

1.1 **THE BID REQUIREMENTS, CONTRACT REQUIREMENTS, SPECIFICATIONS,
SCHEDULES AND DRAWINGS FOR**

DeRoy Auditorium Renovations

are amended as follows:

SPECIFICATIONS

1.2 **REVISED SPECIFICATIONS**

- .1 The following revised specifications issued with this addendum supersede previously issued specifications of the same title and number

AUDIO VISUAL & TECHNOLOGY

.1 **27 41 16** Integrated Audio-Video Systems and Equipment

- .1 Article 2.2 paragraph I number 5 clarify part number of presentation switcher to remove "xi" from the name.
- .2 Article 2.2 paragraph Q number 3 shall read as, "The DSP shall be: Biamp TesiraFORTE DAN CI."
- .3 Article 2.2 paragraph N number 3 shall read, "Shure MXW1 or equivalent with lavalier and over the ear microphones."

.2 **27 41 19** Video Display Equipment

- .1 Article 2.4 paragraph B number 2 replace with the following, "Monitor shall be Wacom DTK-2451 (Addendum #1) Pro Interactive Pen Display or equivalent. Monitor shall include tilting desk mount."

DRAWINGS

1.3 **REVISED DRAWINGS**

- .1 The following Drawings are revised and re-issued with this addendum. Revisions are shown in bubbled areas on drawings. The following descriptions of revisions are for convenience only and do not define or limit the extent of actual revisions indicated on drawings:

ARCHITECTURAL

.1 **A01-01** CONTEXT MAP, DRAWING LIST, LIST OF ALTERNATES

- .1 ADDED: Sheet A70-02 Plan and Section Details on Drawing List - Architectural

.2 **AD10-01** BASEMENT DEMOLITION PLAN

- .1 ADDED: Note on existing convenience power outlets.
- .2 ADDED: Keynotes: Clarifications on demo items and patch/repair work.

- .3 ADDED: Keynote: Clarifications on temporary acoustic hoarding wall construction.
- .4 ADDED: Keynote: Clarifications on basement furring wall demolition.
- .5 ADDED: Keynote: Patch and repair work by main projection wall.
- .3 **AD10-02 FIRST FLOOR DEMOLITION PLAN**
 - .1 ADDED: Notes on existing convenience power outlets.
 - .2 ADDED: Notes for clarifications to coring sizes.
 - .3 ADDED: General Notes for clarifications to coring location proximity.
 - .4 REVISED: Keynote D58: Clarifications on main auditorium projection head wall demolition/investigation.
- .4 **AD10-03 BASEMENT CEILING DEMOLITION PLAN**
 - .1 REVISED: Extent of ceiling removal to include ceiling mounted projector area.
 - .2 REVISED: Keynote CD9: Clarifications on the extent of ceiling removal.
 - .3 ADDED: Keynote: Clarifications on temporary acoustic hoarding wall construction.
 - .4 REVISED: Note on clarifications to the existing ceiling mounted pole for projector.
- .5 **A20-06 FLOOR POWER INFEED LAYOUT**
 - .1 ADDED: Notes on existing convenience power outlets.
 - .2 REVISED: notes clarifying fully recessed junction boxes.
 - .3 ADDED: General Notes for clarifications to coring location proximity.
- .6 **A60-01 INTERIOR ELEVATIONS – BASE BID**
 - .1 ADDED: Wall sections for clarifications to projector screen installations.
 - .2 ADDED: Note: For existing outlets to remain and provided new face plates.
 - .3 REVISED: Note: To clarify patch and repair work for installation of new speakers.
- .7 **A70-02 FIRST FLOOR ENLARGED REFELCTED CEILING PLAN**
 - .1 ADDED: Sheet A70-02: 3 details to provide clarifications to new projectors installation.

ELECTRICAL

- .1 **ED10-01 Power Plans**
 - .1 REVISED: Power Keynotes P1, P2, P3, P4, P5, P6, P13, P14 and P15
 - .2 REVISED: Drawing 1/E10-01 for clarification of Keynote "P14"
 - .3 REVISED: Drawing 2/E10-01 for clarification of Keynote "P15"

- .2 **E00-02 Telecommunications**
 - .1 REVISED: Telecommunications Keynotes T6.
 - .2 REVISED: Drawing 1/E40-01 for clarification of Keynotes
 - .3 REVISED: Drawing 2/E40-01 for clarification of Keynotes

AUDIO VISUAL & TECHNOLOGY

- .1 **Drawing No. T10-01**
 - .1 REVISED: Plan Note #3 to remove reference to existing FSR box.
 - .2 REVISED: (1) input outlet to be demolished.
- .2 **Drawing No. T20-01**
 - .1 ADDED: (1) input outlet.
 - .2 REVISED: Plan Note #7 to indicate installation of new FSR box.
 - .3 REVISED: Plan Note #8 to state camera models indicated on plans.
 - .4 REVISED: Plan Note #9 to specify model of podium.
 - .5 ADDED: (3) plain text annotations to security cameras.
 - .6 ADDED: (1) security camera.
 - .7 REMOVED: (1) security camera.
- .3 **Drawing No. T20-02**
 - .1 REVISED: Plan Note #3 to specify model of podium.
 - .2 REVISED: Plan Note #8 to state camera models indicated on plans.
 - .3 ADDED: (4) plain text annotations to security cameras.
 - .4 ADDED: (2) security cameras.
 - .5 REMOVED: (3) security cameras.
- .4 **Drawing No. T50-01**
 - .1 REVISED: annotation for TV outlet to indicate new work.
 - .2 REVISED: TV outlet detail.
- .5 **Drawing No. T50-02**
 - .1 REVISED: DSP model.

- .2 REVISED: podium rack elevation to add AV network switch.
- .3 REVISED: projector to include LAN connection to WSU network.
- .4 REMOVED: POE injector.
- .5 REVISED: Presentation switcher for clarity.
- .6 REVISED: Room microphone to have AV network connection.
- .7 REVISED: Lectern mounted monitor.

.6 **Drawing No. T50-03**

- .1 REVISED: DSP model and specified XLR port in rack.
- .2 REVISED: podium rack elevation to add AV network switch.
- .3 REVISED: projector to include LAN connection to WSU network.
- .4 REMOVED: POE injector.
- .5 REVISED: Presentation switcher for clarity.
- .6 REVISED: Room microphone to have AV network connection.
- .7 REVISED: Lectern mounted monitor.

End of Addendum No.3
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SECTION 27 41 16

INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.1 Scope

- A. The work described by this section includes the furnishing of all components, materials, equipment, installation and technical labor and the performance of all operations necessary for the complete installation of audio-visual systems in operating condition as indicated on the drawings and/or specified herein.
- B. In general, the conduit and/or cable tray, junction boxes, electrical power circuits and outlets and terminal cabinets, as required for a complete operating system, shall be furnished and installed by the Electrical Contractor under a separate contract. The entire responsibility for the system, its installation, operation, and function shall be that of the Systems Contractor.

1.2 Description of Work

- A. Work consists of new A/V Systems as detailed on the drawings and specified herein.
- B. A/V Distribution Systems are required to be complete with sources, inputs, displays, distribution, controls and connection to the data network as detailed on the drawings and specified herein.
- C. All material and/or equipment necessary for proper operation of the system(s), not specified or described herein, shall be deemed part of these specifications.

1.3 Quality Assurance

- A. Performance Verification: All digital video systems shall be pre-tested to verify the complete compatibility of all sending, receiving and distribution components and the performance and integrity of the transmission media. The performance of each system shall be demonstrated, with all proposed components, in the presence of the Design Engineer and/or Owner prior to approval and installation. Any system failing to meet the specified performance requirements shall be rejected and re-configured as required prior to re-testing.
- B. All system components shall be UL listed.
- C. Installation shall be in compliance with the National Electric Code and all other applicable codes.
- D. All equipment described herein or otherwise required to perform the specified system functions shall be a regular product line, produced by the system manufacturer.
- E. All materials furnished under this contract shall be new, of highest quality and shall be of a regularly manufactured line, currently in production at the time of installation.

1.4 Contractor Qualifications

- A. The A/V equipment package shall be furnished and installed by a contractor who meets all the requirements listed herein. It shall not be acceptable for the A/V contractor to utilize a

Subcontractor for any portion of the work, unless the Subcontractor has been approved in writing by the Engineer based upon adherence to the qualifications listed herein.

- B. The Contractor shall maintain a fully equipped, factory certified service organization capable of providing full maintenance and service of the installed system within 24 hours. This facility shall be available for inspection by the Engineer.
- C. Equipment supplier shall have a service organization within 75 miles of the project site.
- D. The Contractor shall have on staff an Infocomm International-certified CTS-I AV systems engineer/project manager responsible for overseeing the project and the lead technician (not installers) shall have a CTS certification.

1.5 Shop Drawings

- A. Refer to Section 27 05 01 Basic Communications Requirements.
- B. A complete and comprehensive list of materials with quantity, manufacturer, model and part number and reference to the Part 2 specification paragraph number for each item.
- C. Manufacturers Data Sheets of all products and cabling, specific to the project. Data sheets shall show the exact parts, with model numbers and options as required and clearly identified.
- D. Qualifications: A statement of contractor's qualifications to verify compliance with other provisions within the specifications, unless the contractor has been pre-approved.
- E. Job specific diagrams.
 - 1. This indicates a block schematic diagram that shows all major items of equipment required for the contract project and the actual interconnections that will be installed, including details of interconnection with other systems.
 - 2. Electrical power requirements for the head-end and ancillary equipment. Include diagrams for any remote control of electrical power, in sufficient detail to coordinate with electrical work. Electrical diagrams shall also indicate all required plug and power outlet configurations including where direct connection is required/preferred.
 - 3. Rack elevations showing the configuration of all rack mounted equipment.
 - 4. 30x42 floor plans at a scale of not less than 1/8 inch=1 foot-0 inches showing the location of all items of equipment. Drawings shall also indicate each location where electrical power is required, and the specific configuration of that power connection (voltage, plug type, mounting height, etc.)
 - 5. Proposed construction details for all custom fabricated items, including wall plates, interface panels, mounting hardware and systems, and rigging hardware. These details shall show labeling, dimensions and indicate finishes and color selection.
- F. Software data – The data package shall consist of manufacturer's data sheets of all system and application software being provided with sufficient information to verify that all specified features and functions are being addressed.

PART 2 - PRODUCTS

2.1 Product Equivalency

- A. Where products are listed with multiple manufacturers, these manufacturers will be approved as equals if all specified features are provided. Any equipment not specifically approved in writing prior to the bid date will not be considered regardless of qualifications. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate equipment at the Contractor's expense.
- B. Different manufacturers may require various options, accessories, converters, patch cables, etc. to perform the specified features and functions. Therefore, all material and/or equipment necessary for proper operation of the system shall be deemed part of these specifications.

2.2 Sources

A. HDBaseT Transmitter (Rack Mount)

- 1. The Transmitter shall be rack-mountable
- 2. The Transmitter shall be a minimum of HDCP 2.2 compliant
- 3. The Transmitter shall be capable of reading EDID information
- 4. The Transmitter shall be capable of signal transmission for up to 230 feet
- 5. The Transmitter shall support HDMI 1.4 and HDMI 2.2
- 6. The Transmitter shall support the following resolutions:
 - a. 1920x1080 @ 60 Hz
 - b. 2560x1600 @ 60 Hz
 - c. 4096x2160 @ 30 Hz (DCI 4K)
 - d. 3840x2160 @ 30 Hz (UHD 4K)
 - e. 3840x2160 @ 60 Hz (4:2:0 chroma subsampling)
- 7. The Transmitter shall support up to 12 bit color depth
- 8. The Transmitter shall be capable of at a minimum embedding and transmitting analog audio, digital video and RS-232 control on a single HDMI cable
- 9. The Transmitter shall contain and a minimum the following connectors:
 - a. HDMI
 - b. 3.5 mm stereo audio
 - c. RS-232 captive screw connector
- 10. The Transmitter shall be:
 - a. Extron DTP HDMI 4K 230Tx

B. Passive HDMI Input (Wall Plate)

- 1. The wall plate shall be a single-gang decora style wallplate
- 2. The wall plate shall be a minimum of HDCP 2.2 compliant
- 3. The wall plate shall be capable of passing EDID information
- 4. The wall plate shall be capable of signal transmission for up to 230 feet
- 5. The wall plate shall support HDMI 1.4 and HDMI 2.2
- 6. The wall plate shall contain and a minimum the following connectors:
 - a. HDMI
- 7. The wall plate shall be:
 - a. Liberty AV Single Gang Wall Plate
- 8. Coordinate faceplate color with Architect

C. HDBaseT Receiver (Rack Mount)

- 1. The Receiver shall be rack-mountable

2. The Receiver shall be a minimum of HDCP 2.2 compliant
3. The Receiver shall be capable of reading EDID information
4. The Receiver shall support HDMI 1.4 and HDMI 2.2
5. The Receiver shall support the following resolutions:
 - a. 1920x1080 @ 60 Hz
 - b. 2560x1600 @ 60 Hz
 - c. 4096x2160 @ 30 Hz (DCI 4K)
 - d. 3840x2160 @ 30 Hz (UHD 4K)
 - e. 3840x2160 @ 60 Hz (4:2:0 chroma subsampling)
6. The Receiver shall support up to 12 bit color depth
7. The Receiver shall be capable of at a minimum receiving and deembedding analog audio, digital video and RS-232 control
8. The Receiver shall contain and a minimum the following connectors:
 - a. HDMI
 - b. 3.5 mm stereo audio
 - c. RS-232 captive screw connector
9. The Receiver shall be:
 - a. Extron DTP HDMI 4K 230 Rx

D. HDMI Scaling Receiver

1. The Receiver shall be mounted behind the receiving device
2. The Receiver shall be a minimum of HDCP 2.2 compliant
3. The Receiver shall be capable of reading and passing EDID information
4. The Receiver shall support HDMI 1.4 and HDMI 2.2
5. The Receiver shall support the following resolutions:
 - a. 1920x1080 @ 60 Hz
 - b. 2560x1600 @ 60 Hz
 - c. 4096x2160 @ 30 Hz (DCI 4K)
 - d. 3840x2160 @ 30 Hz (UHD 4K)
 - e. 3840x2160 @ 60 Hz (4:2:0 chroma subsampling)
6. The Receiver shall support up to 12 bit color depth
7. The Receiver shall be capable of at a minimum receiving and deembedding analog audio, digital video and RS-232 control
8. The Receiver shall contain at a minimum the following connectors:
 - a. XTP Input
 - b. LAN
 - c. Line Level stereo audio
 - d. RS-232
 - e. Relay
9. The Receiver shall be:
 - a. Extron XTP SR HD 4K

E. USB Extender

1. The Extender Shall have the following features:
 - a. USB host support: xHCI (USB 3.0), EHCI (USB 2.0), OHCI/UHCI (USB 1.1)
 - b. USB data rates:
 - 1) Low speed (1.5 Mbps), full speed (12 Mbps), high speed (480 Mbps)
 - c. USB host — Tx units
 - 1) Number/signal type: 1 USB
 - 2) Connectors: 1 female USB type B

- 3) Maximum built-in USB hubs: 2
- 4) Minimum built-in USB hubs: 0
- 5) Optional built-in USB hubs: Peripheral emulation enabled: 1
- 6) 1:n network pairing enabled: 1
- d. USB device ports — Receiver
 - 1) Number/signal type: (1) 4-port, USB hub
 - 2) Connectors: 4 female USB 2.0 type A
 - 3) Maximum built-in USB hubs: 1
 - 4) Minimum built-in USB hubs: 1
 - 5) Available USB power: 500 mA per port
- e. Interconnection between transmitter and receiver
 - 1) Connectors: 1 female RJ-45 per unit
 - 2) Termination standards: TIA 568B
- f. Signal transmission distance
 - 1) Point to point: Up to 330' (100 m)
 - 2) Over the network: Up to 1980' (600 m)
- g. Network
 - 1) Protocol: Ethernet
 - 2) Transport: TCP/IP, UDP
 - 3) All supported: IPv4, UDP, DHCP, Unicast
 - 4) Standards: IEEE 802.3u (100Base-T), IEEE 802.3ab (1000Base-T)
 - 5) IP Configuration: Static IP (default) or DHCP
2. The Transmitter/Receiver shall be:
 - a. Extron USB Extender Plus T/R

F. Ceiling Mounted PTZ Conferencing Camera

1. Camera shall be mounted as indicated on the drawings. Provide any additional hardware as indicated.
2. The Camera shall support the following resolution:
 - a. 1920x1080 @ 60 Hz
3. The Camera shall contain at a minimum the following connectors:
 - a. RS-232
 - b. USB 2.0
 - c. HDMI Out
 - d. LAN
 - e. DC12V
4. The Camera shall contain at a minimum the following features:
 - a. Sensor 1/2.8" HD CMOS
 - b. Optical Zoom 10X, f = 4.7 ~ 47 mm
 - c. Viewing Angle 6.43° (telephoto), 60.9° (wide-angle)
 - d. Effective Pixels 2.07 MP
 - e. Focus Settings Auto / Manual
 - f. AVF1.6 – F3.0
 - g. Minimum Illumination 0.5 lm, F1.8 with Automatic Gain Control ON
 - h. Signal-to-Noise Ratio (SNR) > 55 dB
 - i. Control Protocol VISCA/Pelco-D/Pelco-P
 - j. Pan Rotation ±170°
 - k. Tilt Rotation -30° ~ +90°
 - l. Pan Control Speed 0.1 – 180° / sec
 - m. Tilt Control Speed 0.1 – 80° / sec
 - n. Integrated IR sensor and manual remote control

5. The Camera shall be:
 - a. Lumens VC-B30U
 - b. Provide all required hardware to ceiling or wall mount as indicated on plans.

G. Table Top Mounted PTZ Conferencing Camera

1. Camera shall be mounted as indicated on the drawings. Provide any additional hardware as indicated.
2. The Camera shall support the following resolution:
 - a. 1920x1080 @ 60 Hz
3. The Camera shall contain at a minimum the following connectors:
 - a. RS-232
 - b. RJ45 LAN
 - c. USB 2.0
4. The Camera shall contain at a minimum the following features:
 - a. Sensor 1/2.5" HD CMOS
 - b. Optical Zoom 30x
 - c. Viewing Angle 3.1° (telephoto), 70.2° (wide-angle)
 - d. Effective Pixels 8.57 MP
 - e. Focus Settings Auto / Manual
 - f. Minimum Illumination 1.6 lux
 - g. Signal-to-Noise Ratio (SNR) > 50 dB
 - h. Pan Rotation ±150°
 - i. Tilt Rotation -30° ~ +90°
 - j. Pan Control Speed 0.35° – 120° / sec
 - k. Tilt Control Speed 0.35° – 120° / sec
5. The Camera shall be:
 - a. Vaddio RoboSHOT 30E-M

H. Document / Demonstration Camera

1. Provide a document camera with the following minimum specifications:
 - a. Output 4K@30
 - b. SONY IMX 415 sensor
 - c. Optics: Exchangeable UHD lenses with manual focus: 8mm / 16mm / 25mm / 35mm
 - d. USB 2.0 interface with bundled software for video control, capture, edit and save functions.
 - e. Flexible arm allowing unit to be mounted to lectern/podium
2. The document camera shall be:
 - a. Futudent ProCam XS or equivalent with mounting arm

I. Presentation Switcher/Control Processor

1. The Presentation Switcher/Control Processor shall be rack mountable
2. The Presentation Switcher/Control Processor shall utilize the following inputs and outputs:
 - a. HDMI In (4)
 - b. HDMI Out (4)
 - c. Audio In (4)
 - d. Audio Out (4)
 - e. LAN
3. The Presentation Switcher/Control Processor shall utilize the following control methods:
 - a. RS-232

- b. IR
 - c. Relay
 - d. Ethernet
 - 4. The Presentation Switcher/Control Processor shall support bidirectional communication via the serial port.
 - 5. **The Presentation Switcher/Control Processor shall be:**
 - a. **Extron IN1808 (Addendum #3)**
- J. Audio Visual Control Panel (Touch Screen)
- 1. The Control Panel shall be Tabletop/Wall Mount
 - 2. The Control Panel shall have an ethernet connection
 - 3. The Control Panel shall be capable of being powered via PoE
 - 4. The Control Panel shall have a screen size of 10"
 - 5. The Control Panel shall be:
 - a. Extron TLP Pro 1025T
 - 6. Coordinate Control Panel color with Architect
- K. Wall Mounted Speakers – Column Array
- 1. The speaker shall be a wall mounted column array
 - 2. The speaker shall meet or exceed the following performance criteria
 - a. Frequency Response: 200 Hz – 20 kHz
 - b. Coverage 120 degrees Horizontal, Vertical user configurable
 - c. Power Handling: 600W @ 12 Ohm (2400W Peak)
 - d. Sensitivity (1W/1m): 93 dB
 - e. Nominal Impedance: 12 Ohm
 - 3. The speaker shall be:
 - a. Biamp Desono ENT-FRW or equivalent
- L. Wall Mounted Speakers - Subwoofer
- 1. The speaker shall be a wall mounted subwoofer
 - 2. The speaker shall meet or exceed the following performance criteria
 - a. Frequency Response: 30 Hz – 1000 Hz
 - b. Coverage 360 degrees Horizontal, 180 degrees Vertical
 - c. Power Handling: 400W @ 4 Ohm (1000W Program)
 - d. Sensitivity (1W/1m): 93 dB
 - e. Nominal Impedance: 4 Ohm
 - 3. The speaker shall be:
 - a. Community VLF208LV or equivalent
- M. Handheld Microphone
- 1. The microphone shall be wireless
 - 2. The microphone shall meet or exceed the following performance criteria:
 - a. Gain Adjustment Range –25 to +15 dB (in 1 dB steps)
 - b. Maximum Input Level (Mic gain @ -16 dB) –9 dBV
 - c. Antenna Type Internal, Spacial Diversity, Linear Polarization
 - d. Battery Type Rechargeable Li-Ion

- e. Battery Life Up to 15 hours Calculated with a new battery. Runtimes vary depending on battery health
 - f. Charge Connector USB 3.0 Type A
 - g. Housing Molded Plastic
 - h. Recommended Storage Temperature Range 0 °C (32 °F) to 25 °C (77 °F)
 - i. Microphone Capsule SM58®, SM86, Beta® 58A, VP68
 - j. Configuration Unbalanced
 - k. Input Impedance (@ 1 kHz) >20 kΩ
 - l. Dimensions 226 mm × 51 mm (8.9 in. × 2.0 in.) L × Dia. including SM58 microphone capsule
 - m. Weight 323 g (11.4 oz.) with batteries, including SM58 microphone capsule
3. The microphone shall be:
- a. Shure MXW2 or equivalent

N. Body Pack

- 1. The microphone shall be wireless
- 2. The microphone shall meet or exceed the following performance criteria:
 - a. Gain Adjustment Range-25 to +15 dB (in 1 dB steps)
 - b. Maximum Input Level (Mic gain @ -16 dB) -9 dBV
 - c. Headphone Output 3.5 mm (1/8"), dual mono (will drive stereo phones)
 - d. Maximum Headphone Output Power (1kHz @ 1% distortion, peak power, @16Ω) 17.5 mW
 - e. Antenna Type Internal, Spacial Diversity, Linear Polarization
 - f. Battery Type Rechargeable Li-Ion
 - g. Battery Life Up to 9 hours Calculated with a new battery. Runtimes vary depending on battery health.
 - h. Charge Connector USB 3.0 Type A
 - i. Housing Molded Plastic
 - j. Recommended Storage Temperature Range 0 °C (32 °F) to 25 °C (77 °F)
 - k. Microphone Connector 4-Pin male mini connector (TA4M), See drawing for details
 - l. Input Impedance (@ 1 kHz) >20 kΩ
 - m. Internal Microphone Omnidirectional (20 Hz – 20 kHz)
 - n. Dimensions 22 mm × 45 mm × 99 mm (0.9 in. × 1.8 in. × 3.9 in.) H × W × D
 - o. Weight 85 g (3.0 oz.) with batteries, without microphone
- 3. The body pack shall be:
 - a. Shure MXW1 or equivalent with lavalier **and over the ear microphones (Addendum #3)**

O. AVB Network Switch

- 1. The 10 Port AVB Network Switch shall feature the following:
 - a. 1 Gbps RJ-45 ports
 - b. Two 10G SFP+ Modules supporting AVB and Dante
 - c. Front panel LEDs indicate port connections, device status, and fault conditions
 - d. Fault reporting and device monitoring supported in SageVue™
 - e. Out-of-the-box compatibility with Tesira conferencing products
 - f. External power supply

- g. CE marked, UL listed, and RoHS compliant
 - h. Covered by Biamp Systems' five-year warranty
 - i. AVB License shall be included.
2. The AVB Network Switch shall be:
- a. Provide Biamp NMS-NG10GPX-AVB AVB Network Switch for connection of Microphones and other equipment to DSP as indicated on the drawings.
- P. Assistive Listening System: Provide an assistive listening system as indicated on the plans, with the required quantity of receivers as specified herein for deployment as needed by the Owner:
- 1. Stationary FM transmitter capable of broadcasting on 3 wide band channels. The transmitter shall have an SNR of 62 dB or greater. The output power shall be adjustable to quarter, half or full. Channel tuning shall be capable of being locked. The device shall have an audio frequency response of 50 Hz to 15k Hz, ± 3 dB at 72 MHz. It shall have two mixing audio inputs. The device shall have the following audio controls: input level, mix level and an adjustable 2kHz shelf filter.
 - a. The Williams Sound model IR T2 is specified. Provide with a rack mount kit and a model universal antenna kit designed to locate the antenna outside of the equipment cabinet.
 - 2. Personal receivers with both dual earbuds and a lightweight ear speaker. The FM receiver shall be capable of receiving on 3 wide and narrow band channels with a SNR of 62 dB or greater. The device shall have an audio frequency response of 50 Hz to 15 KHz, ± 3 dB at 72 MHz. The device will incorporate a stereo headset jack that allows the user to plug in either a mono or stereo headset and listen to the audio normally. The receiver shall incorporate automatic battery charging circuitry for recharging batteries.
 - a. The Williams Sound model PPA R37N FM receiver is specified. Provide (27) Receivers, (27) EAR 022 surround earphones, BAT 026-2 AA rechargeable NiMH batteries, and (7) Neckloops to support both the upper and lower seating arrangements.
 - 3. Provide a quantity of Drop in Charger/Carrying Cases with removable lid to support the above equipment.
- Q. Audio Digital Signal Processor
- 1. The Audio Digital Signal Processor shall be a multi-channel, software-controlled (RS-232/LAN interface to external computer) multi-function unit incorporating the following functions:
 - a. 128 x 128 channels of AVB
 - b. 12 mic/line level inputs with AEC, 8 mic/line level outputs
 - c. Gigabit Ethernet port
 - d. RS-232 serial port
 - e. 4-pin GPIO
 - f. 2-line OLED display with capacitive-touch navigation
 - g. Rack mountable (1RU)
 - h. System configuration and control via Ethernet
 - i. Internal universal power supply
 - j. SIP VoIP interface via RJ-45 connector
 - k. Signal processing via intuitive software allows configuration and control for signal routing, mixing, equalization, filtering, and delay
 - l. CE marked, UL listed, and RoHS compliant

- m. Covered by Biamp Systems' five-year warranty
- n. Compliant with the US Trade Agreement Act (TAA)
- 2. The DSP shall meet or exceed the following performance criteria:
 - a. Frequency Response:
 - 1) 20Hz to 20kHz, +4dBu output: +0.25 dB/-0.5 dB
 - b. THD+N (22Hz to 22kHz):
 - 1) 0dB gain, +4dBu input: < 0.006%
 - 2) 54dB gain, -50dBu input: < 0.040%
 - c. EIN (no weighting, 22Hz to 22kHz): < -125dBu
 - d. Dynamic Range (in presence of signal)
 - 1) 22Hz to 22kHz, 0dB gain: > 108dB
 - e. Input Impedance (balanced): 8k Ω
 - f. Output Impedance (balanced): 207 Ω
 - g. Maximum Input: +24dBu
 - h. Maximum Output (selectable):
 - 1) +24dBu, +18dBu, +12dBu,
 - 2) +6dBu, 0dBu, -31dBu
 - i. Input Gain Range (6dB steps): 0-66dB
 - j. Overall Dimensions:
 - 1) Height: 1.75 inches (44 mm)
 - 2) Width: 19.0 inches (483 mm)
 - 3) Depth: 10.5 inches (267 mm)
 - 4) Weight: 8 lbs (3.63 kg)
 - k. Phantom Power: +48VDC (7mA/input)
 - l. Crosstalk, channel to channel, 1 kHz:
 - 1) 0dB gain, +4dBu input: < -85dB
 - 2) 54dB gain, -50dBu input: < -75dB
 - m. Sampling Rate: 48kHz
 - n. A/D - D/A Converters: 24-bit
 - o. Power Consumption:
 - 1) 100-240VAC 50/60Hz: < 35W
 - p. USB:
 - 1) Bit Depth: 16- or 24-bit
 - 2) Number of Channels: up to 8
 - 3) Sample Rate: 48kHz
- 3. **The DSP shall be:**
 - a. **Biamp TesiraFORTE DAN CI (Addendum #3)**

R. Audio Amplifier

- 1. The Audio Amplifier shall meet or exceed the following performance criteria:
 - a. Audio
 - 1) SNR >110dB(A)
 - 2) Frequency Response 20 Hz - 20 kHz \pm 0.5 dB, 1 W @ 8 Ω
 - 3) Crosstalk -70 dB
 - 4) Input Impedance 20K Ω balanced
 - 5) THD+N <0.1%
 - b. Output
 - 1) Max Output per channel @8 Ω 1250W
 - 2) Max Output per channel @4 Ω 1400W
 - 3) Max Output per channel @2 Ω 1600W
 - 4) Max Output bridged @8 Ω 3200W

- 5) Max Output bridged @4Ω 2800W
- 6) Max Output per channel @70V 1600W
- 2. The Amplifier shall be:
 - a. Community ALC-1604D or equivalent

S. Audio Amplifier

- 1. The Audio Amplifier shall meet or exceed the following performance criteria:
 - a. Audio
 - 1) SNR >110dB(A)
 - 2) Frequency Response 20 Hz - 20 kHz ±0.5 dB, 1 W @ 8Ω
 - 3) Crosstalk -70 dB
 - 4) Input Impedance 20KΩ balanced
 - 5) THD+N <0.1%
 - b. Output
 - 1) Max Output per channel @8Ω 400W
 - 2) Max Output per channel @4Ω 400W
 - 3) Max Output per channel @2Ω 400W
 - 4) Max Output bridged @8Ω 800W
 - 5) Max Output bridged @4Ω 800W
 - 6) Max Output per channel @70V 400W
- 2. The Amplifier shall be:
 - a. Community ALC-404D or equivalent

T. Rack Mounted Surge Eliminator

- 1. The Rack Mounted Surge Eliminator shall incorporating the following functions:
 - a. Input: (1) NEMA 5-20P, 120V/20A
 - b. Output: (5) NEMA 5-15R, (4) NEMA 5-20R, 120V
 - c. Load Rating 15 Amps @ 120 volts
 - d. Power Requirements (no load) 15 watts
 - e. Surge Let-Through Voltage (6000-volt surge) 0 volts
 - f. UL 1449 Adjunct Classification Test Results 1000 surges, 6000 volts, 3000 amps, B3 pulse
 - g. Measured suppressed voltage 170 volts, no failures
 - h. Federal Guidelines Grade A, Class 1, Mode 1 (CID A-A-55818)
 - i. EMI/RFI Filter, Normal Mode (50-ohm load) 40 dB @ 100 kHz; 50 dB @ 300 kHz; 50 dB @ 3 MHz; 50 dB @ 30 MHz
 - j. EMI/RFI Filter, Common Mode (50-ohm load) 18 dB @ 300 kHz; 30 dB @ 1 MHz; 50 dB @ 5 MHz; 50 dB @ 20 MHz
 - k. Maximum Applied Surge Voltage 6000 volts
 - l. Maximum Applied Surge Current Unlimited, due to current limiting
 - m. Maximum Applied Surge Energy Unlimited, due to current limiting
 - n. Endurance (C62.41-1991 Category B3 pulses) 1 kV>500,000; 3 kV>10,000; 6 kV>1000
 - o. Undervoltage Shutdown 90 volts (resume at 100 v)
 - p. Overvoltage Shutdown 145 volts (resume at 135 v)
 - q. Maximum Load Inrush Current During Power-up 1000 Joules
 - r. Remote Turn-on Applied Voltage Range 5 to 30 volts DC
 - s. Contact Closure 1.5 mA
 - t. 5 V DC Applied Voltage 0.1 mA
 - u. 12 V DC Applied Voltage 1.5 mA

- v. 24 V DC Applied Voltage 5.0 mA
 - w. Auxiliary Relay Contact Rating 30 Volts at 1 Amp
 - x. LED Output 12 volts DC, maximum 20 mA (resistor required)
 - y. Dimensions 1.75" H x 19" W x 10.5" D (4.5 x 48.3 x 26.7 cm)
 - z. Weight 11 lbs (5 kg)
 - aa. Temperature Range 5° to 35° C
 - bb. Humidity Range 5% to 95% R.H., non-condensing
 - cc. Agency Listings ETL and cETL certified to (UL 1449; CSA C22.2 No.8-M1986, R2000)
2. The Surge Eliminator shall be:
- a. SurgeX SX1120RT or equivalent

2.3 Wiring

A. Control Wiring

- 1. Provide low voltage control wiring for RS-232 control of Flat Panel Monitors.
- 2. Provide low voltage control wiring for RS-232 or LAN control of projector. Where RS-232 cabling distances exceed industry standards or where otherwise required, provide repeaters/line conditioners.
- 3. Provide low voltage control wiring for infra-red control of rack mounted devices as required.

B. Video and Audio Cable - Installed

- 1. Digital Video Cable
 - a. HDMI Pre-terminated Assembly: Provide high-quality HDMI cables, tested and verified to support all digital video resolutions up to 1080p/60 and computer resolutions up to 1920 x 1200 over the actual length of the specific cable. It shall additionally support all digital audio formats including Dolby True HD and DTS-HD Master Audio. The assembly shall be covered by a lifetime warranty
 - b. Physical characteristics:
 - 1) 24k gold-plated connectors
 - 2) 24 AWG high-purity, oxygen-free conductors
 - 3) High-density triple shielding for rejection of EMI and RFI
 - 4) UL Listed, CL2P, CL3P and CMP certified
 - c. Approved manufacturers: Atlona, Crestron, Extron, Covid
 - d. HDMI Extender: In those instances where the HDMI cable length exceeds the maximum length necessary to achieve the specified resolution(s), an HDMI extender shall be utilized to restore signal strength. The unit shall be located at the display (sink) and either powered via the HDMI cable from the source or powered via external low-voltage power supply. The extender shall be compatible with the latest HDMI 1.3 (1080p, 60Hz) and support DDC transmission of pass-through EDID and HDCP information.
 - 1) Approved products: Extron HDMI 101, Covid HDMI 91x1, Atlona AT HDMI-11s, Geffen Super Booster Plus.
- 2. Stereo Audio/Serial Control Cable
 - a. Stereo Audio Cables - 22 gauge, tinned, stranded copper, 2 pair w/individual shields and drain wire under a common jacket.
 - b. Cable By Extron, Belden, West Penn, Covid or Liberty.
- 3. Digital Video Cable – Provide where shown for twisted pair cable digital media solutions. Twisted pair cable shall have the following qualities:
 - a. High-bandwidth/low crosstalk shielded 4-twisted pair (STP) cable with overall jacket.

- b. Crestron Electronics or equal by, Extron, Belden, West Penn or Covid.
4. Fiber Optic – Provide fiber optic cable where called out on drawings.

C. Audio/Visual Interconnection Cables

1. Provide all associated A/V patch cables for each equipment item for a fully operational system. Flat Panel Monitors, etc. shall be supplied with all patch cables required to fully connect with local outlets and interconnect with related equipment as specified and as shown on drawings. All outlets must also be provided with a patch cable for every A/V jack.
2. At a minimum, all items of equipment shall be supplied with a patch cable for each type of input. In some instances, it may be required of the contractor to provide the appropriate adaptors depending on input/output configurations of specific items of equipment.
3. The A/V Contractor shall be responsible for final dressing of all patch cables at each item of equipment to provide a neat and orderly appearance. Plastic Tie Wraps shall not be allowed. Hook and Loop type wraps shall be acceptable.
4. Patch cable lengths shall be sized to provide sufficient serviceability yet maintain a neat and workmanlike appearance.

2.4 Cables, Connectors and Plates

A. Audio/Video Jacks

1. HDMI – Type A feed-through, panel mount connector.

B. Jackplates

1. Outlet faceplates shall be custom-fabricated, stainless steel.
2. Each and every jack shall be labeled to corresponding patch panel and port. Each and every audio/video jack shall be labeled to indicate function. Coordinate labeling scheme with Owner. Labels shall be engraved and backfilled or adhesive laminated plastic. P-touch labels or labels applied with pens or markers are not acceptable.
3. Data jacks, where shown integrated into custom jackplates, shall be provided by the structured cabling provide and shall adhere to the provided channel solution. Custom cut-outs shall be coordinated with the structured cabling contractor to provide an exact fit for the RJ-45 module as provided, labeled and terminated by the structured cabling installer.
4. Outlets to be installed in floor boxes/poke-thrus to be installed in faceplates, compatible with floor box / poke-thru make / model and secured within floor box / poke-thru. The use of loose or un-mounted jacks shall not be acceptable. Where floor box / poke-thru to determine specific requirements for jacks and coverplate.
5. Refer to drawings for arrangement of various workstation outlets including jack types and quantities within each outlet type. All voice/data/video/audio and fiber jacks indicated in the faceplate shall be deemed included in this specification unless specifically noted otherwise.
6. Acceptable custom plate manufacturers: Ace Backstage, Panel Crafters, ProCo or RCI Custom

PART 3 - EXECUTION

3.1 General Installation

- A. Equipment shall be furnished and installed in accordance with manufacturer's recommendations in compliance with all local, city, state and national codes.

- B. Provide all hardware, framing members, etc. as required for mounting equipment. Coordinate all structural mounting points and locations and load requirements with Architect/General Contractor.
- C. All penetrations in smoke or firewalls shall be sealed with fire stop rated for this purpose.
- D. The installation of all work shall be neat and of professional quality. Cooperate with other trades in order to achieve well-coordinated progress and satisfactory final results. Execute without claim for extra payment minor moves or changes in equipment locations to accommodate equipment of other trades or the architectural symmetry of the facility.
- E. Installation shall follow industry standard wiring and installation practice, and shall meet or exceed industry standards for such work, with particular attention given to any installation instructions in Parts 1 and 2 of these Specifications.
- F. Equipment shall be secured firmly with proper types of mounting hardware. All equipment affixed to the building structure must be self-supporting with a safety factor of at least three unless otherwise stated.
- G. All equipment shall be installed so as to provide reasonable safety to the operator.
- H. All overhead or wall-mounted speaker systems shall be supported from the building structure utilizing the materials and methods recommended by the speaker manufacturer and good rigging practices, providing a load-rated safety factor of six (6). All required installation material and labor shall be deemed included in these specifications.
- I. Furnish the system to facilitate expansion and servicing using modular, solid-state components. All equipment shall be designed and rated for continuous operation and shall be UL listed where applicable, or manufactured to UL standards.
- J. It will be the responsibility of this contractor to provide all programming of the room control system to incorporate the functionality the owner requires.
- K. In addition to the GUI provided the technology systems contractor will provide an Ethernet based executable GUI for interfacing to the system.
- L. Technical Systems Manual, custom-written by the Contractor, for the purpose of instructing the Owner's operating personnel in the detailed step-by-step operation of the system and preventative maintenance procedures. This manual shall include descriptions of the system components and their relationship to system function. This manual shall be bound separately and labeled appropriately.
- M. Provide capability for mute override upon activation of the building fire alarm system.

3.2 Wiring Installation

- A. Observe proper circuit polarity and loudspeaker wiring polarity. No cables shall be wired with a polarity reversal between connectors with respect to either end. Special care shall be taken when wiring microphone cables, to ensure that uniform polarity is maintained. Balanced audio connectors shall be wired with shield at Pin #1, hi/positive at Pin #2.

1. All audio circuits shall be balanced and floating, except as noted in the specifications or directed by Heapy Engineering at the time of final equalization and testing. Shields of audio cables installed between active interconnected equipment components shall be grounded at the sending end only.
2. All cables shall be installed in conduit except above accessible ceilings, where they shall be installed utilizing J-hooks or bridle rings on minimum 5 ft. centers or cable tray, where available.
3. Separate conduits and/or cable harnesses shall be maintained for cables in the following categories
 - a. Levels below -20 dBm (microphone).
 - b. Nominal line levels from -20 dBm to +30 dBm (line).
 - c. Loudspeaker
 - d. Control
 - e. Power
 - f. Video
4. Cable management system shall be secured to building structure utilizing manufactured approved methods and hardware. Cable management system support components shall be designed with wide support surfaces that do not cause cables to be bent, crushed or otherwise deformed when installed within component loading parameters. Cable management system shall meet UL standards and be UL labeled. Utilizing elements of the building's structure such as beams, joists, etc. to hang cable from will not be acceptable.
5. Group and route all cables within equipment cabinets according to type and function and separate according to signal levels. All cables shall be continuous lengths without splices.
6. Cables shall be handled and installed with extreme care. Tie wraps shall **loosely** hold cables; **do not over-tighten**. Cables shall have sweeping bends and shall have a maximum bending radius at any point in the installation of not less than 4 times the outer diameter of the cable. The cable manufacturer's recommended bending radius and maximum pulling tensions shall be strictly adhered and shall not be exceeded. Failure to comply will result in the removal and replacement of affected cable at no additional cost to the Owner.
7. Cable pathways shall provide the following minimum clearances (parallel or perpendicular)
 - a. Motors and transformers – 48 inches.
 - b. Conduit and cable used for electrical power distribution – 12 inches.
 - c. Fluorescent lighting – 5 inches.
 - d. Power lines up to 2kVA – 5 inches.
 - e. Power lines over 5kVA – 24 inches.
 - f. Hot water/steam lines - Bare –18 inches, Insulated – 6 inches.
8. All cabling installed in underground conduit installations shall be outdoor rated cables, acceptable for use by the manufacturer in underground applications.
9. All system wire shall be terminated by approved soldered or mechanical means. No unterminated wire ends will be accepted. Heat shrink type tubing shall be used to insulate and dress the ends of all ground or drain wires.
10. All solder joints and terminations shall be made with rosin-core silver solder. No lead based solder shall be accepted.
11. Mechanical connections shall be made using approved connectors of the correct size and type for the connections. Wire nuts are not acceptable except in the case of distributed, constant-voltage speaker systems.

3.3 Programming

- A. AV Distribution System and touch panel controller shall be programmed as described herein and as required by owner. Contractor to develop system programming through a series of meetings, storyboard submittals and a final virtual run-through prior to programming. Programming shall be submitted to Heapy Engineering prior to application for approval.
- B. Program flow drawings shall be submitted by the contractor for review prior to any programming taking place. No fewer than three meetings shall take place regarding program flow and touch panel interface prior to any programming being started.
- C. Program flow review with follow-up email communication and approval or in-person meetings as necessary.
- D. Technical review of touch panel (mock-up touch panel will be required at this meeting).
- E. End-user touch panel review of mock-up touch panel
 - 1. Present must be the AV Vendor Engineer and an Owner's representative.
 - 2. End users will also be present at the end-user review of mock-up touch panel.
- F. Access to the Owner's network for programming shall be coordinated with C&IT. Any request for this type of access should be submitted in writing no fewer than ten (10) business days prior to need.
- G. JPEG screen shots will be required of the touch panel once the design is final so that the end-user may begin to create a user instruction guide.
- H. Touch panel controller shall be programmed as described herein at a minimum, with full comprehensive programming coordinated with the owner. Programming shall be submitted to the Owner as outlined in Supplemental Instructions below.
- I. Programming - Touch panel controller shall be programmable with graphic page as required to offer controls for A/V equipment connected to the system. Unit shall be programmed per the owner's requirements to provide the following controls at a minimum:
 - 1. There shall be a welcome page with simple system on/off features and custom Owner logo and a home page with the most often used control features. For bidding purposes, plan for a minimum of 10 user pages with 5 additional technician level pages.
 - 2. Controls for system on/off, system volume and mute, monitor on/off, and user "blackout" shall be accessible as fixed buttons.
 - 3. There shall be provided full component control of the DocCam, Switchers/Scalers, Matrix Switchers, Display device and DSP control (see below)
 - 4. DSP control shall allow for system-wide mute and volume control.
 - 5. There shall be Technician level control pages, password protected that allow complete access to all component features including system menus.

3.4 Tests

- A. Upon completion of installation and satisfactory testing of system by Contractor in presence of the equipment supplier, the Contractor shall test the system in the presence of the Owner and the Engineer to demonstrate satisfactory performance.

- B. System shall be tested by and a certificate of inspection shall be furnished by a qualified manufacturer's representative or equipment vendor; Submit report indicating result to the Engineer.
- C. A qualified technical representative of the system contractor shall do systems acceptance testing. Installation must be complete in all respects before acceptance testing. Acceptance testing and training must be scheduled on separate dates to allow time for corrections, if necessary. Once all functions and devices within the system have been adequately demonstrated to be working properly, a complete owner's manual will be presented to the Owner's agent. It shall contain a comprehensive list of all supplied equipment, a complete point-to-point system wiring diagram with "AS BUILT" wire numbers indicated, details of hook-up connections including build-out devices (active and passive), systems control settings record, the final test results including plotted frequency response curves, operation and maintenance manuals for each active device including schematic diagrams and parts list. A thoroughly completed commissioning checklist (re: InfoComm's AV Installation Handbook Appendix J: Audiovisual Systems Commissioning Tests Checklist) shall be included with the Owner's Manual.
- D. The Contractor shall be prepared to verify the performance of any portion of the system by demonstration, listening tests and/or instrument measurements.
- E. Measurement of frequency response, distortion, noise, or other characteristics shall be performed (or a demonstration test requested) if deemed necessary to determine proper operation.
- F. The Contractor shall make additional mechanical and electrical adjustments within the scope of the work and which are deemed necessary by the Engineer as a result of acceptance tests.
- G. Test Reports and Certification: Submit results of all tests conducted above and certification that the installation is complete and ready for checkout as specified.

3.5 Identification/Labeling

- A. Contractor shall identify all major items of equipment and tag all cables with machine printed labels to denote equipment served. Cables shall be tagged at both end and at each point where the cable is administered.
- B. The contractor shall be responsible for applying a permanent label to each cable to indicate source and destination.
- C. All labeling and recording shall be approved by the Owner and the Engineer prior to application.

3.6 Training

- A. Provide step-by-step user instructions identifying operator controls for normal use operations. This shall be included with the O&M manuals.
- B. The contractor shall arrange for a total of sixteen (16) hours for end user training on the various A/V Systems. This training shall be planned and scheduled with the Owner. Training plan shall be pre-approved by the Engineer/Architect and shall include a review of the proposed syllabus.
- C. Video record the training sessions and provide an electronic copy to the Owner.

3.7 O & M Manuals

- A. Copies of all approved shop drawings with the Engineer's stamp.
- B. Owner's manuals for every item of equipment when available from the manufacturer. These shall be the technical manuals provided by the manufacturer and shall not consist of generic sales brochures. Technical manuals shall provide complete specifications for the equipment as well as complete operating, maintenance, troubleshooting and product repair/replacement information. Where available only in electronic format, the contractor may provide a CD with electronic versions of Owner's manuals. CDs containing electronic versions of Owner's manuals must contain the proper software viewers for each document type.
- C. Technology drawings updated with final as-built information. This shall be in the form of a complete set of Technology drawings with as-built information indicated in colored pen based upon actual field conditions.
- D. System schematic and block diagrams for every system updated with final as-built information. These drawings shall define the exact arrangement of each system including wiring configuration, device locations and cable types.
- E. Rack elevations for all systems with rack mounted equipment.
- F. System Operating Instructions: Provide a clear and concise description of operation which gives, in detail, the information required to properly operate the equipment and system.
- G. Manufacturer's warranties and operating instructions for each and every equipment item furnished. Include a copy of the Certificate of Warranty, signed by both parties.
- H. Provide statement of warranty with O&M Manuals.

3.8 Warranty

- A. Warrant all workmanship, equipment, material and software entering into this contract for a period of three (3) years from date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect or Construction Manager. Any materials or equipment proving to be defective during the warranty period shall be made good without expense to the Owner. Provide a statement of this warranty with the O & M Manuals.
- B. During the warranty period, report to the site and repair or replace any defective materials or workmanship without cost to the Owner. Warranty service shall be rendered within 24 hours after request by the Owner. Equivalent replacement equipment shall be temporarily provided when immediate on-site repairs cannot be made.
- C. Where warranties on individual pieces of equipment exceed three (3) years, the guarantee period shall be extended to the warranty period of the particular items.
- D. After completion of the work, the Contractor shall submit a Certificate of Warranty, stating commence and expiration dates and conditions of the warranty, for signature of both participating parties. Incremental warranties for complete portions of the work may be negotiated at the discretion of the Owner, if delays occur beyond the control of the Contractor.

END OF SECTION

27 41 19
VIDEO DISPLAY EQUIPMENT

PART 1 - GENERAL

1.1 Scope of Work

- A. The work described by this section includes the furnishing of all components, materials, equipment, installation and technical labor and the performance of all operations necessary for the complete installation of an audio/visual system in operating condition as indicated on the drawings and/or specified herein.
- B. Included in the Scope of this Section:
 - 1. Licenses, permits as may be applicable
 - 2. Provision of submittal information
 - 3. Installation in accordance with contract documents, manufacturers' recommendations and applicable codes
 - 4. Programming and configuration of control and signal processing software
 - 5. Testing and adjustments, including documentation thereof
 - 6. Provision of manuals
 - 7. Maintenance and warranty services
- C. Applicable References:
 - 1. National Electric Code (NEC)
 - 2. Underwriters Laboratories (UL)
 - 3. Infocomm International AV Installation Handbook –2nd Edition
 - 4. Telecommunications Distribution Methods Manual (TDMM)
- D. In general, the conduit and/or cable tray, junction boxes, electrical power circuits and outlets and terminal cabinets, as required for a complete operating system, shall be furnished and installed by the Electrical Contractor under a separate contract. The entire responsibility for the system, its installation, operation and function shall be that of the Systems Contractor.

1.2 Description of Work

- A. Work consists of new A/V Display Equipment including:
 - 1. Television/Flat Panel Monitors complete with wall mounting hardware and connection to the local AV Distribution Systems as detailed on the drawings and as specified herein.
 - 2. Interactive / Non-Interactive monitors located on the Podiums and connection to the local AV Distribution Systems as detailed on the drawings and as specified herein..
- B. All material and/or equipment necessary for proper operation of the system, not specified or described herein, shall be deemed part of these specifications.

1.3 Quality Assurance

- A. All system components shall be UL listed.

- B. Installation shall be in compliance with the National Electric Code and all other applicable codes.
- C. All equipment described herein or otherwise required to perform the specified system functions shall be a regular product line, produced by the system manufacturer.
- D. All materials furnished under this contract shall be new, of highest quality and shall be of a regularly manufactured line, currently in production at the time of installation.

1.4 Contractor Qualifications

- A. The A/V equipment package shall be furnished and installed by a contractor who meets all the requirements listed herein. It shall not be acceptable for the A/V contractor to utilize a Subcontractor for any portion of the work, unless the Subcontractor has been approved in writing by the Engineer based upon adherence to the qualifications listed herein.
- B. The Contractor shall maintain a fully equipped, factory certified service organization capable of providing full maintenance and service of the installed system within 24 hours. This facility shall be available for inspection by the Engineer.
- C. Equipment supplier shall have a service organization within 75 miles of the project site.
- D. The Contractor shall employ factory trained service personnel for the service and maintenance of the system.

1.5 Shop Drawings

- A. Refer to Section 27 05 01 Basic Communication Requirements.
- B. A complete and comprehensive list of materials with quantity, manufacturer, model and part number and reference to the Part 2 specification paragraph number for each item.
- C. Manufacturers Data Sheets of all products and cabling, specific to the project. Data sheets shall show the exact parts, with model numbers and options as required and clearly identified.
 - 1. Drawings shall include designations, dimensions, operating controls, electrical requirements, input/output configurations, operating controls, etc.
 - 2. Major components including all sub-assembly components (daughter cards, option cards, etc.) required to perform the specified functions.
 - 3. Any items of equipment which have features and/or functions that deviate from the specifications contained herein, shall have these deviations clearly called out by a separate attachment with the shop drawings specifically listing and detailing the deviation along with a justification. Deviations must be approved specifically in writing.
- D. Job specific diagrams.
- E. 30x42 floor plans at a scale of not less than 1/8 inches=1 foot-0 inches showing the location of all items of equipment. Drawings shall also indicate each location where electrical power is required, and the specific configuration of that power connection (voltage, plug type, mounting height, etc.)

- F. Proposed construction details for all custom fabricated items, including wall plates, interface panels, mounting hardware and systems, and rigging hardware. These details shall show labeling, dimensions and indicate finishes and color selection.
- G. Submittals that do not contain all the required information will be REJECTED unless prior approval for partial submittals has been approved.

PART 2 - PRODUCTS

2.1 Product Equivalency

- A. Where products are listed with multiple manufacturers, these manufacturers will be approved as equals **if all specified features are provided**. Any equipment not specifically approved in writing prior to the bid date will not be considered regardless of qualifications. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate equipment at the Contractor's expense.
- B. Different manufacturers may require various options, accessories, converters, patch cables, etc. to perform the specified features and functions. Therefore, all material and/or equipment necessary for proper operation of the system shall be deemed part of these specifications.

2.2 Projectors

A. Large Format Video Projector – Upper Level

- 1. The projector shall be a Laser Projector
- 2. The projector shall have a native resolution of 1920x1200 WUXGA
- 3. The projector shall have a maximum brightness of 22,000 lumens
- 4. The projector shall have a contrast ratio of 10,000:1 or 30,000:1 (with DB on)
- 5. The projector shall have an expected light source lifespan of 20,000 hours
- 6. Basis of Design:
 - a. Vivitek DU9900Z-BK
 - b. Approved Equal Manufacturers: Epson, Panasonic, Optoma

B. Large Format Video Projector – Lower Level

- 1. The projector shall be a Laser Projector
- 2. The projector shall have a native resolution of 1920x1200 WUXGA
- 3. The projector shall have a maximum brightness of 8,500 lumens

4. The projector shall have an expected light source lifespan of 20,000 hours
5. The projector shall use a Laser Phosphor illumination method
6. Basis of Design:
 - a. Epson EB-PU1008W
 - b. Approved Equal Manufacturers: Vivitek, Panasonic, Optoma

2.3 Podium Mounted Display – Non-Interactive Configuration

- A. Basis of Design as indicated on the drawings, Wide-screen, LED flat panel, high definition display with 16:9 aspect ratio, 1920 x 1080 native display resolution, 60Hz refresh rate.
 1. A/V inputs
 - a. HDMI
 - b. DisplayPort
 - c. Analog Audio
 - d. USB – Monitor shall be configured to be Non-Interactive; USB shall not be connected to OFOI PC.
 2. Monitor shall be Planar Helium PCT2235 or equivalent. Monitor shall include tilting desk mount.

2.4 Podium Mounted Display –Interactive Configuration

- B. Basis of Design as indicated on the drawings, Wide-screen, LED flat panel, high definition display with 16:9 aspect ratio, 1920 x 1080 native display resolution, 60Hz refresh rate.
 1. A/V inputs
 - a. DVI-I
 - b. USB – Monitor shall be configured to be Interactive and be connected to OFOI PC.
 2. Monitor shall be **Wacom DTK-2451 (Addendum #1)** Interactive Pen Display or equivalent. Monitor shall include tilting desk mount.

2.5 Projector Mounts

- A. Ceiling Mount
 1. Provide a universal projector mount with the following minimum adjustments:
 2. Pitch: +5/-20-degree
 3. Roll: +/- 1—degree
 4. Swivel: 360-degree
 5. Peerless model PRS-UNV

6. Adjustable suspended-ceiling mounting kit. Peerless model CMJ500.
7. Provide an attachable swivel mount in locations with sloped ceilings. Peerless model ACC912.
8. Extension column(s) (1-1/2-inch diameter) as required to position the projector at the required mounting height.
9. Equal manufacturers: Chief, Premier

2.6 Projection Screens

A. Lower Level

1. The electrically operated, ceiling recessed screen shall have two motors, one to operate the closure door and one to operate screen. It shall provide the following features:
 2. Aspect Ratio: 16:10
 3. Screen Size: 200 inch diagonal
 4. Screen Fabric: White screen with minimum gain of 1.00
 5. Provide with a drop to place the bottom of the screen at top of the marker board (where required).
 6. Rigid metal roller.
 7. Each side of the fabric to have tab guide cable system to maintain even lateral tension and hold surface flat. Custom slat bar with added weight maintains vertical tension on the screen surface. The ends of the slat to be protected by heavy duty plastic caps enclosing a preset adjustable mechanism for screen tensioning.
 8. The case shall be a white powder coated extruded aluminum. The bottom of case shall be self-trimming with a built-in flange around the bottom of the case. A section of the bottom of the case shall be an aluminum door equipped with hinges so that it opens and closes automatically with the lowering and raising of the picture surface. The balance of the bottom of the case shall be a second hinged aluminum door with manual opening to provide access. Hinges shall be mounted in a concealed way.
 9. A junction box shall be internally integrated into the housing making it possible to install the housing and wire to the building's electrical system during construction. The junction box shall contain a quick connect connector that is mounted in the housing for easy plug-in connection to the motorized fabric and roller assembly.
10. The motorized fabric and roller assembly to be installed in the case at the factory or at a later time at the job site.
11. Integrated low voltage control unit and three position control switch and cover plate.

12. The motor shall accept control from at a minimum RS-232 or relay contact closure.
13. Suitable for use in environmental air space in accordance with section 300-22 (c) of the National Electric Code. Screen to be listed by Underwriters' Laboratories.
14. Coordinate location and height with Architectural Drawings.
15. Basis of Design: Draper Access V
16. Approved Equal Manufacturers: Da-Life or Stewart Filmscreens

B. Upper Level

1. The electrically operated, ceiling recessed, screen shall have two motors, one to operate the closure door and one to operate screen. It shall provide the following features:
 2. Aspect Ratio: 16:10
 3. Screen Size: 335 inch diagonal
 4. Screen Fabric: White screen with minimum gain of 1.00
 5. Rigid metal roller.
 6. Each side of the fabric to have tab guide cable system to maintain even lateral tension and hold surface flat. Custom slat bar with added weight maintains vertical tension on the screen surface. The ends of the slat to be protected by heavy duty plastic caps enclosing a preset adjustable mechanism for screen tensioning.
 7. The case shall be a white powder coated extruded aluminum. The bottom of case shall be self-trimming with a built-in flange around the bottom of the case. A section of the bottom of the case shall be an aluminum door equipped with hinges so that it opens and closes automatically with the lowering and raising of the picture surface. The balance of the bottom of the case shall be a second hinged aluminum door with manual opening to provide access. Hinges shall be mounted in a concealed way.
 8. A junction box shall be internally integrated into the housing making it possible to install the housing and wire to the building's electrical system during construction. The junction box shall contain a quick connect connector that is mounted in the housing for easy plug-in connection to the motorized fabric and roller assembly.
 9. The motorized fabric and roller assembly to be installed in the case at the factory or at a later time at the job site.
10. Shall be capable of control from either RS-232 or relay control
11. Suitable for use in environmental air space in accordance with section 300-22 (c) of the National Electric Code. Screen to be listed by Underwriters' Laboratories.

12. Coordinate location and height with Architectural Drawings.
 13. Provide 24 inches (2 feet) of screen drop from screen case to top of image.
 14. Basis of Design: Draper Paragon E
 15. Approved Equal Manufacturers: Da-Life or Stewart Filmscreens
- 2.7 Surge Suppressors (for all display devices): The surge suppressor shall be a compact mountable unit in a magnetic shielding steel enclosure. It shall operate from 120 volts AC and include a separate 3-foot, grounded, 3-wire #18 line cord. There shall be 2 grounded AC receptacles. Overall dimensions shall be 1.75 inches H x 5.31 inches W x 9.06 inches D. Weight shall be 3.4 pounds. It shall have a load rating of 8 amps @ 120 volts. It shall be listed to UL 1449-2 and certified to Federal Grade A, Class 1, Mode 1 Guidelines for powerline surge suppressors. The unit shall provide auto-resetting overvoltage shutdown. There shall be three limiter circuits: a series surge reactor current limiter, a cascaded auto-tracking dual-polarity voltage limiter, and a pulse inverter. The onset clamping voltage shall be 172 volts nominal, and the unit shall have an instant-reacting snubber to protect against fast-rising surges generated within the installation location. The surge suppressor shall have an unlimited Applied Surge Current rating (8 x 20 μ s) and shall withstand at least 1000 occurrences of Surge Pulse Voltages up to 6000 volts. Provide a Surgex model SA82 Flatpak for each flat panel monitor and projector. No substitutes.

PART 3 - EXECUTION

3.1 General Installation

- A. Equipment shall be furnished and installed in accordance with manufacturer's recommendations in compliance with all local, city, state and national codes.
- B. Provide all hardware, framing members, etc. as required for mounting supports.
- C. All penetrations in smoke or firewalls shall be sealed with fire stop rated for this purpose.
- D. The installation of all work shall be neat and of professional quality. Cooperate with other trades in order to achieve well-coordinated progress and satisfactory final results. Execute without claim for extra payment minor moves or changes in equipment locations to accommodate equipment of other trades or the architectural symmetry of the facility.

3.2 Projector Installation

- A. Contractor shall field verify the location of projector, structural elements at the proposed mounting location, and the screen/lens combination to ensure proper installation prior to mounting equipment. Where field conditions will not provide the correct application for the proposed projector type/location/mounting method, the contractor shall notify the Engineer/Architect in writing. Notification shall include proposed alternatives for review.
- B. Projectors shall be mounted straight, level and true and shall provide the desired image size/orientation on the projection surface.

- C. Contractor shall custom configure the projector video/image/setting menus once source equipment and AV system is operational. Projector set-up shall be completed and the optimal settings stored for later recall.
- D. Programming of projectors and centralized projector control software including all network assignments, passwords, schedules, etc.

3.3 Flat Panel Installation

- A. Contractor shall field verify the location of each flat panel with surrounding structural elements and room furnishings at the proposed mounting location to ensure proper installation prior to mounting equipment. Where field conditions will not provide the correct application for the proposed flat panel type/location/mounting method, the contractor shall notify the Engineer/Architect in writing. Notification shall include proposed alternatives for review.
- B. Flat panel displays shall be mounted straight, level and true.
- C. Contractor shall custom configure the flat panel video/image/setting menus once source equipment and AV system is operational. Flat panel set-up shall be completed and the optimal settings stored for later recall.
- D. Programming of flat panels and centralized AV control software including all network assignments, passwords, schedules, etc.

3.4 Tests

- A. Upon completion of installation and satisfactory testing of system by Contractor in presence of the equipment supplier, the Contractor shall test the system in the presence of the Owner and the Engineer to demonstrate satisfactory performance.
- B. System shall be tested by and a certificate of inspection shall be furnished by a qualified manufacturer's representative or equipment vendor; Submit report indicating result to the Engineer.

3.5 Identification/Labeling

- A. Contractor shall identify all major items of equipment and tag all cables with Machine Printed Labels to denote equipment served. Cables shall be tagged at both end and at each point where the cable is administered.
- B. The contractor shall be responsible for applying a permanent label to each cable to indicate source and destination.
- C. All labeling and recording shall be approved by the Owner and the Engineer prior to application.

3.6 Training

- A. Provide step-by-step user instructions identifying operator controls for normal use operations. This shall be included with the O&M manuals.

- B. The contractor shall arrange for a total of sixteen (16) hours for end user training on the various A/V Systems. This training shall be planned and scheduled with the Owner. Training plan shall be pre-approved by the Engineer/Architect and shall include a review of the proposed syllabus.
- C. Video record the training sessions and provide an electronic copy to the Owner.

3.7 O & M Manuals

- A. Copies of all approved shop drawings with the Engineer's stamp.
- B. Owner's manuals for every item of equipment when available from the manufacturer. These shall be the technical manuals provided by the manufacturer and shall not consist of generic sales brochures. Technical manuals shall provide complete specifications for the equipment as well as complete operating, maintenance, troubleshooting and product repair/replacement information. Where available only in electronic format, the contractor may provide a CD with electronic versions of Owner's manuals. CDs containing electronic versions of Owner's manuals must contain the proper software viewers for each document type.
- C. Technology drawings updated with final as-built information. This shall be in the form of a complete set of Technology drawings with as-built information indicated in colored pen based upon actual field conditions.
- D. System schematic and block diagrams for every system updated with final as-built information. These drawings shall define the exact arrangement of each system including wiring configuration, device locations and cable types.
- E. Rack elevations for all systems with rack mounted equipment.
- F. System Operating Instructions: Provide a clear and concise description of operation which gives, in detail, the information required to properly operate the equipment and system.
- G. Provide statement of warranty with O&M Manuals.

3.8 Warranty

- A. Warrant all workmanship, equipment, material and software entering into this contract for a period of three (3) years from date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect or Construction Manager. Any materials or equipment proving to be defective during the warranty period shall be made good without expense to the Owner. Provide a statement of this warranty with the O & M Manuals.
- B. During the warranty period, report to the site and repair or replace any defective materials or workmanship without cost to the Owner. Warranty service shall be rendered within 24 hours after request by the Owner. Equivalent replacement equipment shall be temporarily provided when immediate on-site repairs cannot be made.
- C. Where warranties on individual pieces of equipment exceed three (3) years, the guarantee period shall be extended to the warranty period of the particular items.

- D. After completion of the work, the Contractor shall submit a Certificate of Warranty, stating commence and expiration dates and conditions of the warranty, for signature of both participating parties. Incremental warranties for complete portions of the work may be negotiated at the discretion of the Owner, if delays occur beyond the control of the Contractor.

END OF SECTION