SECTION 274100

AUDIO/VISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General: The General Requirements, Conditions of the Contract, these Specifications, Drawings, Addenda and Contract Modifications (the Contract Documents), and definitions of legal entity (such as Contract, Installer, Engineer, Owner, etc…) shall apply to the work of this specification section.

B. Supplemental: Refer to the specification sections identified below for additional requirements, which are supplemented by this section.

1. 270010 Technology General Provisions
2. 270528 Raceways for Technology
3. 271000 Structured Cabling System
4. 270526 Grounding and Bonding for Communication Systems

1.2 SCOPE OF WORK (SOW)

A. General: Refer to the requirements of the related documents identified in Part 1.1 of this specification, for scope of work requirements, which are supplemented by this section. This shall constitute the basis for the “Scope of Work” for this specification.

B. System: The goal of the project is to provide a finished, complete audiovisual system with the functionality, capacity, and operability, as described in the Contract Drawings and specifications herein. The finished, complete system shall serve as a vehicle for the transport of associated system signals from designated origination points to equipment interfaces and/or identified distribution points per the Contract Documents. The scope of work for the AVS installer shall include, but not limited to the following tasks:

1. Preparation of shop drawings, submittals, training and as-built information for the system.
2. Procurement, installation and warranty of all AVS hardware including projectors, flat panel displays, mounts for displays, signal transceivers, players, switchers, servers, etc.
3. Procurement, installation and warranty of all AVS cabling and wiring, including support system, and fire stopping for all low voltage cabling part of the AVS.
4. Programming labor of the AVS, including initial software set up, software registration, and initial data input, unless otherwise noted in this specification section.
5. Attend project plan meetings with the Owner and the Consulting Engineer (A&E) to fine tune data interchange details, network configuration and other user requirements:
6. Provide training and close out information as indicated in this specification.

C. It shall be understood by the AVS installers that this is an integrated system where multiple pieces of equipment from different manufacturers are required to be connected/interfaced together to make the AVS operational. To allow for competitive bidding multiple manufacturers are listed in the specifications for many devices and software, but it is the sole responsibility of the AVS installers to verify that their particular equipment and software selection integrate and work seamlessly with other equipment and software from the pool of approved manufacturers. These specifications represent a design guideline and design intent but they are not intended to verify that all possible equipment and software listed in this specification work and integrate seamlessly with any equipment and software form the pool of acceptable manufacturers. Approval of submittals for the AVS by the A&E of the project does not relieve the responsibility for the AVS installers to deliver a working system. Any equipment changes required because of incompatibility between different devices of a particular system, even after the equipment has been approved by the A&E, shall be provided at no additional cost to the owner.

D. The following items are not part of this scope of work:

1. Network switches, unless specifically indicated in the design documents.

E. The following is a list of room types where Audio Visual system shall be provided:

1. Small Conference Room
2. Small Conference Room with TV
3. Medium Conference Room
4. Medium Conference Room with TV
5. Judicial Meeting Room
6. Jury Assembly and Selection Room
7. Law Library – Clinic Area Room
8. Grand Jury Room.
9. Standard and Large Courtroom
10. Special Proceedings Courtroom
11. A broadcast system

F. For a list of all the rooms and the room type assignment, see schedule design drawings

G. Consumables: The Audio Visual System (AVS) Installer shall provide as part of the scope the following consumable devices:

1. One (1) wind screen for each microphone in the project.

1.3 INSTALLER QUALIFICATIONS

A. General: The qualifications and requirements herein apply to the specific technology identified by this specification section. Refer to the specification sections identified in Part 1.1 “Related Documents”, of this specification, for additional requirements, which are supplemented by this section.

B. Installer Qualifications: The Installer directly responsible for the work described in this specification section is also referenced as the AVS Installer. The Installer shall be a licensed and registered contractor who is, and who has been, regularly engaged in providing the installation

of audiovisual systems of similar size and complexity for at least the immediate past five (5)-years.

C. Project manager requirements: The project manager for each company participating in the installation of the AVS shall be a Certified Technology Specialist (CTS) by Avixa. Proof of current certification shall be provided with the submittal

D. Programmer-Installer: The AVS Installer must have a factory-trained programmer/installer, for the provided Project products, in full-time employment, as part of their staff. The AVS installer needs to provide certificates of completion of training for the staff that will be taking part in the execution of this project

E. Qualification Documentation: The Installer shall provide the following documentation with their bid package, as evidence that the requirements for the Installer qualifications have been satisfied:

1. A list of not less than five (5) references for jobs of similar size and complexity including:

    a. Project Names
    b. Locations
    c. Contact Names
    d. Contact Telephone Numbers

2. Location (specific street address) of the office from which this installation and warranty work will be performed. It is preferred that the Installer has established and maintains a permanent office within 100 miles of the project site.
3. Copies of Manufacturer certification certificates. It is required that the Installer possess the following certifications, at a minimum:

    a. AMX certified dealer, installer and programmer.
    b. Biamp certified dealer, installer and programmer
    c. QSC certified dealer, installer and programmer

4. Copies of Licensure certificates.
5. Copies of Insurance and Bonding certificates.

1.4 MATERIALS ALTERNATES AND SUBSTITUTIONS

A. General: See details for alternates and substitution in specification section 270010.

B. Specific equipment: When the design drawings indicate a brand and a model number for a piece of equipment as part of the audio visual system, the AVS Installer needs to provide the same device as indicated. Substitutions for this type of equipment are not acceptable.

C. Non-specific equipment: When the design drawings do not indicate a brand and a model number for a piece of equipment as part of the audio visual system, the AVS installer is free to pick equipment that meets the minimum specifications indicated in this section. The AVS installer needs to submit the selected choice as part of the submittal process

1.5 SHOP DRAWINGS AND SUBMITTALS

A. The AVS installer shall follow all requirements for shop drawings indicated in specification section 270010.

B. Project Start Submittals: A maximum of 60 days after the AVS installer receives a notice to proceed with the project, but no sooner than a year before substantial completion, the following information shall be submitted.

1. Cut sheets with all specifications of every device, cables and connectors to be used in the project.
2. One-line diagrams with all devices included in the systems. Each system in a different sheet.
3. User interface and faceplate color submittal. The AVS installer shall prepare a separate submittal with the shape and color of all user interface plates to be approved by the Architect of the project or the Owner.
4. Rack elevations of all AV equipment for all rooms in the project.
5. Conduit rough-in requirements of all wall and ceiling mounted devices for all equipment part of the AVS system.

C. Construction Submittals: During the construction process the AVS installer shall submit various documents for approval prior to continuing with the installation process. Here is some of the information the AVS installer needs to submit:

1. Before starting the programming process the AVS Installer shall provide the following information:

    a. A schematic presentation of the layout of all the user interfaces in the project. The AVS Installer needs to get approval of this submittal before starting any programming. These layouts shall include all graphics with all button sizes, shapes, colors and wording to be used in all user interfaces. All keypads shall include working for engraving in the buttons.
    b. Completely fill out network configuration template provided by TLC Engineering upon request, to explain all network devices to be used in a project and to get IP addresses from the network administrator.
    c. A layout/presentation of any digital audio programming and user interfaces that are part of the project.
    d. Dante® and AVB map assignment. A list of all Dante® and AVB channels from all rooms and all the routing shall be provided.
    e. Detailed layout of the DSP filters to be used in each DSP processor.

2. Any design changes whether originated by the Owner, Designer or by the AVS Installer as a VE suggestion need to follow the same submittal process described in the previous paragraph for all equipment involved on the change.

1.6 PROJECT SPECIFIC SOURCE CODE OWNERSHIP

A. Definition of project specific source code: Project specific source code includes all source code created to generate an executable file to be intended to run in any equipment used in the installation of the AVS. Examples of project specific source code include source code used to

generate executable files for control processors, DSP processors and touch panels. Project specific source code does not include source code used to create programming tools and compilers or source code used to generate operating systems or application programs running in PC based workstations.

B. Ownership: Any project specific source code used in this project shall remain the exclusive property of the Owner. By accepting the contract to perform the work included in this project, the AVS installer or designer and any other companies working creating project specific code during this project relinquish the right of ownership of this source code, and waive any licensing fees or royalties for the use of source code by the Owner or any company authorized by the owner to perform changes in the source code after the project is substantially completed for an undefined period of time.

PART 2 - PRODUCTS

2.1 SYSTEM FUNCTIONS

A. System Signals for All Systems

1. General: The completed system shall be capable of receiving, processing, routing and distributing the associated signals, noted herein, from and to the respective devices identified under Part 2 of this specification and the Contract Documents.
2. Digital video signals through the system shall be capable of delivering 1920X1080 resolutions at 24 fps from end to end.
3. Control signals through the system shall be maintained to the minimum level established by the control equipment manufacturer for the control protocol utilized. This level shall be correct at all connection points in the system.

B. Network protocols. There are several Ethernet Network AV protocols that will be used on this project. Here is a list of them and their utilization:

1. AVB (Audio Video Bridging). This protocol will be used extensively, but only for audio, not for video. This network traffic can’t leave the telecom room where all the cables are terminated or the room where the DSP is. All traffic will be unicast
2. Dante. This protocol will be used extensively for audio only. This is the protocol that needs to be used to move traffic between floors in this project. Traffic will be unicast and multicast.
3. NDI-HX. This protocol will be used for video only for all the broadcast camera. This protocol will be used between floors. Traffic for these cameras will be unicast only.
4. Q-LAN. This protocol will only be used in the 4th floor and shall not leave the telecom room.

C. Remote Asset Management Software

1. General: The Remote Asset Management Software (RAMS) is another tool that will be provided to the owner to control the AVS system. When referenced in this section within the room functionality, the RAMS shall be able to provide the functionality described in these paragraphs.
2. Capabilities of the RAMS. This software tool shall have the following features:

a. Connect to all controllable rooms in the project through the owner's IP network.
b. Fully compatible with the controllers installed in each room part of the AVS.
c. Be able to support all the controllable rooms in this project plus 10% expansion capacity.
d. Be able to have at least two (2) simultaneous users on the system.
e. A customizable graphical user interface.
f. Unlimited Grouping features.
g. Real-time monitoring, control and diagnostics of control systems in each room on the project.
h. Built-in event scheduler.
i. E-mail alerts.
j. Built-in logging, report and chart generation.
k. SSL Authentication

3. Computer system. The AVS Installer shall provide and install a computer system capable of running the RAMS as required by the manufacturer of the software package.
4. Software customization: The AVS Installer shall customize the user interface of the RAMS according to the owner's request. The AVS installer shall meet with the Owner and Design engineer during the construction process and agree on the features that will be used by the owner from this tool. Once this step is done, the AVS Installer shall program the RAMS interface based on the conclusions of that meeting. At a minimum all AVS with control processors shall have the following monitoring features through the RAMS:

    a. All media players and recorders usage: start time, stop time and cumulative use.
    b. All sources connected to interface plate usage: start time, stop time and cumulative use.
    c. Projector lamp usage hours.
    d. Flat panel display usage hours.
    e. UPS monitoring, including automatic start, battery test and status, and internal temperature.

5. Database input: The AVS Installer shall fill the RAMS database with the correct information of all the rooms that have controllable AV equipment in the project.
6. At a minimum the following alarms of the AVS shall be monitored by using the RAMS:

    a. Projector in video mute for more than 1 hour.
    b. Projector turned off (not on stand-by).
    c. Projector lamp approaching 85% of estimated life time.
    d. Projector lamp bad (if reported by projector)

7. Reporting capabilities: The AVS Installer shall provide at least five (5) different reports from the RAMS. The AVS installer shall meet with the Owner and Design engineer during the construction process and agree on the fields of each report that will used by the owner from this tool. Once this step is done, the AVS Installer shall program the RAMS reporting features to accomplish the conclusions of that meeting.
8. Training: The AVS installer shall provide two levels of training for the RAMS. Administration level training shall be provided for at least 4 hours. User level training shall be provided for 2 hours.
9. Design selection: AMX RMS-ENT

D. Computer Based User Interface

1. General: The computer based user interface (CBUI) is another way for the Owner to control the AVS. This interface is in the form of a computer software program with the following requirements:

   a. Needs to be an executable file capable of running in any Windows based PC.
   b. One file per controllable room is required.
   c. Needs to have the same user functions available inside the room in touch screens and keypads.
   d. The "look" and layout of the interface shall be the same as the one in the room.
   e. Programs shall be password protected and have SSL.

2. Delivery: The AVS Installer shall provide two (2) flash drives with all the programs in executable and source code format inside. Each file shall be properly labeled with the room description and the room number.

E. Owner Provided Input Sources and Destination Devices

1. General: Design drawings could indicate AV equipment, part of the AVS, to be provided by owner (as OFE or owner furnished) or third parties. Such equipment is explicitly indicated as such in design drawings to distinguish it from all other equipment to be provided by the AVS installer. When such equipment is indicated in the drawings the AVS Installer shall interface with it. Refer to the design drawings for audio, video and control lines required for owner provided equipment.
2. Scope of work: It is in the scope of work of the AVS Installer to run, terminate and connect the audio, video and control lines to owner provided devices as shown in the design drawings. When control lines are indicated in the design drawings, the AVS installer shall program all control features described in each system functions per controllable room, including all features related to owner provided equipment or third party equipment.

2.2 SMALL CONFERENCE ROOM.

A. This type of room is composed of the following elements:

1. System input for a user device through an HDMI cord
2. A flat panel display type D.
3. A pair of HDBase-T receiver and transmitter
4. A flip top device type 2

B. The system control is only the infrared remote control that comes with the flat panel display. The system shall include an HDBase-T receiver and transmitter to avoid long HDMI cables. The speakers of the system will be the built in speakers in the displays.

C. HDMI cables shall be provided for this system at the display side and at the table side.

D. The HDMI cable in the table side shall be through a flip top device type 2.

2.3 SMALL CONFERENCE ROOM WITH TV.

A. This type of room is composed of the following elements:

1. System input for a user device through an HDMI cord
2. A flat panel display type D.
3. A cable TV receiver for commercial TV
4. A pair of HDBase-T receiver and transmitter
5. A flip top device type 2

B. The system control is only the infrared remote control that comes with the flat panel display and the cable TV receiver. The system shall include an HDBase-T receiver and transmitter to avoid long HDMI cables. The speakers of the system will be the built in speakers in the displays.

C. HDMI cables shall be provided for this system at the display side, at the table side and between the display and the cable TV receiver.

D. The HDMI cable in the table side shall be through a flip top device type 2.

2.4 MEDIUM CONFERENCE ROOM.

A. This type of room is composed of the following elements:

1. System input for a user device through an HDMI cord and USB type A cable
2. A flat panel display type D.
3. A soundbar with built in microphone and camera
4. A pair of HDBase-T receiver and transmitter
5. A flip top device type 2

B. The system control is only the infrared remote control that comes with the flat panel display and the remote for the soundbar. The system shall include an HDBase-T receiver and transmitter to avoid long HDMI/USB cables. The display shall be configured for constant volume output, through a line level output, to the soundbar.

C. The USB cable type A shall allow the user to connect to the built in camera and microphone in the sound bar.

D. HDMI cables shall be provided for this system at the display side and at the table side.

E. The HDMI cable and USB cable in the table side shall be through a flip top device type 2.

2.5 MEDIUM CONFERENCE ROOM WITH TV.

A. This type of room is composed of the following elements:

1. System input for a user device through an HDMI cord and USB type A cable
2. A flat panel display type D.
3. A Cable TV receiver for commercial TV
4. A soundbar with built in microphone and camera

5. A pair of HDBase-T receiver and transmitter
6. A flip top device type 2

B. The system control is only the infrared remote control that comes with the flat panel display, the remote for the soundbar and the remote for the cable TV receiver. The system shall include an HDBase-T receiver and transmitter to avoid long HDMI/USB cables. The display shall be configured for constant volume output, through a line level output, to the soundbar.

C. The USB cable type A shall allow the user to connect to the built in camera and microphone in the sound bar.

D. HDMI cables shall be provided for this system at the display side, at the table side and between the display and the commercial TV receiver.

E. The HDMI cable and USB cable in the table side shall be through a flip top device type 2.

2.6 JUDICIAL MEETING ROOMS

A. General: The AVS Installer shall provide a complete and operable system with the minimum functional requirements noted herein.

B. Input sources: The AVS described for this room shall have multiple audio and video sources. Audio and video sources can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all source equipment except when noted in the design documents as provided by Owner or under a different division. Refer to design drawings to determine what and how many signal types will be used for each source. The AVS for this room shall have the following audio and video input sources:

1. Wall plates with connectors and quantities as indicated in the design drawings.
2. Wired and Wireless Microphones as shown in design drawings.
3. Three (3) wireless presentation systems
4. Broadcast cameras (4 total for all 3 rooms)
5. Two (2) cable TV receivers
6. Two (2) video feeds from the broadcast system.

C. Output devices: The AVS described for this room shall have multiple audio and video output devices. Audio and video output devices can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all output devices except when noted in the design documents as provided by Owner or under a separate division. Refer to design drawings to determine what and how many signal types will be used for each output device. The AVS for this room shall have the following audio video output devices:

1. Wall plates with connectors and quantities as indicated in the design drawings.
2. Two (2) Projectors type 1
3. Two (2) Projectors type 2
4. Program and sound re-enforcement speakers as indicated in design drawings.
5. Three (3) wireless presentation systems
6. Infrared audio transmission system.
7. Three (3) video capture devices

8. An audio/video feed to the broadcast system.

D. Controllable devices: The AVS described for this room shall have a microprocessor based controller as indicated in the design drawings. This controller shall be capable of managing all input sources, output devices and other devices part of the AVS. Refer to design drawings to determine what and how many signal types will be used for each controllable device. The following is a list of other controllable devices to be provided by this room.

1. Four (4) Electric projection screen.
2. One (1) Audio/video switcher
3. One (1) DSP audio processor.

E. User Interfaces: The Owner shall be able to operate and receive system status information from the AV system through the following user interfaces:

1. Three (3) wall mounted touch screens
2. Computer based user interface
3. Remote Asset Management System.

F. General description: This system is a presentation system for 3 rooms with combinable capabilities. Each room shall be capable of being used independently or combined. The system has 4 cameras that are shared with the broadcast system. The cameras can be used by the broadcast system but shall also be available to the presentation system. The cameras shall be controllable by an operator from the broadcast system but also from the touchscreen by the user if desired. Audio shall be also capable to be sent/received to/from the broadcast system.

G. Cable TV receiver sharing: The system only has two (2) cable TV receiver. One receiver shall be dedicated for the larger room. The second receiver shall be shared between the two smaller rooms. If the shared receiver is not being used it shall be available to any of the 2 rooms on a first come first serve mode. Once the tuner is no longer used it shall be available to either room again.

H. User control: The Owner shall be able to use the above mentioned user interfaces to operate the AV system. All user interfaces shall be able to perform all tasks unless otherwise noted in the design drawings or this specification. The Owner shall be able to perform the following tasks and get the following status indication from the user interfaces:

1. Room combine mode selection. This option shall have a graphic map of the room to clearly indicate the user what rooms are being combined.
2. System On-Off with status indication
3. Individual display device on/off control and video mute.
4. Select and route any audio and video source to any of the available audio and video output devices. Each output device shall provide indication in the user interface of the current source selected for that output.
5. TV channels selection. TV channel selection shall be provided by the following methods:

    a. Manual entering channel number
    b. Pick from a list of ten (10) favorite channels. Favorite channels shall be labeled by the name of the network and the channel number. The owner will provide list of favorite channels for this room.
    c. Channel up and down, by moving up or down in the list of available channels.

6. Selected audio output device(s) volume control. Volume level should always be set to an acceptable user level during power up. Status indication of volume level shall be provided for each controllable output device.
7. Selected audio output device(s) volume mute. Mute status indication shall be provided at user interfaces.
8. Audio settings control. Manual equalization control per band and selection from five (5) equalization presets.
9. Individual control and status indication of all features for all controllable devices
10. Control of PTZ cameras as follows: In the smaller rooms the interface shall only allow the control of the camera in the room. In the larger room, the interface shall allow the use of the cameras available in the combine mode. As an example, when all rooms are combined all cameras shall be available from the large room interface.
11. Soft videoconference controls shall include selecting all sources for a soft conference and selecting the microphones that will be used on the conference based on the combine mode selected. All soft codecs will use the wireless presentation system to start the conference using the video capture system as the camera input.
12. Voice conference control shall include dialing keypad, hang up and off hook buttons and indicators, five (5) number memory buttons, microphone mute and user recording of memory buttons.

I. Special Features: The AVS shall allow the owner to perform certain automated task by means of using the user interfaces. Those task will be available only on the user interfaces mentioned within this paragraph:

1. Room combine: The room combine mode shall allow the owner to select the operation mode of the rooms from the following options:

    a. Each room independently (A, B, C).
    b. Room A independently, and B and C combined (A, B+C)
    c. Room A and B combined, C independently (A+B, C)
    d. Room A and C combined, B independently (A+C, B)
    e. All rooms combined (A+B+C)

2. Once a room combine mode is selected the grouped rooms shall operate as a single room for audio mode. Volume control, muting and source destination shall affect all grouped rooms equally.
3. A video combine mode is also required while in room combine mode. In this mode, the owner shall be able to select what source goes to the other room screen, from the user interfaces. Video combine mode could be turned on and off. While off the other room screens will follow the screen where the podium is connected at all time.
4. Display automation. Motorized Screen shall follow the operation status of the projector, regardless if the manual switch to the screen has been used to operate the screen. When the projector is on the screen shall be down and when the projector is off the screen shall be pulled up

J. DSP Features: The AVS shall program the DSP audio processor to provide at least the following features, additional to the functionality described above:

1. All inputs and outputs shall be labeled at the physical input/output and by text blocks within the software.

2. All inputs and outputs shall be monitored by RMS metering. Metering shall also be provided throughout the audio chain where appropriate.
3. Microphones shall be input to an Acoustic Echo Cancellation (AEC) input. Noise reduction shall be enabled for reduction of room background noise. Prior to being fed into an Automatic Mixer (AM) with direct outputs, each microphone channel shall also have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.
4. Program audio: Prior to being fed into a matrix mixer, each program channel shall also have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.
5. For all audio outputs there shall be 5-band parametric equalization and 12dB of gain control (+6dB to -6dB).
6. All inputs/outputs shall be connected to a matrix mixer, which will allow for flexibility in routing, gain adjustment and presets.
7. The audio to the wireless presentation system for soft codec shall be comprised of a stereo signal mix of all program audio sources with a mix of all microphone inputs.
8. The AVS Installer shall create a user monitoring and control interface utilizing Biamp Canvas software. Canvas software and interface shall be demonstrated to the owner, developed and presented to the owner and after approval be provided, loaded and tested on an owner furnished computer.
9. Audio mix: When program audio is used in the system, sound reinforcement speakers shall play a mixed (left and right) audio from program material at 50% of the level of the program material sent to the program speakers. Volume control adjustments including volume mute shall affect equally the program speakers and the sound reinforcement speakers when program audio is used in the system.
10. The assisted listening output shall be a mono signal compressed a mix of all microphones in the system plus a mix of all program audio, left and right summed.
11. All microphone arrays shall be configured for optimal performance in the location where they are installed.

K. Other features: This room shall have room scheduling panels at the entry doors to each room to indicate the use of the room during any day. The AVS installer shall program the room scheduling panel to connect to the Microsoft Outlook server of the 11th Judicial Circuit. The room scheduling panels shall have the ability to book the rooms on the touch panel disabled. The room shall only be booked through Outlook.

2.7 JURY ASSEMBLY AND SELECTION ROOM SYSTEM

A. General: The AVS Installer shall provide a complete and operable system with the minimum functional requirements noted herein.

B. Input sources: The AVS described for this room shall have multiple audio and video sources. Audio and video sources can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all source equipment except when noted in the design documents as provided by Owner or under a different division. Refer to design drawings to determine what and how many signal types will be used for each source. The AVS for this room shall have the following audio and video input sources:

1. Wireless and wired Microphones as shown in design drawings.

2. One (1) IP Page adapter
3. Four (4) CATV receiver.
4. Two (2) AV workstation
5. One (1) Apple TV.

C. Output devices: The AVS described for this room shall have multiple audio and video output devices. Audio and video output devices can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all output devices except when noted in the design documents as provided by Owner or under a separate division. Refer to design drawings to determine what and how many signal types will be used for each output device. The AVS for this room shall have the following audio video output devices:

1. Eleven (11) Flat panel display type D
2. Program and sound re-enforcement speakers as indicated in design drawings.
3. Infrared audio transmission system.
4. A 27" PC monitor with Keyboard and mouse

D. Controllable devices: The AVS described for this room shall have a microprocessor based controller as indicated in the design drawings. This controller shall be capable of managing all input sources, output devices and other devices part of the AVS. Refer to design drawings to determine what and how many signal types will be used for each controllable device. The following is a list of other controllable devices to be provided by this room.

1. One (1) Audio/video presentation switcher
2. One (1) DSP audio processor.
3. Five (5) HDMI Title Creators.

E. User Interfaces: The Owner shall be able to operate and receive system status information from the AV system through the following user interfaces:

1. Two (2) wall mounted touch screen
2. A desk mounted touch screen
3. Computer based user interface.
4. Remote Asset management software

F. General comments: These rooms could be used in different modes as follows:

1. The selection room could be used as overflow for the general seating or could be used as a jury selection room. In overflow mode the display will be used as one more additional display in the system with the audio following the video in the room. As a jury selection room, video will not be used, only audio. In this mode the control interface is only there to control basic audio functionality as well as microphone mute. Audio from the selection room is not required to be recorded, neither is required to be played in any other room in the floor.
2. The general seating area. This space could be used for presentations but also as general waiting area for jury selection. As a presentation space, video from the podium shall be routed to the displays in the room (at a minimum the 6 displays in the room and an option for all others). The audio in the room will be a combination of program audio from the podium plus the microphone at the presenter. In general waiting mode, each display might have a different video source but only one source will play in the speakers in each

room. In different rooms, different audio sources could be played, following the video of the display in the room. The quiet room shall not play program audio, only emergency messaging and audio from microphones. The user interface in the general seating room shall be used for presentation mode only. The user interface in the counters shall be used for general seating mode use of the room or presentation mode.

G. Audio priorities: Since several audio sources are possible the following audio play priority shall be used:

1. IP Page adapter: any time audio comes in from the IP page adapter from the building intercom system, all audio shall be muted, with the exception of this audio and played at 3dB above current volume levels. Once there is no more audio for more than 10 seconds, the last audio source in each zone shall resume playing.
2. Counter microphones: Any time audio comes from any of the two microphones in the counter area, all audio shall be muted, with the exception of this audio and played at 3dB above current volume levels, including in the quiet room. Once the microphones are not keyed anymore, the last audio source in each zone shall resume playing. These microphones shall be routed to all system zones when used, with the exception of the selection room, if currently system is used as selection room. If room is being used as overflow, audio from the counter microphones shall be routed to the room.
3. Podium microphones (wired & wireless). Audio from these microphones shall operate the same as the counter microphones, just a lower priority
4. Program audio: It has the lowest priority and can be muted by other sources or not possible, like in the quiet room.

H. KVM system: The 24” display with keyboard and mouse in the counter area shall be used as a KVM solution for the two AV workstations). This configuration should allow the users to use these PCs remotely.

I. User control: The Owner shall be able to use the above mentioned user interfaces to operate the AV system. All user interfaces shall be able to perform all tasks unless otherwise noted in the design drawings or this specification. The Owner shall be able to perform the following tasks and get the following status indication from the user interfaces:

FOR THE TOUCHSCREEN IN THE SELECTION ROOM

1. System On-Off with status indication. Turning on the system in this room, shall bypass all modes of operation previously selected in the room.
2. Selected audio output device(s) volume control. Volume level should always be set to an acceptable user level during power up.
3. Pink noise activation for gallery speakers.
4. Selected microphone(s) mute. Microphones shall be able to be muted individually or in groups, depending in the area where they are. Mute status indication shall be provided at the interface.
5. Small gain adjustment. A 3dB microphone gain adjustment shall be available in the interface to each microphone. This adjustment shall not be saved, and when the system is re-started again, default gains shall be loaded.

FOR THE TOUCHSCREEN IN THE COUNTER SPACE

1. System On-Off with status indication.

2. Room's mode operation selection. For General Seating: Presentation or Waiting area. For Selection room: Jury selection or Waiting area. Power up model is waiting area in both rooms.
3. KVM for AV workstation for content and KVM for AV workstation for titles.
4. Individual display device on/off control and video mute.
5. Select and route any audio and video source to any of the available audio and video output devices. Each output device shall provide indication in the user interface of the current source selected for that output.
6. Playback control of the Apple TV capable of operating in the available input sources. Status indication for playback control include selected function and invalid action. The playback control shall at least provide the following functions:

    a. Play
    b. Stop
    c. Rewind
    d. Forward
    e. Pause
    f. Digital media menu navigation controls.

7. TV channels selection. TV channel selection shall be provided by the following methods:

    a. Manual entering channel number
    b. Pick from a list of ten (10) favorite channels. Favorite channels shall be labeled by the name of the network and the channel number. The owner will provide list of favorite channels for this room.
    c. Channel up and down, by moving up or down in the list of available channels.

8. Selected audio output device(s) volume control. Volume level should always be set to an acceptable user level during power up. Status indication of volume level shall be provided for each controllable output device.
9. Selected audio output device(s) volume mute. Mute status indication shall be provided at user interfaces.
10. Audio settings control. Manual equalization control per band and selection from five (5) equalization presets.
11. Individual control and status indication of all features for all controllable devices.
12. Microphone mute selection and gain adjustment (3 dB)

FOR THE TOUCHSCREEN IN THE GENERAL SEATING AREA

1. System On-Off with status indication.
2. Once this mode is used the general seating shall change to presentation mode.
3. Selected audio output device(s) volume control. Volume level should always be set to an acceptable user level during power up. Status indication of volume level shall be provided for each controllable output device.
4. Selected audio output device(s) volume mute. Mute status indication shall be provided at user interfaces.
5. Microphone mute selection and gain adjustment (3 dB)

J. DSP Features: The AVS shall program the DSP audio processor to provide at least the following features, additional to the functionality described above:

1. All inputs and outputs shall be labeled at the physical input/output and by text blocks within the software.
2. All inputs and outputs shall be monitored by RMS metering. Metering shall also be provided throughout the audio chain where appropriate.
3. Microphones shall be input to a standard mic input. Each microphone channel shall have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.
4. Program audio: Prior to being fed into a matrix mixer, each program channel shall also have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.
5. For all audio outputs there shall be 5-band parametric equalization and 12dB of gain control (+6dB to -6dB).
6. All inputs/outputs shall be connected to a matrix mixer, which will allow for flexibility in routing, gain adjustment and presets.
7. Audio test signal generators (pink noise) shall be input to the matrix mixer as well.
8. Audio mix: When program audio is used in the system, sound reinforcement speakers shall play a mixed (left and right) audio from program material at 50% of the level of the program material sent to the program speakers. Volume control adjustments including volume mute shall affect equally the program speakers and the sound reinforcement speakers when program audio is used in the system.
9. The assisted listening output shall be a mono signal compressed a mix of all microphones in the system plus a mix of all program audio, left and right summed.
10. All microphone arrays shall be configured for optimal performance in the location where they are installed.

2.8 LAW LIBRARY – CLINIC AREA SYSTEM

A. General: The AVS Installer shall provide a complete and operable system with the minimum functional requirements noted herein.

B. Input sources: The AVS described for this room shall have multiple audio and video sources. Audio and video sources can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all source equipment except when noted in the design documents as provided by Owner or under a different division. Refer to design drawings to determine what and how many signal types will be used for each source. The AVS for this room shall have the following audio and video input sources:

1. Microphones as shown in design drawings.
2. Two (2) wireless presentation system
3. One IP page adapter connected to the security intercom system.
4. A soundbar with built in camera and microphones.

C. Output devices: The AVS described for this room shall have multiple audio and video output devices. Audio and video output devices can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all output devices except when noted in the design documents as provided by Owner or under a separate division. Refer to design drawings to determine what and how many signal types will be used for each output device. The AVS for this room shall have the following audio video output devices:

1. Two (2) Flat panel display type D
2. Program speakers as indicated in design drawings.
3. A soundbar with built in camera and microphones.

D. Controllable devices: The AVS described for this room shall have a microprocessor based controller as indicated in the design drawings. This controller shall be capable of managing all input sources, output devices and other devices part of the AVS. Refer to design drawings to determine what and how many signal types will be used for each controllable device. The following is a list of other controllable devices to be provided by this room.

1. One (1) DSP audio processor.

E. User Interfaces: The Owner shall be able to operate and receive system status information from the AV system through the following user interfaces:

1. Two (2) wall mounted touch screens.

F. User control: The Owner shall be able to use the above mentioned user interfaces to operate the AV system. All user interfaces shall be able to perform all tasks unless otherwise noted in the design drawings or this specification. The Owner shall be able to perform the following tasks and get the following status indication from the user interfaces:

1. System On-Off with status indication
2. Individual display device on/off control and video mute.
3. Select and route any audio and video source to any of the available audio and video output devices. Each output device shall provide indication in the user interface of the current source selected for that output.
4. Selected audio output device(s) volume control. Volume level should always be set to an acceptable user level during power up. Status indication of volume level shall be provided for each controllable output device.
5. Selected audio output device(s) volume mute. Mute status indication shall be provided at user interfaces.
6. Soft videoconference controls shall include selecting all sources for a soft conference and selecting the microphones that will be used on the conference based on the combine mode selected. All soft codecs will use the wireless presentation system to start the conference.
7. Audio output to the other library area speakers shall be controlled separate for volume and mute.

G. Special Features: The AVS shall allow the owner to perform certain automated task by means of using the user interfaces. Those task will be available only on the user interfaces mentioned within this paragraph:

1. Room combine: The room combine mode shall allow the owner to select the operation mode of the rooms from the following options:

a. Each room independently.
b. Rooms A and B as a single room. (A+B)

2. Once a room combine mode is selected the grouped rooms shall operate as a single room for audio mode. Volume control, muting and source destination shall affect all grouped rooms equally.

H. DSP Features: The AVS shall program the DSP audio processor to provide at least the following features, additional to the functionality described above:

1. All inputs and outputs shall be labeled at the physical input/output and by text blocks within the software.
2. When audio is detected by the DSP coming from the IP page adapter, all sources shall be muted and this audio shall play in all speakers in the system at 3dB above current volume level. This action shall happen regardless if the presentation system is being used or not. When no more audio is present for more than 10 seconds, the last audio source shall resume playing.
3. All inputs and outputs shall be monitored by RMS metering. Metering shall also be provided throughout the audio chain where appropriate.
4. All microphones shall be input to an Acoustic Echo Cancellation (AEC) input. Noise reduction shall be enabled for reduction of room background noise. Prior to being fed into an Automatic Mixer (AM) with direct outputs, each microphone channel shall also have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.
5. Program audio: Prior to being fed into a matrix mixer, each program channel shall also have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.
6. For all audio outputs there shall be 5-band parametric equalization and 12dB of gain control (+6dB to -6dB).
7. All inputs/outputs shall be connected to a matrix mixer, which will allow for flexibility in routing, gain adjustment and presets.
8. Soft videoconference out, shall be a compressed stereo signal mix of all program audio sources with a mix of all microphone inputs at 50% level to each channel (left and right)

2.9 GRAND JURY ROOM SYSTEM

A. General: The AVS Installer shall provide a complete and operable system with the minimum functional requirements noted herein.

B. Input sources: The AVS described for this room shall have multiple audio and video sources. Audio and video sources can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all source equipment except when noted in the design documents as provided by Owner or under a different division. Refer to design drawings to determine what and how many signal types will be used for each source. The AVS for this room shall have the following audio and video input sources:

1. Microphones as shown in design drawings.
2. One (1) wireless presentation system

C. Output devices: The AVS described for this room shall have multiple audio and video output devices. Audio and video output devices can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all output devices except when noted in the design documents as provided by Owner or under a separate

division. Refer to design drawings to determine what and how many signal types will be used for each output device. The AVS for this room shall have the following audio video output devices:

1. One (1) Flat panel display type D
2. Program speakers as indicated in design drawings.
3. A soundbar with built in camera and microphones.

D. Controllable devices: The AVS described for this room shall have a microprocessor based controller as indicated in the design drawings. This controller shall be capable of managing all input sources, output devices and other devices part of the AVS. Refer to design drawings to determine what and how many signal types will be used for each controllable device. The following is a list of other controllable devices to be provided by this room.

1. One (1) DSP audio processor.

E. User Interfaces: The Owner shall be able to operate and receive system status information from the AV system through the following user interfaces:

1. One (1) wall mounted touch screens

F. User control: The Owner shall be able to use the above mentioned user interfaces to operate the AV system. All user interfaces shall be able to perform all tasks unless otherwise noted in the design drawings or this specification. The Owner shall be able to perform the following tasks and get the following status indication from the user interfaces:

1. System On-Off with status indication
2. Individual display device on/off control and video mute.
3. Select and route any audio and video source to any of the available audio and video output devices. Each output device shall provide indication in the user interface of the current source selected for that output.
4. Selected audio output device(s) volume control. Volume level should always be set to an acceptable user level during power up. Status indication of volume level shall be provided for each controllable output device.
5. Selected audio output device(s) volume mute. Mute status indication shall be provided at user interfaces.
6. Soft videoconference controls shall include selecting all sources for a soft conference and selecting the microphones that will be used on the conference based on the combine mode selected. All soft codecs will use the wireless presentation system to start the conference.

G. DSP Features: The AVS shall program the DSP audio processor to provide at least the following features, additional to the functionality described above:

1. All inputs and outputs shall be labeled at the physical input/output and by text blocks within the software.
2. All inputs and outputs shall be monitored by RMS metering. Metering shall also be provided throughout the audio chain where appropriate.
3. All microphones shall be input to an Acoustic Echo Cancellation (AEC) input. Noise reduction shall be enabled for reduction of room background noise. Prior to being fed into an Automatic Mixer (AM) with direct outputs, each microphone channel shall also

have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.

4. Program audio: Prior to being fed into a matrix mixer, each program channel shall also have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.
5. For all audio outputs there shall be 5-band parametric equalization and 12dB of gain control (+6dB to -6dB).
6. All inputs/outputs shall be connected to a matrix mixer, which will allow for flexibility in routing, gain adjustment and presets.
7. Soft videoconference out, shall be a compressed stereo signal mix of all program audio sources with a mix of all microphone inputs at 50% level to each channel (left and right)

2.10 STANDARD AND LARGE COURTROOM SYSTEM

A. General: The AVS Installer shall provide a complete and operable system with the minimum functional requirements noted herein.

B. Input sources: The AVS described for this room shall have multiple audio and video sources. Audio and video sources can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all source equipment except when noted in the design documents as provided by Owner or under a different division. Refer to design drawings to determine what and how many signal types will be used for each source. The AVS for this room shall have the following audio and video input sources:

1. Microphones and headsets as shown in design drawings.
2. Three (3) Broadcast quality cameras
3. One (1) Wireless presentation system
4. One video feed from the broadcast system (only in courtrooms 13203 & 13204)
5. Audio streams from remote interpreter

C. Output devices: The AVS described for this room shall have multiple audio and video output devices. Audio and video output devices can be provided by a device part of the AVS or by owner provided equipment through an interface plate. The AVS Installer shall provide all output devices except when noted in the design documents as provided by Owner or under a separate division. Refer to design drawings to determine what and how many signal types will be used for each output device. The AVS for this room shall have the following audio video output devices:

1. One (1) Projector (O.F.E.)
2. One (1) Flat panel display type D
3. Program and sound re-enforcement speakers as indicated in design drawings.
4. Infrared audio transmission system.
5. One (1) wireless presentation system
6. One (1) video streamer
7. One (1) audio streamer
8. Five (5) Audio streams to court recording system.
9. Four (4) Audio streams to the Broadcast system

D. Controllable devices: The AVS described for this room shall have a microprocessor based controller as indicated in the design drawings. This controller shall be capable of managing all

input sources, output devices and other devices part of the AVS. Refer to design drawings to determine what and how many signal types will be used for each controllable device. The following is a list of other controllable devices to be provided by this room.

1. One (1) DSP audio processor.
2. One (1) SDI switch (shared between courtrooms in the same telecom room)
3. One (1) SDI Multiview

E. User Interfaces: The Owner shall be able to operate and receive system status information from the AV system through the following user interfaces:

1. Two (2) desk mounted touch screen
2. Virtual touch panel (XPanels)
3. Computer based user interface.
4. Remote Asset management software

F. General room features:

1. Shared cameras. The broadcast quality cameras in the room shall be used by multiple systems as follows:

    a. They can be used by the courtroom AV system for video streaming by using a Multiview processor and a video streamer.
    b. They can be used by the wireless presentation system during soft videoconference as the image device for the soft-conference user.
    c. They can be used by the broadcast system through an NDI stream.
    d. Cameras shall be PTZ controllable through the room control system but also from the broadcast system. The room control system shall always have priority.

2. Evidence presentation. Evidence presentation shall happen through the wireless presentation system using the projector provided by owner. It is the intention of the courts to use the flat panel display mostly for remote testimony.
3. Kill button. The user interface shall have a kill button capable of shutting down evidence presentation that has not been authorized by the courts. By pressing this button, audio and video presentation in the projector or flat panel display shall stop.
4. Remote witness/expert audio only. It shall be possible to provide and receive audio from a remote user by means of a phone line.
5. Remote witness/expert through soft conference. It shall be possible to use soft videoconference (Zoom) from remote users to listen and viewing the courtroom. The wireless presentation system shall be used to establish the soft conference call. Camera video to the wireless presentation system shall be an automatic switch feature controlled by the room audio.
6. Court reporting. Court reporting (stenographer) could happen locally at the courtroom or from a remote location. The remote court reporters will be located in the same building but in a centralized location. The AVS shall allow the remote court reporter to see and control the PTZ cameras in the courtroom as well as listening to the court proceedings. The video signal to the remote reporter shall be an MPEG4 stream coming from the video streamer. Camera control shall happen through the XPanel interface loaded in the reporter’s PC. Audio for the reporter shall come from the playback feature of the court reporting system, not live audio from the courtroom. Each remote court reporter shall be

able to monitor up to 3 courtrooms simultaneously. There shall be no pre-assigned courtrooms to a court reporter. There shall be no restriction son which courtrooms can be monitored by the reporter.

7. Remote interpretation. Remote interpretation (translation to and from a foreign language) shall be possible from a location within the building or outside the building through proper VPN access. The remote interpreter shall be capable of receiving real time audio streams from the courtroom and shall be able to send real time audio to the courtroom. It shall be possible for the interpreter to view the activity of the courtroom by means of an MPEG4 stream coming from the video streamer. Camera control shall happen through the XPanel interface loaded in the interpreter's PC. When the interpreter is translating from foreign language to English, the audio shall be played on the courtroom speakers. When the interpreter is translating from English to foreign language, the audio shall be routed to the second channel of assisted listening. The user that requires the interpretation in the courtroom shall use a headset (infrared) to get the audio from the remote interpreter. The remote interpreter will need to switch the direction of the audio depending on the translation mode. For controlling the routing of the audio, the remote interpreter shall use a button in the XPanel interface loaded on his/her PC. All translated audio to English shall be recorded.
8. Remote private interpretation. Remote private interpretation (translation to and from a foreign language) shall be possible from a location within the building or outside the building through proper VPN access. This case of translation is particular for attorney-client conversations. The remote interpreter shall be capable of receiving real time audio streams from the courtroom and shall be able to send real time audio to the courtroom. It shall be possible for the interpreter to view the activity of the courtroom by means of an MPEG4 stream coming from the video streamer. Camera control shall happen through the XPanel interface loaded in the interpreter's PC. For this type of translation the attorney and the client will use a hard wired headset that has a built in microphone. All audio from the headset microphones shall go to the interpreter only. All audio from the interpreter shall go to the headsets only. The remote interpreter will need to switch the direction of the audio depending on the translation mode. For controlling the routing of the audio, the remote interpreter shall use a button in the XPanel interface loaded on his/her PC. All audio part of this operating mode shall not be recorded.
9. Assisted listening. There shall be two ways of getting assistance listening. Persons requiring assisted listening can use the infrared headset provided by the courts or they can use their own smart phone with an APP and their own head phones, using the public Wi-Fi and the audio streamer to get this audio. In either case, there shall be always 2 channels of assisted listening per courtroom. The first channel is the English language channel, the second channel is the foreign language channel.

G. User control: The Owner shall be able to use the above mentioned user interfaces to operate the AV system. All user interfaces shall be able to perform all tasks unless otherwise noted in the design drawings or this specification. The Owner shall be able to perform the following tasks and get the following status indication from the user interfaces:

TOUCHSCREENS

1. System On-Off with status indication
2. Overflow mode (yes/no). With this button the user shall be able to set the courtroom for overflow mode (only in courtrooms 13203 & 13204). On this mode, the audio from the

incoming video feed shall be pushed to all the speakers in the room. In overflow mode the only other available command shall be volume control.

3. Individual display device on/off control and video mute.
4. Kill switch, as describe dint he previous section.
5. Select and route any audio and video source to any of the available audio and video output devices. Each output device shall provide indication in the user interface of the current source selected for that output.
6. Selected audio output device(s) volume control. Volume level should always be set to an acceptable user level during power up. Status indication of volume level shall be provided for each controllable output device.
7. Control room audio page. On this page the user shall be able to select what mix of audio, from all available audio sources, will be going to each of the 2 channels of audio going to the control room.
8. Remote interpreter assignment. Since there are two possible simultaneous interpreters working at any given time, there shall be a page to assign those interpreters to each of the attorney tables in the room or the witness translation channel (2nd channel of assisted listening). Two interpretation channels to 5 possible destinations.
9. Selected audio output device(s) volume mute. Mute status indication shall be provided at user interfaces.
10. Control all PTZ cameras in room. At least five (5) presets shall be recorded for each camera. The user interface shall allow the recording of the presets through a password protected page.
11. Window selection for the multiviewer. This page shall allow the user to select the configuration of the multiviwer and what cameras are to be included in the Multiview image. All cameras shall hav titles indicating the courtroom number where the camera is located and the view.
12. Microphone mute page. There should be a page, where microphone mutes are possible, but with names that represent the activities happening in the courtroom as follows:

    a. Gallery. Toggle switch with feedback to mute/unmute all microphones in the gallery.
    b. Jury. Toggle switch with feedback to mute/unmute all microphones in jury box.
    c. Side bar. On this mode, all microphones shall be muted as well with the exception of the side bar microphone. Speakers shall play white noise above the jury box on this mode, and the sound of the side bar microphone shall never be played in the speakers.

13. Soft videoconference controls shall include selecting all sources for a soft conference and selecting the microphones that will be used on the conference. The soft codecs will use the wireless presentation system to start the conference.
14. Voice conference control shall include dialing keypad, hang up and off hook buttons and indicators, five (5) number memory buttons, microphone mute and user recording of memory buttons.

XPANEL INTERFACE

1. This interface shall allow only for PTZ camera preset recall.
2. Audio routing control for the interpreter to route audio to the proper destination depending on the translation mode. This interface is composed of 2 buttons that can never be active or inactive at the same time. The buttons are:

a. "To attorney/speaker" shall be used to route the audio to the attorney headset or to the speakers. This is English language only. This shall be the default start up mode.
b. "To client/headset" shall be used to route the audio to the client headset or to the 2nd channel of assisted listening. This is the foreign language only

3. This interface does not have the ability to select which channel of interpretation is being used to what device. That option shall only be available at the touchscreen in the room.

H. DSP Features: The AVS shall program the DSP audio processor to provide at least the following features, additional to the functionality described above:

1. All inputs and outputs shall be labeled at the physical input/output and by text blocks within the software.
2. All inputs and outputs shall be monitored by RMS metering. Metering shall also be provided throughout the audio chain where appropriate.
3. Microphones shall be input to an Acoustic Echo Cancellation (AEC) input. Noise reduction shall be enabled for reduction of room background noise. Prior to being fed into an Automatic Mixer (AM) with direct outputs, each microphone channel shall also have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.
4. Program audio: Prior to being fed into a matrix mixer, each program channel shall also have an adjustable HPF (High Pass Filter), compressor/limiter and a 3-band parametric equalizer in its path.
5. For all audio outputs there shall be 5-band parametric equalization and 12dB of gain control (+6dB to -6dB).
6. All inputs/outputs shall be connected to a matrix mixer, which will allow for flexibility in routing, gain adjustment and presets.
7. Audio test signal generators (tone, pink noise, white noise) shall be input to the matrix mixer as well.
8. The AVS Installer shall create user monitoring and control interfaces utilizing Biamp Canvas software. Canvas software and interface shall be demonstrated to the owner, developed and presented to the owner and after approval be provided, loaded and tested on an owner furnished computer.
9. Audio mix: When program audio is used in the system, sound reinforcement speakers shall play a mixed (left and right) audio from program material at 50% of the level of the program material sent to the program speakers. Volume control adjustments including volume mute shall affect equally the program speakers and the sound reinforcement speakers when program audio is used in the system.
10. The first channel of assisted listening output shall be a mono signal compressed a mix of all microphones in the system plus a mix of all program audio, left and right summed
11. Audio to far sides, including soft codec videoconference out, phone interface, remote interpreter, or remote reporter shall be a compressed stereo signal mix of all program audio sources with a mix of all active microphone inputs at 50% level to each channel (left and right).
12. Audio channels to and from the control room. These outputs shall be part of a mixer that includes all the different audio channels. Inputs from the control room shall be used as additional program audio.
13. Auto-switching. The DSP shall provide a signal to the room control system to automatically switch the camera going to the wireless presentation system for soft videoconference. The intention is to switch the camera view depending on who is talking.

This feature shall only involve two out of the 3 cameras. When the strongest voice signal is coming from the bench (Witness, Clerk or Judge) the DSP shall trigger output 1 in the system to let the control system know the selected camera shall be the camera viewing the bench. No preset change shall happen. When the strongest voice is coming from any of the attorney tables or the podiums, the DSP shall trigger output 2 to indicate to the control system to switch to the camera viewing the well. No preset change shall happen either. This feature shall have a delay and timed, so if there is a very small transient of audio, it does not switch cameras automatically very fast.

14. Court recording. The five (5) channel of audio streams going to the court recorder shall be as following:

    a. Channel one: Judge's microphone mixed with side bar microphone.
    b. Channel two: Witness microphone and jury microphone (when present in courtroom).
    c. Channel three: Attorney table microphones.
    d. Channel four: A mix of all other remaining microphones including program audio.
    e. Channel 5: Interpretation channels (all channels mixed, except when on private interpretation mode)

15. Site files. Each courtroom shall be a separate site DSP file to avoid a failure in the system that causes multiple courtrooms be down.

2.11 SPECIAL PROCEEDINGS COURTROOM

A. The functionality of the special proceedings courtroom is the same as the Standard and Large Courtroom system with the following differences:

1. This courtroom has one extra broadcast camera, but this camera shall not be part of the soft video conference system, but should be part of the multiviewer.
2. This courtroom will never have an OFE projector, this room will have a second flat panel display type D. For this room one flat panel display shall always be used identically to the other courtrooms. The second display will be used as the projector. Different from the Standard and Large Courtroom system where there is no control of the projector, in this room there shall be control of the flat panel displays (on/off, input source selection, etc.).
3. This room has 8 attorney tables so there are more options for interpreters.
4. This room shall have the ability to have up to 4 interpreters at any given time.
5. This room shall have up to 4 audio channels to and from the control room.

2.12 THE BROADCAST SYSTEM

A. The broadcast system has two different subsystems as follows:

1. It is a system designed to create a high quality audio and video from a courtroom to be recorded or to be sent by streaming or other courtrooms. It is based on a live production setup.
2. It is also being used as a very large audio router to route audio between the courtrooms and the interpreter’s suite as well as the AV control room.

B. Live production. Here are the required functions for the live production component:

1. This subsystem shall have the ability to connect to any of the courtrooms in the building for audio and video, but it is understood, the operator will only be able to control and produce and event in only one courtroom at the time. It is not expected for the operator of the control room to do a live production in multiple courtrooms at the same time. Nevertheless, there should not be any restriction on which courtroom the operator can do a production.
2. This system has no separate control system for this room. The operator shall use the interfaces provided by the equipment to control the different devices in the system. To control the audio routing of the system, the operator is expected to use an instance Biamp Canvas controlling the DSP system part of this system.
3. This system is not expected to be used without and operator at the controls, and might not be used at all unless there is the interest of the Courts to do a production of a particular court case.

C. Audio router. Here are the required functionality for the audio router subsystem:

1. All Dante audio traffic coming from the courtrooms and interpreter's suite shall be converted to AVB traffic to be put together in a very large DSP mixer. This mixer will control what channels go to what direction.
2. This DSP system is broken into two DSP processors but they should be treated as a single site file to provide unified control.
3. The control interface shall be an instance of Biamp Canvas that has the names of all the courtrooms and interpreter location clearly label to assist the operator in the process of assigning the audio stream by presets, so the operator does not have to start selecting channel by channel what has to go to each location. Also to avoid selecting more than one courtroom to a particular interpreter. A multi-page (nested pages) interface shall be created in Canvas to list of presets, grouped by Courtroom Floor number and then by courtroom number.
4. For all audio going between the interpreter's suite and the courtrooms, it is not intended for this DSP system to do any type of processing besides routing. There shall be no additional filters added to this DSP such as gain adjustment, EQ filters, etc. All signal adjustment shall be done at the Courtroom DSP.
5. For all audio going between the courtrooms and the control room, there shall be DSP processing allowed such as gain control and 5 band EQ with RMS meters for the signal going to the
6. The DSP system shall be capable of sending audio from the control room (program and microphone) to the courtroom, to assist with the audio set up installation before the court proceedings take place. Once court is in session, the audio stream coming from the control room shall be muted.
7. The DSP system shall have a smaller mixer filter for the audio coming to the control room, including the following sources:

    a. The audio stream from the courtroom.
    b. The line level stereo line from an O.F.E. PC or a mixer board if the owner desires to add one.

2.13 WIRE, CABLE, CONNECTORS, AND ACCESSORIES

A. General: The AVS Installer shall provide the system components and materials necessary to properly install, support, and terminate all audiovisual cabling, in accordance with the related documents identified in Part 1.1 of this specification. Where the Project Electrical Installer has provided a raceway designated for use by this system, the AVS Installer shall coordinate and install all required cables into the provided raceway. The AVS Installer shall also provide and attach all required cable connectors.

B. Cable: The AVS Installer shall provide all cabling associated with, and required to, provide a complete, operable system in accordance with the Contract Documents. All cable provided by the AVS Installer shall be of a manufacture and quality consistent with the design intent, and shall be reviewed by the Engineer prior to installation.

C. Cabling in air handling spaces. The AVS Installer is responsible for determining the rating of the cables to be used for the AVS, as per current version of the National Electrical Code. If, at the bidding point the AVS Installer is not certain about the type of cables to be used in the project, the AVS Installer shall assume that all cables need to be plenum rated cables.

D. Cabling below grade: When cable part of the AVS have to be run in conduits below slab and grade level, the AVS Installer shall use only cables with water-blocking jackets.

E. Cable signals: The following is a list of signal types and the cables to be used for those signals:

1. Line level audio signal cable: Provide one (1) twisted pair cable for mono signals and two (2) twisted pair cables for stereo signals. Twisted pair cables to be 22 AWG stranded (7X30) tinned copper conductors with overall foil shield (100% coverage), with 22 AWG stranded tinned copper drain wire.
2. Microphone level audio signal cable: Provide one (1) twisted pair cable, 20 AWG stranded (7X28) tinned copper conductors, overall foil shield (100% coverage) with a 20 AWG stranded tinned copper drain wire.
3. Proprietary Control cable (i.e. AX link® Signal): Provide one (1) cable with 1 twisted pair 22 AWG stranded bare copper conductors with overall aluminum/polyester foil (100% coverage) and a 24 AWG tinned copper drain wire, and one (1) unshielded twisted pair, 18 AWG stranded bare copper conductors.
4. Control cable (i.e. RS-232, RS-485 Signal): Provide one (1) cable with 1 or 2 twisted pair 22 AWG stranded bare copper conductors with overall aluminum/polyester foil (100% coverage) and a 24 AWG tinned copper drain wire. Pair count depends on manufacturer's specifications.
5. Digital video, audio and control over twisted pair. Provide one, two or more cables UTP or STP as required by transceiver equipment manufacturer to ensure the digital signal is transported properly up to 328 ft, at maximum resolution indicated in part 2.01 of this specification. If equipment manufacturer supports the use of standard UTP Category (5e, 6 or 6A) for this application, the AVS installers shall provide cables in compliance with specification section 271000 and all cables part of the AVS shall be included in the same warranty as all cables provided under specification section 271000. If equipment manufacturer requires the use of proprietary cables, only these cables shall be used in the project.
6. UTP Category cables. Provide UTP category cables for all Ethernet connection part of the AVS as indicated in design drawings, including horizontal cables, patch cords and

station cables. All cables part of the AVS shall have all specifications and shall be included in the same warranty as all cables provided under specification section 27100.

7. Speaker Cable: Provide two (2) unshielded bare high conductivity ETP copper 16 AWG stranded conductors, with overall jacket.
8. IR control signal cable. Provide one (1) pair, unshielded twisted pair cable with 22 AWG solid copper conductors.
9. Contact closure signal cable. Provide one (1) or more unshielded twisted pair cable with 22 AWG solid conductors. Quantity of pairs as required by the application.
10. HDMI Cables. All HDMI cables longer than 10 meters (32.8 ft.) must include an adaptive cable equalizer capable of providing not less than +40 dB of cable compensation @ 825 MHz. Such device must be capable of operating automatically without the need for human intervention and must include an external AC to DC power converter that can accept 100-240VAC @ 50/60 Hz. Furthermore, such device must also include I2C correction circuitry to mitigate the effects of long cable runs on the DDC clock and DDC data signals. HDMI cables shall have the following requirements:

    a. Support HDMI v2.1 with resolutions up to 8K60 and 4K120 with 12-bit color depth
    b. Support HDMI v2.1 Category 2 data rates (3.4 Gbit/sec.) lengths up to 7.5 meters
    c. Support HDMI v2.1 data rates up to 2.25 Gbit/sec. lengths up to 40 meters
    d. Support PC data rates up to 1.65 Gbit/sec. lengths up to 60 meters
    e. Supports PC resolutions up to 1600x1200 / 60 Hz and 1920x1200 / 60 Hz
    f. Made of AWG-22 gauge wires
    g. Triple shield for noise immunity
    h. Cable jacket shall have dual UL Ratings: UL13 (CL2) and UL758 (AWM20276) for non-plenum spaces. In plenum environments cables shall have a CL2P rating or CMP rating.
    i. RoHS compliant.
    j. Gold plated connectors

11. DVI Cables. All cables carrying DVI signals through conduit, floor slabs or longer than 10 ft. shall be HDMI cables as described in previous section with HDMI to DVI adapters in both ends.

F. Connectors and plates: The AVS installer shall provide connector and plates to terminate all wiring part of the AVS, regardless if shown or not in the design drawings. As a general guideline the AVS Installer shall follow these recommendations:

1. Only use crimp type BNC connectors on coaxial baseband video cables. Use crimp type F connectors on RF based coaxial cables. Use only connectors with the same impedance as the cable where they will be terminated.
2. When custom panels or plates are required in the project, the AVS Installer shall submit detail drawings of all plates for approval by the Design Engineer.
3. Whether shown in the design drawings or not all cables coming out of an outlet box into an equipment shall have a disconnect means at the outlet box with a face plate. Faceplates with grommets are not acceptable as pass-through connections to equipment.
4. All termination of UTP Category (5e, 6 or 6A) cables shall be done in accordance to specification section 271000.

2.14 DEDICATED COMPUTERS FOR AV SYSTEMS

A. General: The AVS Installer shall provide dedicated workstations for the AV systems as indicated in the design drawings. For workstations for Digital Court Reporting see specification section 274116. The specifications of those workstations are:

1. Intel processor (latest model) with no less than 2.8 MHz and 1000 MHz FSB.
2. Latest offering of Microsoft Operating system for professional environments.
3. Minimum of 8 GB of SDRAM
4. Minimum of 500 GB of SCSI hard drive 10,000 rpm.
5. Five (5) USB ports, including one USB type C
6. 512 MB video board with HDMI/DP output.
7. Line level audio output.
8. Keyboard and mouse: All workstation for AV systems shall include a keyboard and a mouse.
9. Rack mounted option or a shelf to mount the workstation. Workstation and shelf shall be no bigger than 2 RU.

B. Acceptable manufacturers for the computer system are: Dell.

2.15 PROJECTOR TYPE 1

A. General: The projector referenced in this specification section and in the design drawings as type 1 shall have the following specifications:

1. Projector native image format: 16:10.
2. Light source technology: Solid state only. Laser, LED/Laser,
3. Projector technology: DMD or 3-LCD,
4. Brightness: minimum 10.000 ANSI Lumens
5. Native resolution: 1920 X 1200
6. Lens: Motorized zoom and focus
7. Lens throw distance: as indicated in the drawings
8. Usable resolutions: The unit shall be capable of displaying all resolutions, from 480i to 1080P in all HDMI inputs
9. Video input ports: (1) HDMI HDCP compliant.
10. Control ports: RS-232 in a DB9 connector.
11. Warranty: 3 years, commercial grade unit. Consumer grade units with extended warranties not acceptable.

B. Accessories: This projector shall be supplied with a corresponding lens to achieve the throw distance indicated in the design drawings. Projector mounts shall be provided with all projector. Design selection for the projector mount is Chief Manufacturing Company recommended mount for the projector specified.

C. Accepted manufacturers:

1. Christie Digital,
2. Panasonic,
3. Sony
4. Projection Design,

5. Digital Projection,
6. Epson,
7. Optoma.

2.16 FLAT PANEL DISPLAY TYPE D

A. General: The flat panel display referenced in this specification section and in the design drawings as type D shall have the following specifications:

1. Flat panel display format: 16:9.
2. Flat panel technology: LED
3. LCD backlight technology: Edge LED BLU
4. Screen size diagonal: As indicated in design drawings ± 1 inch.
5. Bezel: Bezel around screen shall be no bigger than 0.75”
6. Brightness (cd/m2): 500
7. Native resolution: 3840 X 2160
8. Speakers included: Yes
9. Video input ports: (2) HDMI HDCO compliant.
10. Control ports: RS-232 in a DB9 connector.
11. Warranty: 3 years, commercial grade unit. Consumer grade units with extended warranties not acceptable

B. Accepted manufacturers:

1. Mitsubishi,
2. LG Electronics,
3. Panasonic,
4. NEC,
5. Samsung,
6. Sharp,
7. Sony.

2.17 FLAT PANEL DISPLAY MOUNT:

A. All flat panel displays, regardless of the type, shall be provided with a flat panel display mount.

B. Tilting wall mounts (TWM) Landscape. All tilting wall mounts for landscape operation shall have the following specifications:

1. VESA pattern: Universal
2. Display orientation: landscape
3. Mount shall not have any supports on the horizontal midline of the display, because it will conflict with the outlet for the mount.
4. Post installation lateral shift: required.
5. Lateral tilt: not required.
6. The mount shall have accessories to mount cameras, speakers (sound bar or side to side). These accessories shall be used when the design drawings indicate those devices to be mounted next to the display.

7. Weight and size capacity: The AVS installer shall select the specific model for the weight and size limits of the flat panel display selected.

C. Tilting wall mounts (TWM) Portrait. All tilting wall mounts for portrait operation shall have the following specifications:

1. VESA pattern: Universal
2. Display orientation: portrait
3. Mount shall not have any supports on the horizontal midline of the display, because it will conflict with the outlet for the mount.
4. Post installation lateral shift: required.
5. Lateral tilt: not required.
6. The mount shall have accessories to mount cameras, speakers (sound bar or side to side). These accessories shall be used when the design drawings indicate those devices to be mounted next to the display.
7. Weight and size capacity: The AVS installer shall select the specific model for the weight and size limits of the flat panel display selected.

D. Articulating wall mounts (AWM): all articulating wall mounts shall have the following specifications:

1. VESA pattern: Universal
2. Display orientation: landscape
3. Maximum extension: The articulating wall mount shall allow a maximum extension from the wall of: 25 inches
4. Post installation lateral shift: required.
5. The mount shall have accessories to mount cameras, speakers (sound bar or side to side). These accessories shall be used when the design drawings indicate those devices to be mounted next to the display.
6. Weight and size capacity: The AVS installer shall select the specific model for the weight and size limits of the flat panel display selected.

E. Suspended ceiling mounts (SCM): all suspended ceiling mounts wall mounts shall have the following specifications:

1. VESA pattern: Universal
2. Display orientation: landscape
3. Ceiling support: the mount shall have a connection for a 1.5” NPT threated pipe suspended from the ceiling.
4. Display quantity: single sided mount
5. Post installation vertical tilt adjustment: required.
6. The mount shall allow for rotation after installation.
7. The mount shall have accessories to mount cameras, speakers (sound bar or side to side). These accessories shall be used when the design drawings indicate those devices to be mounted next to the display.
8. All ceiling mounts shall be provided with a ceiling plate that allows anchoring to structure and suspension of the 1.5” pipe.
9. Weight and size capacity: The AVS installer shall select the specific model for the weight and size limits of the flat panel display selected.

F. All flat panel display mounts shall be UL listed.

G. Approved manufacturers: Legrand (Chief Manufacturing), Peerless AV, Premier Mounts.

2.18 ELECTRIC SCREENS

A. General: The Electric screen referenced in this specification section and in the design drawings shall have the following specifications:

1. Screen format: 16:10.
2. Screen dimensions: As shown in the design drawings ± 3 inches
3. Screen projection type: Front projection
4. Screen case mounting: in-ceiling
5. Tensioned screen: Yes
6. Screen gain: 1
7. Viewing angle: 45°
8. Screen fabric: seamless, flame retardant, mildew resistant vinyl.
9. Motor: oil free, quick reversal, with adjustable limit switches.

B. Accepted manufacturers:

1. Da-Lite,
2. Draper,
3. Stewart.

2.19 FLIP TOP DEVICES

A. Flip top device shall be combination power/low voltage connection devices to be installed on tables. There are 2 types of flip top devices specified for this project.

B. Flip top devices type 1. These devices are to be used only at the attorney tables in all courtrooms. The configuration of the devices shall have the following configuration:

1. Two NEMA 15R receptacles with 2 USB type A chargers.
2. Two 3.5 mm stereo mini jack top solder tap for the remote interpretation headsets.
3. Two RJ-45 female to punch down for CAT6 – Ortronics.

C. The flip top device type 1 design selection is:

1. Extron cable Cubby 1202 black (70-1184-02)
2. Extron AC+USB 224 US module (60-1697-01)
3. Extron single space AAP, two 3.5 mm (70-098-11) with custom engraving on each connector (“MIC” and “HEADSET”)
4. Extron single space AAP, with 2 RJ-45 punch down jacks (70-491-14)
5. Extron single space AAP blank panel (70-090-11)

D. Flip top devices type 2. These devices are to be used only at tables inside conference rooms. The configuration of the devices shall have the following configuration:

1. Two NEMA 15R receptacles with 2 USB type A chargers.
2. Two additional USB type A chargers.
3. Two RJ-45 female to punch down for CAT6 – Ortronics.
4. One HDMI connector
5. One USB type A connector.

E. The flip top device type 2 design selection is:

1. Extron cable Cubby 700 black (70-1046-02)
2. Extron AC+USB 224 US module (60-1697-01)
3. Extron USB power plate (60-1356-02)
4. Extron single space AAP,USB A to USB 8 pigtail (70-1249-02)
5. Extron single space AAP, with 2 RJ-45 punch down jacks (70-491-14)
6. Extron single space AAP, with HDMI connector (70-616-12)

2.20 HDBASE-T TRANSMISSION SYSTEM

A. The HDBase-T transmission system for the project shall have the following specifications:

1. The unit shall be composed of a transmitter and receiver capable of sending a 4K video signal at distances of no less than 200 ft. over a single 4-pair UTP Category 6 cable.
2. The transmission system shall be capable of transporting the following singals:

    a. Video, up to 4K
    b. Stereo Audio signals
    c. USB 2.0 passing connections
    d. RS-232 and CEC passing

3. The receiver system shall be in the form factor of a plate, so it can be mounted inside a 4”X4; electrical box with a single gang adapter.
4. The receiver shall be powered from the transmitter.

B. Acceptable manufacturer: Atlona, Crestron, AMX,

2.21 NETWORKING EQUIPMENT

A. General: All networking equipment required for the AVS shall be provided by the owner unless otherwise note in the design documents.

2.22 CABLE BOX (CABLE RECEIVER)

A. General: Cable boxes also referenced as cable receivers will be owner provided

2.23 IDENTIFICATION AND LABELING TAGS

A. The AVS installer shall follow labeling materials indicated in specification section 270010.

PART 3 - EXECUTION

3.1 INSTALLATION PRACTICES

A. General: The AVS installer shall follow all installation practices indicated in specification section 270010.

B. Workmanship: The AVS Installer shall adhere to, at a minimum, the following installation practices:

1. Securely mount equipment plumb and square in place. Where equipment is installed in cabinets, provide mounting bolts in all equipment rack fastening holes. All rack mount equipment shall be secured with Rackmount Solutions HTX™ security screws (STAR-TYPE or similar) provided with nylon washers between bolt heads and equipment.
2. Where equipment (such as VHS players, monitors, DA's etc… and other system devices) is packaged by the manufacturer without rack mount ears or braces, as part of a regular manufacture process, the Installer shall provide all required, accessory ears, brackets, and shelves, which are necessary to properly mount the equipment within the designated cabinets and rack locations.
3. Provide appropriate ventilation panels, vents, and/or fans to assure sufficient ventilation for adequate cooling of all equipment.
4. Confirm the polarity and phasing of system components before installation. Connect to maintain uniform polarity and phasing.
5. Insulate all non-insulated, stranded conductors before making termination when connecting to equipment terminals.
6. "Wire", "wing" and "twist" NUT type connections are not permissible for any type of signal connection.
7. All wiring is to be free from grounds loops, shorts, opens, and reversals.
8. Neatly tie all cabling within equipment cabinets, housings, and terminal cabinets with nylon cable ties at not more than 12" intervals for cables different from 4-pair CAT cables. Use Velcro straps to tying all 4-pair CAT cables. Install in accordance with the latest EIA installation standards. Engineer approved wiring trough may be used in lieu of tie-wraps. Cable routing shall not braid or cross with other wires in parallel more than once.
9. Secure all cables in equipment cabinets and terminal cabinets to provide strain relief at all raceway exits in accordance with NFPA 70 including all supplements. All plugs and receptacles are to be the grounding type.
10. Connect all equipment power to surge/noise suppression outlet strips or associated power conditioning devices.
11. Where system cables are extended through an exposed umbilical connection, the Installer shall harness all associated cable within a common, manufactured, flexible, sheath (ex. Snakeskin™).
12. All racks and cabinets shall be bonded to a grounding system as required by NEC.

C. Raceways. All raceways for audio/visual devices shall have the following specifications:

1. Refer to specification section 270528 for all raceways specification.
2. All cables for speaker level signals, regardless of their level shall be run in separate raceways from other low voltage cables.

3. All cables for microphone level signals, regardless of their level shall be run in separate raceways from other low voltage cables.
4. Raceways for AV outlets: Outlets for AV cables shall be composed of electrical boxes (sized for the amount of connectors) and a conduit(s) to the nearest accessible ceiling space. All AV outlet boxes shall be at least 2.5" deep.
5. All indoor rated cables can be supported with j-hooks or cable hangers above accessible ceiling spaces. J-hooks shall be spaced no longer than 4. Ft.

D. Labeling System. The labeling system for all cables shall be a system that allows for unique identifiers for each cable. Each cable has to have an indicator from where it is coming from and an indicator to where it is going to.

E. Engraving: All push buttons interfaces and connection faceplates part of the AVS shall be engraved with descriptive wording of the use of the button/plate. The AVS Installer shall submit and receive approval for the proposed wording in each button/plate before doing the engraving. Failure to follow this step might cause the AVS installer to replace the buttons in interfaces and/or plates where the Owner is not satisfied with the wording of the label at no additional cost to the Owner. The color of the wording in the engraving shall have high contrast with the background color of the button.

F. Installation of Screens: Whether shown in the drawings or not the AVS installer shall install all projection screens following the following installation practices:

1. All electric screens shall be provided with a low voltage controller to be mounted inside the screen housing.
2. All electric screens shall be provided with a control wall plate mounted at 48" A.F.F.
3. All in-ceiling screens shall be leveled with the ceiling grid.
4. All in-ceiling screens housing shall be plenum rated when installed in plenum spaces.
5. All in-ceiling screens installed in hard ceilings shall include an access panel no smaller than 16"X16" to access the electrical junction box of the screen. Access panel shall be a metal panel, with a hinged door and painted the same color as the finished ceiling.

G. Projector Installation: The Installer shall adhere to, at a minimum, the following installation practices for projectors:

1. Projector shall be provided with corresponding mounting brackets depending on the projector selected.
2. All anchors and supports whether pre-fabricated or customs, required to mount the projector where indicated in the design drawings are in the scope of work of the AVS Installer
3. When electronics are provided next to the projector (receivers, controllers, etc.), provide an enclosure to mount all electronics suitable for the space above the ceiling (plenum, nor plenum)

H. Flat Panel Display Installation: The AVS Installer shall adhere to, at a minimum, the following installation practices for flat panel display devices

1. All anchors and supports whether pre-fabricated or customs, required to mount the displays where indicated in the design drawings are in the scope of work of the AVS installers.

2. All walls where flat panel displays will be installed shall be re-enforced with sheet metal behind the drywall. The extent of the re-enforcing shall be the contour of the flat panel display to be installed.
3. When flat panel displays are installed inside a wall niche, the AVS shall provide a wall mount with adjustable depth that allows the flat panel display to be installed flush with the exterior wall.
4. For flat panel displays mounted on structures, the installer shall provide anchoring as approved by structure manufacturer.
5. For flat panel displays suspended from the structure above, the installer of this system shall provide all custom brackets and pipes properly secured to the structure to mount the displays

I. Speaker Installation: The Installer shall adhere to, at a minimum, the following installation practices for speakers:

1. All ceiling mounted speaker shall have a support wire tie to the building structure. Ceiling speakers shall not be supported from the ceiling grid.
2. All ceiling mounted speakers shall be installed with a backbox to prevent sound from dispersing into the plenum space and causing noise issues in adjacent rooms.
3. When ceiling speakers are mounted in fire rated partitions, the speakers shall have UL listed speaker back boxes with a fire rating no less than the rating of the partition.
4. All in-wall speakers shall be installed with pre-construction brackets.

J. Millwork Openings: When AV equipment like flip tops and plates will be mounted in millwork provided by the owner or third parties, the AVS installers shall provide cut out dimensions for all the AVS equipment listing location in the millwork where the cuttings need to be done. It is the AVS installer's responsibility to install those devices in the millwork, once the openings have been done. All millwork opening shall be done by the AVS installer.

K. Floor Boxes. Floor boxes used for connection to teaching lecterns, podiums, conference tables, or mixing boards shall have at least the following minimum requirements:

1. Floor boxes shall be large enough to have at least 3 different compartments, one for power one for voice/data cables and one for AV.
2. Each low voltage compartment shall have a separate raceway back to the accessible ceiling space. If speaker wires are run from the lectern, the AV compartment shall have one 1" and one ¾" conduit to the nearest accessible ceiling space. If no speaker wires are run from the lectern, at least one 1" conduit from the AV compartment to the accessible ceiling shall be provided. Additional conduits might be required depending on the application.
3. There shall be no daisy-chaining of AV conduits between adjacent floor boxes. Floor boxes shall also allow to recess the connectors from the umbilical cord tied to the lectern.
4. Floor boxes shall have a recessed compartment to hold connectors. Floor boxes that leave AV connectors flushed with the floor are not desirable since they become tripping hazards and could be easy broken with the lectern when moved.
5. AV compartments shall have termination plates and connectors for all cables coming from the accessible ceiling space. Pass-through cables shall not be allowed in floor boxes. All connectors shall be properly secured to the plates in the floor box. All unused compartments shall have blank plates.

L. Structured Cabling Infrastructure: The AVS Installer shall adhere to specification section 271000 for all requirements of structured cabling components to be used as part f the AV system. The structured cabling components include but are not limited to:

1. All unshielded twisted pair Category cables and fiber optic cables
2. Termination devices like termination jacks, patch panels and faceplates.
3. All UTP and fiber optics patch cords.
4. All testing procedures for Category and fiber optic cables.

3.2 REQUEST OF IP ADDRESS

A. General: The AVS installer shall follow all requirements indicated in specification section 270010 for the request of IP addresses for devices part of the AVS.

3.3 SOFTWARE PROGRAMMING AND INSTALLER TESTING

A. The software programming and testing of the AVS system will be a multi-step process. The AVS Installer shall provision in the proposal for the time indicated in each of the steps:

B. Briefing Step: A maximum of 45 days after the AVS installer receives the NTP for this project, the AVS installer shall request one or more briefing sessions with the Owner and/or design engineer to go over the expectation of each room and clarify any points that might not be clear to the AVS Installer. Some important notes about this step are:

1. The AVS installer shall allocate at least 8 hours of meeting time
2. Travel time will not be counted as part of the meeting time.
3. The quantity of staff required to attend these meetings by the AVS Installer is sole decision of the AVS Installer.
4. Before the start of this step the AVS installer shall have software programming submittals approved as described in part 1 of this specification section.
5. The AVS Installer shall prepare meeting minutes of the key decisions made during these meetings. The approval of these meeting minutes by the Owner and Design Engineer will be accepted as approval notice of this step.

C. Shop Programming Step: Once the briefing step has been completed and approved, the AVS installer shall allocate off-site programming time to accomplish all the requirements listed in this specification and the clarifications done in the previous step. It is the sole responsibility of the AVS Installer to estimate how many man hours are required for this step. This step does not require approval by the Owner and/or design Engineer.

D. Field Verification Step: After all AVS equipment has been installed on site and the system has been programmed, the AVS Installer shall request one or more working sessions with the Owner and/or design engineer to verify in the field the functionality of the AVS system. Some important notes about this step are:

1. The AVS Installer shall allocate at least 10 hours of working sessions.
2. Travel time will not be counted as part of the working sessions.
3. The AVS installer shall have different AV media and sources to test all features in the AVS system.

4. The quantity of staff required to attend these meetings by the AVS Installer is sole decision of the AVS Installer.
5. Physical installation of all devices will be checked by the Owner and/or the Design Engineer. Any deviations in the installation of the equipment part of the AVS from this specifications and previous meetings will be noted by the Design Engineer in a "punch list". This punch list will be send to the AVS installer within the next 5 days of the meeting for immediate corrective action. One punch list will be prepared for each room with AVS.
6. The AVS Installer shall prepare meeting minutes of the key decisions made during these meetings that affect the programming sequence. The approval of these meeting minutes by the Owner and Design Engineer will be accepted as approval notice of this step.

E. Final Adjustment Step: Once the previous step has been approved, the AVS Installer shall allocate time to make any corrections to the AVS system on site based on the conclusions of the previous step. It is the sole responsibility of the AVS Installer to estimate how many man hours are required for this step. This step does not require approval by the Owner and/or design Engineer.

F. Data Wiring and Fiber Optic Testing: Testing of UTP data wiring, copper patch cords, fiber optic cables and fiber optic patch cords shall be done as indicated in specification section 271000. Testing results shall be submitted as indicated in the same specification section.

G. Signal Adjustment: The AVS Installer shall ensure that the following adjustments, tests and measurements, at a minimum, have been completed:

1. The system shall be measured and adjusted for optimum signal quality and minimum signal loss, to all audio and video signals, through the system channel, using appropriate test equipment and standardized testing procedures.
2. The system shall be measured and adjusted for optimum signal-to-noise ratio and maximum headroom in the system electronics.
3. The system shall be measured and adjusted to eliminate distortions or degradation of signal resulting from, but not limited to, clipping, hum, noise, and RFI interference.
4. The Installer shall check the quality of each signal, at its source, and compare it against the quality of the signal at various points of its transmission through the system. The Installer shall correct the system for any significant (the lesser of 2dB or the manufacturers throughput requirements) signal distortion or loss.

3.4 SYSTEM WARRANTY AND SERVICE

A. General: The AVS installer shall follow all warranty and service requirements indicated in specification section 270010.

3.5 ENGINEER'S FINAL ACCEPTANCE TEST

A. General: The AVS installer shall follow all test requirements indicated in specification section 270010

B. As part of the Engineer's final acceptance all sources, inputs, outputs and interfaces will be tested. Additional notes about the final acceptance test:

1. It is the sole responsibility of the AVS system installer to estimate the time allocated for this step. It is assume that at this point in time all the features of the AVS system are clear to the Owner and the AVS Installer so this step is just to make sure that all the features are working properly as agreed.
2. The AVS installer shall have different AV media and input signal generators to test all input plates and sources in the AVS system.
3. The quantity of staff required to attend these meetings by the AVS Installer is sole decision of the AVS Installer.
4. Failure to complete one or more of the previously issued punch list items or failure to correct any programming changes previously noted will revoke acceptance of the room or system being tested.
5. Final acceptance will be granted on a room by room basis.

3.6 TEST EQUIPMENT REQUIRED.

A. Test Equipment: The AVS Installer shall supply all testing instruments required for the equipment programming and system tests. The AVS Installer shall use test equipment meeting the minimum specifications, identified herein, to perform system calibrations and adjustments. The AVS Installer shall make available the same test equipment available, for inspection by the Engineer, during Final Acceptance step.

1. Direct reading Audio Impedance Meter.

    a. Minimum of three frequencies ranging from 250Hz to 4kHz.
    b. Range 1 ohm to 1M ohm.
    c. 10% accuracy.
    d. Direct reading of dBm across 600-ohm load.

2. Digital Multimeter.

    a. DC to 20kHz bandwidth.
    b. 300V range.
    c. 100mV resolution.
    d. 10M ohms input impedance.
    e. DC resistance to 0.1 ohms.

3. Dual trace oscilloscope.

    a. 450MHz minimum bandwidth.
    b. 1mV/cm sensitivity.
    c. Dual timebase capability.

4. Sine/Square Wave Generator.

    a. 5Hz to 5kHz bandwidth.
    b. Output level of 0dBm with less than 0.5%THD.

5. Sound Pressure Level Meter:

    a. Applicable Standards: IEC 61672-1, 60651 and 60804 Type 2, ANSI S1.4 Type 2

b. Accuracy: ±1.5dB (ref 94dB@1KHz)
c. Resolution: 0.1dB
d. Digital Display: 4 digital LCD
e. Measurement Parameters: SPL, SPL MIN/MAX, SEL, and Leq
f. Measurement Range: 30dB to 130dB
g. Linearity Range: 100dB
h. Measurement Frequency Range: 31.5Hz to 8KHz
i. Frequency Weighting: A and C
j. Response Impulse: Fast and Slow
k. Microphone: 1/2 " Electret condenser microphone
l. Sampling time: updated every 0.5s
m. Bargraph: 4dB steps, 100dB range, 125ms update

6. Digital Video Signal Test pattern generator with output for the following signal types:

a. Composite Video
b. Component Video
c. RGBHV video
d. HDMI video (1080p 24 fps)
e. SDI

3.7 TRAINING AND INSTRUCTION

A. General: The AVS installer shall follow all training requirements indicated in specification section 270010. The AVS Installer shall provide the owner with different types of training as described herein.

B. System Administration Training. The AVS installer shall provide system administration training at the job site as described below:

1. At least 8 hours of training shall be provided.
2. Travel time will not be counted as part of the training sessions.
3. Training will be broken down to a maximum of 2 sessions in different days.
4. The objective of the system administration training will be to properly operate, trouble shoot, calibration and perform specific field repairs to AVS equipment.
5. Field repair and calibration training will be limited to those repairs notes by the manufacturer of the equipment as field repairs done by non factory trained personnel.
6. Training shall be done at the job site with all the equipment operational after final acceptance.
7. Training will be limited to a maximum of 5 attendees per session.
8. Operation and Maintenance manuals shall be delivered at the beginning of this sessions.

C. User Training. The AVS installer shall provide system administration training at the Job site as described below:

1. At least 10 hours of training shall be provided.
2. Travel time will not be counted as part of the training sessions.
3. Training will be broken down to a maximum of 3 sessions in different days.
4. The objective of the user training will be to properly operate the AVS.
5. Training will be limited to a maximum of 20 attendees per session.

6. User short form guides shall be provided to all attendees of the sessions.
7. Short form guides shall provide the users with quick finding ways to operate the system. If AVS operation is different from one room to the other, one separate short form guide shall be provided for each room.

3.8 AS BUILT DOCUMENTS AND CLOSE OUT INFORMATION

A. General: The AVS installer shall follow all as built and close out information requirements indicated in specification section 270010.

B. The following information shall be included in the as built drawings:

1. Drawings indicating final floor plan locations of all AV devices
2. One line diagrams with all devices connected in the system.
3. Mounting details
4. Any signed and sealed structural calculations required for the AVS

C. Additional close out information to be delivered by the AVS installer:

1. All programming source code done by the AVS for this project for all pieces of equipment in digital format (no printed copies required).
2. List of all IP addresses assigned to each equipment part of the AVS.
3. Compiled executable files as requested for Computer based user interface.
4. All printed test results.

END OF SECTION 274100