be a dedicated OFE PC with the software for the Smartboard loaded on it; the PC shall be a source for the AV system.

Attachment C: Audiovisual Requirements

- c. Room 423 shall have a table top audio conference phone for use in single mode. Room 422 shall have a VoIP module for audio conferencing.
- d. Room 422 shall have a digital audio mixer / DSP processor for the audio support in the room. There shall be a VoIP module for audio conferencing in room 422. There shall be nine wireless microphone systems for use in 422 when in single mode or both rooms when combined. There shall be eight (8) wireless goose neck microphone transmitters and one (1) wireless hand held microphone transmitter.
- e. Audio reproduction shall be through the two (2) ceiling speakers in each room, when the rooms are in single mode room 422 shall use the two (2) ceiling speakers, room 423 shall use the speakers built into the display. When the rooms are combined the ceiling speakers shall be used in both rooms.
- f. Control of the AV system in room 422 shall be from a 10" table top LCD control panel. When the rooms are divided each control panel shall control the equipment in the room only. When the rooms are combined the control panel in 422 shall be the master panel for the rooms. Control of the display and VTC codec in 423 shall be from the IR remote control.
- g. There shall be a media recorder located in the rack for recording presentations and VTC calls from room 422. The information from the recorder shall be stored on the media server located in room 237.
- h. There shall be a pullout rotating equipment rack in the millwork below the displays in each room.

8. IT Training Room 560:

- a. There shall be one ceiling mounted projector and electric roll down screen (screen provided and installed by others) and a wall mounted Smartboard and short throw projector.

Attachment C: Audiovisual Requirements

- b. The inputs for the system shall be a HDMI and VGA / stereo audio from the presenter's podium, a dedicated DVD / Blu-ray player, dedicated OFE PC with Smartboard software loaded on it. There shall be four (4) ceiling microphones and two (2) goose neck microphones for the podium. There should be space allowed for a future VTC system in the switcher / controller.
- c. The AV switching and control shall be from a combination
- d. There shall be a table top conference phone for VoIP audio conferencing.
- e. There shall be a Mixer / DSP processor for handling the audio requirements in the room. There shall be an input for the future VTC system.
- f. Audio reproduction shall be from four (4) ceiling speakers and a 70V audio amplifier. The system shall be configured for local voice reinforcement from the goose neck microphones. The ceiling microphones should only feed the media recorder the room.
- g. There shall be a media recorder located in the rack for recording presentations and VTC calls from room 560. The information from the recorder shall be stored on the media server located in room 237.
- h. There shall be a pullout rotating equipment rack in the podium in the room.

9. Large Courtroom 313:

The courtroom shall receive a custom turnkey JAVS courtroom AV system.

- a. The displays in the large court room shall be a ceiling mounted projector and electric roll down screen (screen provided and installed by others); two (2) 42" flat panel displays wall mounted for the audience, the counsel tables shall have a 16" LCD display on each table, the witness stand shall have a 16" LCD display, the judge shall have a 10.6" LCD display. These displays shall be connected back to the courtroom head end system I room 321 by CAT5 cables.

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- b. There shall be laptop connection at the counselor tables and the presenter's podium; there shall be a document camera available for connection at the podium.
- c. There shall be an audio processing system for the gooseneck microphones at the judge's bench, counselor table, witness box, presenter's podium. The audio system will voice re-enforcement for the microphones and recording of all audio.
- d. Audio reproduction shall be from six (6) 70V ceiling speakers.
- e. There shall be four (4) video camera wall mounted for recording of the court sessions.
- f. There shall be an IR ALS system with IR neck loop receivers for use by the hearing impaired.
- g. Control of the JAVS court system shall be from the custom JAVS controller and control panel.
- h. There shall be a full height AV equipment rack located in room 321 for the JAVS system.
- i. There shall be an optional Presentation Rolling Cart to be shared between the four (4) courtrooms. The cart shall have a DVD/Blu-ray player, VHS player, 16" LCD monitor.

10. Small Courtrooms 314, 315, 316:

The courtrooms shall receive a custom turnkey JAVS courtroom AV system.

- a. The displays in the small court room shall be two (2) 42" flat panel displays wall mounted for the audience, the counsel tables shall have a 16" LCD display on each table, the witness stand shall have a 16" LCD display, the judge shall have a 10.6" LCD display. These displays shall be connected back to the courtroom head end system I room 321 by CAT5 cables.

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- b. There shall be laptop connection at the counselor tables and the presenter's podium; there shall be a document camera available for connection at the podium.
- c. There shall be an audio processing system for the gooseneck microphones at the judge's bench, counselor table, witness box, presenter's podium. The audio system will voice re-enforcement for the microphones and recording of all audio.
- d. Audio reproduction shall be from six (6) 70V ceiling speakers.
- e. There shall be three (3) video camera wall mounted for recording of the court sessions.
- f. There shall be an IR ALS system with IR neck loop receivers for use by the hearing impaired.
- g. Control of the JAVS court system shall be from the custom JAVS controller and control panel.
- h. There shall be a full height AV equipment rack located in room 321 for the JAVS system.

11. Lunch Room 521:

- a. The 5th floor lunch room shall receive an OFE 46" flat panel display with a new wall mount.
- b. The source shall be an OFE cable set top box that shall be mounted to the back side of the display. The set top box shall be connected to a wall plate with a RF coax connection behind the display.
- c. Control of the display and set top box shall be with the IR remote controls.

III. EXECUTION OF WORK

A. Technical Performance Requirements

Attachment C: Audiovisual Requirements

The AV system will follow the Technical Performance Requirements described below:

1. Equipment Specifications

- a) Like Components
- b) All like devices used in the Project shall be the same (i.e., manufacturer, model). Standardization of like components will enable consistent AV system functional and technical performance, familiar interface capabilities, and efficient maintenance and support. Should limited product availability or other factors impair the Integrator's ability to provide like components throughout the Project, the Integrator shall immediately bring the situation to the attention of the Audiovisual Consultant so that an appropriate course of action can be identified.
- c) Approved Equipment Manufacturers
- d) The Audiovisual Consultant has provided an approved manufacturer equipment list for the AV system. It is preferred that components of the system solution proposed shall be sourced from the manufacturers identified in Appendix A: Major Equipment and Approved Manufacturers List. If the Integrator proposes to substitute an alternate manufacturer, the proposed submittal shall be presented to the Audiovisual Consultant in accordance with the procedures identified elsewhere in this Specification.
- e) Additional Equipment Components and Spares
- f) The following Additional Equipment Components shall be provided by the Integrator as a part of the AV system:
 - i. Uninterruptible Power Supplies (UPS): The Integrator shall provide UPS equipment where specified. In the event of a power failure, each UPS shall be capable of powering devices for a minimum of 20 minutes at full operating load.
 - ii. Power Conditioners: The Integrator shall provide power conditioners in each equipment rack to protect electronic equipment from fluctuations in building power supply. Power conditioners shall derive line voltage power from the UPS in each equipment rack, or may be integral with the UPS.
 - iii. Media Input cabling shall be provided by the Integrator as a part of the AV system. The Integrator shall provide all cabling necessary to connect wall and rack mounted computer and laptop audio and video interfaces to Owner furnished (OFE) laptop and desktop computers as specified in this document.
 - iv. Spares: The Integrator shall provide the following spares:
 - (a) Video projector lamp – (1)
 - (b) Microphone foam covers – (1 complete set)

Attachment C: Audiovisual Requirements

2. AV System Performance Requirements

The individual elements of the complete integrated AV system shall meet or exceed the technical performance defined below.

a) Audio Systems

The audio systems, when properly installed and adjusted shall meet the following performance criteria:

- i. Loudness: Through the general listening area the media and/or voice audio systems shall produce an undistorted sound level greater than 90dB when reproducing typical program material. This shall be verified after the system has been equalized to meet frequency response specifications. An approved sound level meter set to "C" weighting and "SLOW" meter response shall be used to make this measurement. The audio system should be able to provide 100 dB of headroom or the ability to produce program peaks of 100 dB. Program peaks should not produce any type of audible distortion.
- ii. Hum and Noise: With system gain set for 90dB peak levels from any normal program source, electrical noise should not exceed 0.2 volts RMS at power amplifier output terminals. Operation of various system controls such as program source, gain control, lighting controls, etc. should not introduce objectionable noise into the system.
- iii. Frequency Response: Using accepted and approved 1/3-octave analysis procedures, the response of each audio channel will be equalized to provide a "flat" frequency response curve over the frequency spectrum of the specified equipment. This requirement may be relaxed if the Owner requests a modified response curve to meet specialized requirements. It is important that loudspeaker crossover settings and equalization be trimmed to result in the closest possible match between each speaker channel, as measured at a favorable centralized listening position.
- iv. Signal to Noise Ratio: (inclusive of cross-talk and hum) Signal to noise ratios should be measured using an approved sound level meter, set to "linear" weighting and "SLOW" meter response. Unless restricted by the undistorted output level of the system, the overall system S/N ratio should be greater than 70dB.
- v. Total Harmonic Distortion: With the exception of microphones and speakers, the published THD for any piece of audio equipment in the system should not exceed 0.1% over a 20 Hz to 20 kHz bandwidth.

Attachment C: Audiovisual Requirements

b) Analog Video Systems

The video systems, when properly installed and adjusted shall meet the following performance criteria:

- i. Differential Gain: Using a standard spectrum analyzer and test signal the differential gain should not exceed 3%. Any variation in color saturation should also be subjectively reviewed.
- ii. Differential Phase: Using a standard spectrum analyzer and test signal, the differential phase should not exceed 2%. Any variation in color hue should also be subjectively reviewed.
- iii. Signal to Noise Ratio: The un-weighted DC to 4.2MHz signal to noise ratio should be 55dB minimum (inclusive of cross-talk. Peak to RMS).
- iv. Frequency Response: The frequency response for any piece of video equipment in the system should not vary more than +/- 0.5dB DC to 4.2MHz.
- v. Line and Field Tilt: Less than 2%.
- vi. Color Timing: Within 3 degrees at 3.58MHz.

c) Audiovisual Control System

vii. Hardware Performance Requirements

(a) The Integrator shall be responsible for providing all control processing, communication and connectivity hardware as required to deliver a complete, operational integrated system.

(b) The Control Systems shall provide either auto-sensing network configuration or manual network configuration on 10 or 100 base T networks.

(c) The Control System shall fully support Domain Name Server (DNS) and Dynamic or Static Host Configuration Protocol (DHCP) for all network communication.

(d) The Control System shall support asynchronous communication providing the ability to send and receive data at the same time.

(e) Master Control System processors shall support multiple levels of security for secure network access to the system.

(f) The Control System shall support the Owner's IT Systems' network firewall, gateway, and network routing.

Attachment C: Audiovisual Requirements

(g) The Control System shall support control of devices via Ethernet control, serial control, relay control, or infrared control.

viii. Software Performance Requirements

(h) The Integrator shall be responsible for providing all software, and all software configuration, setup, and programming as required to deliver a complete, operational integrated Control System providing the user control functionality designated in the Specifications.

(i) All software programming must be included in the scope of the Integrator's work. No portion may be omitted from the scope of Integrator's work. Proposals excluding any portion of the software programming will be deemed non-responsive.

(j) All commercial software provided by the Integrator, as part of the Project shall be procured and transferred in full compliance with the publisher's copyright, licensing, and other requirements of ownership and use. All software license agreements shall be registered in the name of the Owner.

(k) The Owner shall retain full rights to all custom software, programming, and software configuration programming code developed by the Integrator as part of the Project. This shall include the right to use, reproduce, and modify the software and software programming code as reasonably required to operate the Audiovisual Systems and to support their ongoing utility, maintenance, and development.

(l) The Audiovisual Control System programmers shall be trained and certified by the system manufacturer. The Integrator must be certified as a dealer in good standing with the manufacturer of the Audiovisual Control System hardware and software.

(m) As part of the Control System design, the Integrator must provide the means and define the procedures for backup of the Control System software and programming code. This backup system may include a removable-type memory backup or a network server backup procedure via FTP transfer, or CD-R.

3. System Assembly and Installation

Attachment C: Audiovisual Requirements

a) Physical Installation

Installation shall include, but not be limited to, the following:

b) General Execution of Work

- i. Equipment Racks
- ii. All assembly and material cutting shall be limited to a working area specifically designated for this purpose.
- iii. Cable and wire stripping scrap and conductor strands shall be kept away from sensitive electronic equipment such that loose pieces do not become lodged inside equipment.
- iv. All racks, consoles, connection boxes and other equipment enclosures shall be degreased and vacuum cleaned prior to installation of equipment or panels.
- v. The Integrator shall take measures to protect all cabinets, casework, finished flooring, wall coverings, equipment, and other surrounding objects from damage resulting from its work. This shall include, but not be limited to, the installation of temporary protective coverings. Any damage resulting from the work of the Integrator shall be corrected by the Integrator at no additional cost to the Owner.
- vi. Prior to shipment to site, all major pieces of equipment shall be unpacked and checked thoroughly at the Integrator's premises. The Owner will not be liable for any delays of completion in installation due to defective equipment being received by Integrator.
- vii. All equipment racks and sub assemblies shall be constructed at Integrator's premises. This will include, but not be limited to, wiring, labeling, dressing, supports, and ventilation.
- viii. All spaces shall be cleaned as an ongoing activity. The Integrator shall vacuum clean all work areas and remove all debris, scrap, and waste at least every week, and after any substantial debris accumulation. At the conclusion of the work in a given room area, a final vacuum cleaning of all such access spaces shall be performed. All loose items, including those that were existing at the start of the work, shall be removed. Wet mopping shall be performed on flooring only when other dry cleaning methods are insufficient. No brushing or wet cleaning of equipment shall be permitted.
- ix. The Integrator shall generate any additional drawings or information required for fabrication, installation and wiring of the system.

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- x. The Integrator shall be responsible for the proper alignment, adjustment and calibration of all audiovisual equipment including equipment specified as Owner Furnished Equipment (OFE or OFCI), and shall provide all personnel and test equipment for the system test and adjust.
 - xi. The Integrator shall be responsible for verifying the compatibility of all equipment and related hardware with related work performed by others. This includes, but is not limited to, electrical, mechanical, structural, and all finish work.
 - xii. The Integrator shall furnish all software necessary to operate software controlled audiovisual equipment or sub systems (e.g. remote control system). Whether produced by the Integrator or supplied by a software manufacturer, all software will be installed and tested prior to the delivery of equipment to the site.
 - xiii. Uncrating, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required of all equipment except as otherwise noted.
 - xiv. Interconnect wiring of the components of the system.
 - xv. Equipment alignment and adjustment.
 - xvi. All other work whether or not expressly required herein which is necessary to result in a completely tested and operating system.
 - xvii. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three (3) times.
 - xviii. All boxes, equipment, etc. shall be plumb and square.
- c) Equipment Installation
- i. The Integrator shall use metal equipment racks of standard height unless otherwise specified. Whether a metal rack or custom cabinetry is used, the following shall apply:
 - (a) Equipment mounting shall conform to industry standards of 1 3/4" rack units.
 - (b) The Equipment Rack shall have a lockable front and back door.
 - (c) The Integrator shall only use rack rails that are tapped for #10-32 screws (no clip nuts shall be used).

Attachment C: Audiovisual Requirements

(d) The Integrator shall implement a general ventilation scheme for all consoles and racks in the Project. A proposed scheme shall be presented to the Audiovisual Consultant for approval prior to execution of the work.

(e) Provide blank rack panels in all rack openings not occupied by equipment. Blank filler panels shall not exceed three rack units in size. Panel color shall be matte black. Perforated panels may be used to aid in proper ventilation.

(f) All devices within equipment racks shall be mounted to the equipment rack. No devices shall be resting atop or mounted to other devices within the equipment racks.

(g) Devices will be mounted in the racks in logical order. Generally, signal flow should move from the top of the rack to bottom. Heavier devices should be mounted in the lower portion to ensure that the assembly is not too top heavy. Frequently used devices will be mounted at the optimal elevation for operator use.

(h) Each rack shall be uniquely identified with an engraved, self-adhesive label affixed to the front top frame. The size and appearance of these labels will be reviewed for approval by Audiovisual Consultant.

(i) Integrator rack logo panels shall be confined to a single rack unit. Rack logo panel graphics shall be submitted for approval by the Audiovisual Consultant. Rack logo plates shall identify the name of the Integrator, the Audiovisual Consultant, and the name of the Owner.

ii. Cable Dress

(a) In general, cable dressing shall be considered from a maintenance standpoint. Suitable service loops shall be provided to allow removal of equipment, or to extend equipment that is mounted in the rack on rack slides. Where there is no rear access to the rack mounted equipment, this requirement shall be carefully addressed, and cabling shall be of sufficient length to enable the removal and replacement of any individual piece of equipment with all others in place.

Attachment C: Audiovisual Requirements

(b) It is expected that the Integrator will fabricate some portions of the systems off site. Pre-wiring is acceptable provided that the pre wired assembly can easily be transported to its final location without complication, and without risk of cable or equipment damage. Use of intermediate connections for inter rack cables is not acceptable.

(c) Equipment specified as "Future" shall be accommodated with cables installed and routed normally, with the unterminated end being labeled, sealed in a plastic bag, and tagged appropriately.

(d) The Integrator shall be responsible for determining the proper length of all cables whether manufactured on or off the job site.

(e) The Integrator shall determine the desired method of securing cables. All of the following requirements must be met by the system:

(i) Plastic cable ties are the preferred method of cable lacing. Lay in systems are not acceptable except as applied to a horizontal cable tray.

(ii) Wires and cable shall be installed in a neat and orderly fashion, with like cable types following similar paths. Groups of cables shall be neatly combed and harnessed. Harnessed groups of cables shall be anchored at suitable intervals to reduce and relieve wire strain, especially strain on connections. Adequate service loops shall be provided at all cable endpoints.

(iii) Some rack-mounted equipment utilizes slide assemblies for front extension while in operation. For this type of mounting, additional, carefully dressed service loops on all cables shall be provided and installed with spring operated cable retractor assemblies to gather and recoil the service loop.

(iv) For all schemes of cable routing, no point in the path shall be subjected to a bend radius of less than eight (8) times the cable diameter, or minimum cable bend radius specified by the manufacturer.

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(v) Captive cables shall not be laced in such a manner as to prevent removal of the equipment to which they are captive.

(f) Wires and cables shall be segregated according to signal type. This applies to cable segregation within equipment racks and conduits. Digital and Analog AV cables shall be separated and routed in different conduits if they are being run to the same endpoints. In addition, audio cable shall be subdivided into three (3) classes: microphone level circuits, line level circuits, and speaker level circuits.

(i) Microphone level audio circuits shall be kept at least three inches (3") from any other type of parallel signal circuits and at least six inches (6") from any parallel AC power circuits.

(ii) Speaker level audio circuits shall be kept a minimum of three inches (3") from line level audio and AC power circuits. All other signal circuits shall be kept at least three inches (3") away from any parallel AC power circuits. Speaker Level audio circuits shall not share conduits with Microphone or Line Level circuits.

(iii) Where circuits of different types must cross, they shall do so at right angles and then return to the above required separations in as short a distance as possible.

(g) Conductors, wires, and cables shall be continuous between termination points. Splices are not acceptable.

(h) Cable tie and lacing installation shall be accomplished using hand tools specifically designed to apply proper tension to the cable tie, and to cut the end off flush with no protruding sharp edges. The Integrator's field supervisor shall spot check assemblies using cable ties both visually and by touch, thereby detecting any sharp edges of improperly cut cable ties. Install cable ties on all cable runs of two or more cables that are not supported by raceway, cable tray, or other means. Place cable ties approximately six inches (6") apart. Do not use more cable ties than are necessary for a neat installation. Cable ties shall not be applied with excessive force that may damage or deform sensitive and fragile cables.

iii. Cable Types

Attachment C: Audiovisual Requirements

All cables installed shall meet appropriate governing codes and standards. The following cable types are recommended for use:

- (a) Component Analog Video: 5-conductor, High Res. Coaxial, 26 AWG.
 - (b) S Analog Video: 2-conductor, S-video, 26 AWG.
 - (c) Composite Analog Video: RG-59/U Coaxial, 20 AWG.
 - (d) Audio-Speaker: Single twisted pair, 12 AWG.
 - (e) Audio-Microphone: Single twisted pair, shielded, 22 AWG.
 - (f) Control: Multi conductor, overall shield 24 AWG.
 - (g) Partyline Intercom: Single twisted pair, shielded, 20 AWG
 - (h) Serial Data: Multi conductor, overall shield, 24 AWG, low capacitance
 - (i) Broadband Television: RG-11/U Coaxial, 14 AWG.
 - (j) Digital Media: Use Digital Media Equipment manufacturer's recommended digital media cabling.
- iv. Cable Labeling
- (a) Provide unique cable designation on each distinct wire or cable. Labels shall be installed within two inches of connectors, unless this interferes with disassembly of the connector.
 - (b) The Integrator shall submit a sample of their cable labeling standards to the Owner and Audiovisual Consultant for review and acceptance.
 - (c) Labels shall be installed in such a manner as to be visible without unlacing any harnesses.
 - (d) Labels must have transparent heat-shrink wrap covers. Stick-on, adhesive, or Velcro labels by themselves are not allowed.
- v. Power Cords

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(a) All equipment power cords shall terminate in a standard plug that shall be wired in compliance with governing codes and standards.

(b) Power cords may be laced to the racks as long as the cords are removable at the power connector on the piece of equipment. This is to allow removal of the equipment without undoing the cable lacing. Power cords shall not be laced in the same bundle with signal or control cables. If the power cord is an active component of the equipment, the cable shall be dressed separately from all other cables terminating at the equipment to facilitate easy removal of the equipment.

(c) All power plugs shall be labeled with the component's label name.

(d) All power cords shall be plugged into an AC power distribution strip which will be pre-wired into the rack prior to delivery to site

vi. Cable Termination

(a) Wire and cable termination shall be performed in accordance with Broadcast Industry Standards and the guidelines of generally accepted professional installation practices.

(b) With respect to audio equipment interconnects, the Integrator shall make every effort to use equipment with balanced inputs and outputs. When this is not possible, such as the case to meet specification, the following are recommended (in order of preference):

(i) An electronic balancing device (professional interface) or balancing transformer should be utilized.

(ii) In the case of an unbalanced output driving a balanced input, forward referencing should be utilized.

(iii) An active balanced to unbalanced interconnect is not recommended.

4. Receptacle Panels

a) Field-verify panel sizes required for backboxes.

i. Oversize flush panels sufficient to trim wall openings, but not less than ½" of overlap.

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- ii. Size surface mount panels exactly to backbox, leaving no sharp corners and chamfering edges.
 - b) Aluminum panels with text engraved and back-filled in a color that contrasts the finish of the panel. Coordinate with Architect to determine finish.
 - c) Anodized, vertical-brushed finish
 - d) Submit engraved sample for approval by consultant and architects.

- 5. **Electrical Requirements**
 - a) Technical Power
 - i. Technical Power, defined as AC power dedicated to the audiovisual equipment and other critical audiovisual systems, will service the Audiovisual System.
 - ii. All racks and cabinets shall have pre-wired AC power strips for Technical Power distribution within the rack. The assembled rack internal power strips shall conform to approved testing laboratory specifications. Each circuit shall consist of a "hot" wire, a dedicated neutral wire, and a dedicated ground wire of equal current carrying capacity.
 - iii. The Integrator shall coordinate the power interface between the equipment enclosure and the building with the Audiovisual Consultant. The Audiovisual Consultant will provide Technical Power at locations adjacent to audiovisual equipment where specified.
 - iv. The Audiovisual Systems shall be designed so that power may be supplied or removed smoothly or abruptly at any time without causing damage to system equipment.
 - b) Grounding Practices
 - i. Technical Ground shall be defined as the ground or earth protection that is dedicated to the Technical Power service supplying electrical power to the audiovisual systems.
 - ii. Because of the great number of variations possible in a grounding system, it shall be the responsibility of the Integrator to follow good engineering practices as outlined below, and to deviate from these practices only when necessary to minimize cross-talk and to maximize signal to noise ratios in audio and video systems.
 - iii. In order to minimize problems resulting from improper grounding, and to achieve maximum signal to noise ratio, the following grounding procedures shall be adhered to:

Attachment C: Audiovisual Requirements

(a) A uni-point ground scheme shall be maintained throughout the systems. A dedicated ground buss bar shall be provided for the exclusive use of the Audiovisual Systems. This buss bar shall serve as a termination point for all equipment rack frame grounds and AC power panel dedicated ground conductors. The Audiovisual Systems' Technical Ground buss bar will be connected to the central facility ground at one point only.

(b) Each audiovisual system equipment rack will be connected to the Technical Power ground buss bar via a dedicated eight (8) gauge green copper wire. The Audiovisual Systems equipment racks will be isolated from building steel, cable trays, electrical conduit and any other object or device that would compromise the dedicated ground system. All conduits entering the equipment racks will be isolated from the enclosure itself with an insulated fitting.

(c) All devices in the audiovisual system racks shall be serviced with a grounded AC outlet. Devices having two (2) prong power cords shall also have a fourteen (14) gauge green copper wire connected from the chassis to the grounded copper buss bar mounted to the equipment rack frame. Under no circumstances shall the prong of a three (3) prong power cord be removed.

(d) Audio cable shield shall be connected to ground at one point only. Exceptions may be made for phantom powered microphones and some ICM and IFB systems. This ground point shall be at the system ground of the destination device, which shall be strapped to the system ground in the rack. For intra rack wiring this requires the shield to be connected at both ends, but grounded at only one end.

(e) All video receptacles shall be insulated from the mounting panel, outlet box, or wireway. Unless otherwise detailed, this shall be accomplished by using insulated from panel type receptacles.

(f) The Integrator shall take care to consider ground references within each device and the grounding factors on site.

Attachment C: Audiovisual Requirements

B. Architectural Integration Requirements

The following information is provided to clarify critical elements of the AV system integration into the buildings and to identify specific design intent throughout the Project. Some of the work and conditions described may be wholly or partially the responsibility of others. The Integrator shall be responsible for ensuring that the AV system is fully compatible with the designs, equipment, fabrications, and conditions described.

1. Computer Workstation Integration

The Integrator shall be responsible for providing all miscellaneous material required to provide the complete integration of owner furnished computer equipment with the AV system. With the aim of providing clear and simple user connection of computers to the AV system, the Integrator shall observe the following requirements:

- a) The Integrator shall securely attach any applicable interface electronics in a position that provides easy access for connection of signal cables as well as adjustment and service of the electronics by system maintenance personnel. No loose equipment will be accepted unless specifically directed otherwise.
- b) All computer video connections at the end user positions (e.g., laptop connections) shall utilize standard VGA-type (15-pin HD) signal connections & HDMI.
- c) Where required, the Integrator shall provide all necessary breakout cable(s) to convert the 15 pin HD computer output connection to the appropriate input connection at the computer interface, switcher or other designated device.
- d) Computer interface connections shall accommodate audio signal connections with corresponding computer video signals.
- e) Clearly label all connection points and cables.
- f) All power and signal cables shall be neatly dressed with removable tie straps (e.g., Velcro) or other means for securing loose cables when not connected or in use.
- g) The AVC shall furnish rack-mounting kits, ears, or shelves as required wherever a PC is being mounted within an equipment rack.

2. Equipment Racks

Equipment Racks shall be mounted in the rooms noted above, as specified. The Integrator shall be responsible for coordinating the final location of the racks, ventilation for the credenzas they reside in (if they are being installed within a credenza), and electrical service required with the Electrical Contractor and Audiovisual Consultant. Additionally, the Integrator shall be required to verify and coordinate all AV equipment heat loads with the Mechanical Engineer and Audiovisual Consultant so that the HVAC systems are designed to keep the AV equipment at the manufacturer-specified temperatures.

3. Furniture, Millwork & Cabinetry

Attachment C: Audiovisual Requirements

Except as identified in this Specification, all millwork and millwork modifications required to accommodate installation of Audiovisual equipment (including related cabling and connections) shall be provided by others. The Integrator shall coordinate with the Owner, furniture suppliers and millwork contractors as required to ensure that the Integrator clearly understands the intent of the equipment integration concepts and that the work of the other trades and suppliers is compatible with the work and equipment provided by the Integrator. This shall include workstation, lectern, credenza, and table locations which are provided by the Owner, and shall include, but not be limited to, the installation of cable pass-throughs, grommets, equipment (e.g., microphone, touch screen, tabletop pop-ups) mounting and location of electrical elements.

C. Testing & Owner Acceptance Procedures

1. Installation Testing and Adjustment

The Integrator shall perform all tests and adjustments, shall furnish all test equipment necessary and perform all work required to verify performance of the system in accordance with these Specifications and the Integrator's test plan (discussed in section I.I.1.r) and (II.G.1). When these initial tests and adjustments are completed, the Integrator shall notify the Audiovisual Consultant that the systems are in compliance with the Specifications and are ready and complete for Acceptance Tests. The scope of this work includes, but is not limited to the following:

a) The acceptance testing process shall reference this AV systems RFP for specific system requirements. There are two distinct procedures in the overall acceptance testing process outlined in this section, the Substantial Completion and the Final Acceptance. Often times, punch lists and incomplete work will preclude considering the first review of the systems for final acceptance. With this in mind, and the Substantial Completion acceptance testing is the first step towards acceptance and will give the Audiovisual Consultant and Owner a chance to create punch lists. Typically, Final Acceptance occurs after all punch lists are completed, the Owner has had some time to work the systems (after the systems are Substantially Complete), final documentation is given to the owner, and all training is performed.

b) Additionally, the Owner shall retain the right to hire a consultant to test the Audiovisual Systems. Delays to this consultant caused by incomplete work, improper wiring, or inoperative equipment may result in consultant's time being billed to the Integrator at current consulting rates. In the event further adjustments are required, or defective equipment is to be repaired or replaced, tests shall be suspended or continued at the option of the Owner.

2. Substantial Completion

Attachment C: Audiovisual Requirements

Audiovisual System Substantial Completion testing will consist of verifying overall system functionality, internal rack functions, cable dressing, external device functions and terminations, and device operation. The Integrator will demonstrate to the AV consultant the performance and compliance of the AV systems' functionality in accordance with the standards and practices delineated in the Specification documentation. Note: The AV Consultant will only perform one Substantial Completion site inspection after the Integrator declares that all AV systems are 100% complete, they've submitted their completed Substantial Completion Checklist to the Consultant, and all functionality is ready to be demonstrated to the Consultant.

The following requirements will be considered the basis for establishing Substantial Completion of the Audiovisual Systems.

- a) The AVC shall provide the as-built equipment list.
- b) The AVC shall provide redlined design drawings, rack layouts, spreadsheets, and any other relevant and current documentation.
- c) Integrator's Punch List: Provide an internally constructed punch list of known devices, cables, or systems that are incomplete. Audiovisual Consultant and the Owner will construct another punch list after the Substantial Completion acceptance testing is performed that is based on the inspection and the Integrator's internally constructed list.
- d) Test, adjust, balance, equalize, and calibrate all equipment (including OFE or OFCI) as required for optimum performance. Establish and tabulate normal settings for all level controls. These settings shall be recorded in the maintenance manual for reference.
- e) Signal and Cable Testing and Documentation: Provide documentation on the point to point testing of all Fiber, CAT6, Audio, Video Inter-Room Cabling, and Building Tie Line cabling provided by the Integrator. The following will be tested for each of the respective category of cable and/or signal types:
 - i. Audio: continuity, polarity, sound check
 - ii. Speaker: impedance, polarity, proper zoning, buzz & rattle (frequency sweep), sound check, signal quality.
 - iii. Video: signal continuity, proper routing.
 - iv. Control: continuity & confirmation of control capability between designated control locations and control processors.
 - v. Fiber: OTDR (Optical Time Domain Reflectometer) testing, spot-check of functionality by the Integrator.
 - vi. Data/Cat6: Bandwidth testing
- f) Quality of Installation: The areas around the racks and consoles should be free of debris and excess wires. Racks, consoles, and equipment should be free from dirt and grease.

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g) Labeling and Terminations: All devices, including floor boxes, racks, termination panels, components, closets, panels, and cables should be terminated and labeled according to the Integrator's engineered plans. Visual spot-checking of wire dressing and terminations will be performed during the Acceptance Testing procedure.

h) The Owner's technical staff shall be involved in recommending hardware and software system settings. The Integrator shall be responsible for providing the test equipment for the tests.

i) System Functional Completion Requirements

- i. The Owner is encouraged to bring in specific testing equipment and to request specific simulated operation scenarios that the Integrator may run through.
- ii. The individual areas of the building and the corresponding audiovisual shall be tested for compliance with system functional descriptions described in the Audiovisual Systems Performance Specification.

j) System Technical Performance Completion

Individual sub-system components of the integrated Audiovisual Systems shall meet or exceed the technical performance defined in the Specification. Testing of the performance of these systems is the responsibility of the Integrator and shall include:

- i. During the acceptance testing procedures, each system will be spot checked to verify systems integration and inter-system operability. For instance, a laptop and/or microphone should be able to be plugged into an interface, and the audio routed to a desired speaker zone.
- ii. The Integrator shall supply any necessary testing equipment for acceptance testing including a continuity checker, laptop computers with software, patch cables, and video test equipment. Also, video signal must be able to be routed, patched, and scaled or scan converted.

k) Architectural Integration Completion

The Integrator shall be responsible for ensuring that the Audiovisual Systems are fully compatible with the architectural designs, equipment, fabrications, and conditions described in the Specification and fit and finish are acceptable to the Owner.

3. Final Acceptance

The following are items that are required for Final Acceptance of the AV systems.

- a) Completion of the Substantial Completion checklist to reflect the resolution of all items that were punched during the Substantial Completion checkout.

Attachment C: Audiovisual Requirements

- b) Demonstration to the Consultant during a Final Acceptance site-walk that all of the outstanding items from the Substantial Completion site-walk have been resolved.
- c) Final Interface Design of the control system interface screens and software provided to Owner.
- d) Audio equalization and final levels
- e) Completion of all consultant and owner checklists
- f) All Training performed and operator proficiency demonstrated.
- g) Review of maintenance agreement documentation, contact information, and procedures with the owner.
- h) Final As built Systems Documentation including spreadsheets, software, and drawings (in final CAD and PDF format) .