

SECTION 27 41 16

MEDIA SERVICES AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes equipment and installation requirements for audiovisual systems in the following spaces:
1. Training Room
 2. Multi Media Conference Room number 449
 3. Multi Media Open Office Area 445
 4. Recording Studio

1.2 FUNCTIONAL DESCRIPTION

- A.
- B. General Notes:
1. Ceiling mounted Motorized screen will be 16:9 aspect ratio.
 2. Provide and install ceiling mounted LED/Laser based lampless video projector.
 3. Wall Mounted flat panels are provided and installed where specified.
- C.
- D. Training Room with Front Teaching Station:
1. Owner furnished PC is mounted under the instructors table at the front of the room.
 2. A wall mounted receptacle is installed on the wall under the instructors table for connecting a portable laptop computer to the video projector. The HDMI connection cable is to pass through the instructor table hole for plugging into the instructors laptop.
 3. Ceiling mounted Motorized screen and wall mounted control switch are provided and installed.
 4. Ceiling mounted LED/Laser based lampless video projector is provided and installed.
 5. Remote control system is installed and programmed to turn the video projector ON or OFF, select input and control power. The control for the motorized screen is on the wall and duplicated on the remote control button panel.
 6. Flush ceiling mounted loudspeakers are installed for speech reinforcement and audio playback purposes.
 7. An HDMI link is installed to the video projector for the instructor installed PC.
 8. A VGA adaptor is used with the HDMI cable to connect a portable computer to the video projector. The adaptor is on a ring of adaptors providing connection for VGA, display port and Mini display port.
 9. Ceiling mounted microphones are used to connect to the OFE PC for connection to the existing lecture capture system.
 10. A ceiling mounted video camera connects the training room to the archive recorder through the OFE computer at the instructor's desk.
 11. Digital marking display is connected to computer and software.
 12. Audio teleconferencing uses an installed system mounted under the instructor's table with a desktop dialer and uses the ceiling microphones, room playback loudspeakers and a DSP unit for echo cancellation and connection the OFE phone line.

E. Multi Media Conference Room:

1. One large flat panel is wall mounted on the wall opposite the entrance to the room.
2. Remote control button panel is installed adjacent to the wall mounted flat panel and programmed to turn the video display ON or OFF, select input and control the volume.
3. HDMI and USB input are provided on the wall near the control panel.
4. HDMI and VGA plus audio inputs are extended to the table for to tabletop connectors provided by the table provider use by meeting participants.
5. The flat panel internal loudspeakers are used for audio playback purposes.
6. Video conference camera mounted to the top of the flat panel and connected to the mini PC behind the flat panel.
7. Microphone array mounted under the flat panel and connected to the PC mounted behind the flat panel.
8. Wireless Keyboard and mouse connected to the mini PC for operational control of the PC.
9. The OFE video conference PC located behind the wall mounted flat panel is operated by an OFE wireless keyboard.

F. Multi Media Meeting area:

1. One large flat panel is wall mounted on the wall.
2. Remote control button panel is installed adjacent to the wall mounted flat panel and programmed to turn the video display ON or OFF, select input and control the volume.
3. HDMI, VGA and USB input are provided on the wall near the control panel.
4. HDMI and VGA input are connected to receptacles provided by the table supplier.
5. The flat panel internal loudspeakers are used for audio playback purposes.

G. Recording Studio:

1. This room is mostly portable equipment so that the room can be used as multiform shooting studio.
2. A Smart video panel is provided on the podium and on the table and connected to the OFE computer.
3. The flat panel internal loudspeakers are used for audio playback purposes.
4. Computer, Digital Marking Computer Display (connected to the computer) are provided.
5. Computer, Digital Marking Computer Display as is the monitor mount video conference camera and desktop microphone on the OFE Capture station furniture.
6. Two ceiling mounted video cameras are connected through a wall backbox for connection to the dual capture card computer used for recording.
7. One ceiling mounted microphone is connected through a wall backbox for connection to the computer used for recording.

H. Recording Studio Lighting:

1. Specified lighting instruments are to be hung on the ceiling of the recording room and connected to the provided AC power receptacles.
2. Provide and connectorize all provided lighting instruments, hang, cable and focus studio lighting in the recording studio.
3. Hang and focus one key, one fill and one overhead backlight for the desktop station and also for the podium station. Circuit for independent control of all studio lighting instruments.

1.3 AUDIOVISUAL CONTRACTOR BID

- A. Furnish and install an itemized bid with full pricing for each item. The Owner reserves the right to exclude items or rooms as the budgetary needs dictate.
- B. The Owners Representative may also add or delete individual devices or items to the device list and will use current published list price as a negotiating point for installed price.

1.4 AUDIOVISUAL CONTRACTOR RESPONSIBILITY

- A. Furnish and install a complete and functioning audiovisual system including cabling, receptacle plates, loudspeakers, and electronic devices. Provide and install all components including the necessary equipment, interconnections, transducers, labor, and services required to meet specifications herein and as indicated on the drawings. Any item listed in the specification or shown on the drawings is to be included as part of this scope of work. Items specifically indicated on the drawings as, "Not in Contract" or "Future," are not to be provided. Items specifically indicated on the drawings as "Owner Furnished" or "OFE" are to be provided by the Owner and installed by the contractor. Items listed as "Owner Installed" are provided and installed by the Owner to work of this installation.
- B. Provide any conduit, wire raceways, and back boxes that are required to maintain a neat and permanent installation for these systems.
- C. Due to the fact that this work is primarily renovation of existing systems, it is necessary to verify site conditions including dimensions, clearances, conduit sizes, and routing. In many cases, the infrastructure is existing, and is to be reused. The contractor is responsible for verifying existing infrastructure prior to beginning work. Coordinate the exact location of the equipment with the Owner's representative.
- D. Verify that 120-volt AC power has been supplied near each equipment location.
- E. Verify the necessary amount of additional black-drop required for projection screens, if any.
- F. Notify the Owner's Representative in writing prior to AV installation of any penetrations at walls, ceilings and floors required for the installation of audiovisual equipment and cabling.
- G. The College will be responsible for the structural engineering of suspended AV components. Verify that the systems have been engineered prior to installation of suspended devices including, but not limited to, loudspeakers, equipment racks, projectors, flat panel monitors, etc.
- H. Conduct preliminary testing and adjustment. Submit documentation required by this specification. Participate in approval testing for acceptance. Perform final adjustments as required to meet specifications.
- I. Deliver bound "as-built" system documentation. Transfer all warranties and equipment guarantees and provide a written description of system operation to the Owner at the time of acceptance of the work by the Owner. Provide system operation training as specified in Section 3.8.
- J. Provide as-built drawings of all systems, including modifications to the as-built infrastructure if any. Provide CAD files on storage format preferred by the Owner. Store files on site in the system documentation binders in disk sleeves.

1.5 QUALITY ASSURANCE

- A. All materials must be newly manufactured current production models and must conform to all applicable codes and the relevant standards listed below:
 - 1. American National Standards Institute (ANSI)
 - 2. Electronic Industries Association (EIA)
 - 3. Institute of Electrical and Electronic Engineers (IEEE)

4. Underwriters Laboratories (UL)
 - B. Coordination: The Contractor shall coordinate with all other trades in scheduling work. The Contractor is responsible for coordination of and compensation for any work or subcontractor work including but not limited to electrical, finish carpentry, metal work, and drywall.
 - C. Experience:
 1. The Contractor will specialize in the installation of audiovisual professional/commercial systems.
 2. Installers and engineers must individually have a minimum of five years of documented experience in the field of audiovisual system installation.
 3. The Contractor will have documentation that they have successfully completed audiovisual installation projects within the University of California school system.
 4. The company must have an office and staff in the Bay Area.
 5. The company must be an approved dealer for devices and components installed. Dealership includes training and a path for warranty repair or replacement.
 - D. Supervision:
 1. The Contractor will designate a single supervisor to oversee the installation work for the duration of the project to ensure that the system is installed in accordance with the specification and drawings.
 2. The supervisor will maintain adequate staff and be responsible for installing and testing the system on schedule.
 3. The supervisor will have at least five years of documented, recent, and similar project experience.
 - E. The Owner reserves the right to make use of the system prior to the final acceptance of the system. Temporary use of the equipment will not constitute an acceptance of the system or any part. The Owner will not pay additional cost to the Contractor and the commencement of the warranty period will not begin for the system or any device prior to the final acceptance of the system by the Owner.
 - F. Codes: Contractor will comply with all applicable laws, regulations and codes.
 - G. Dealership: The Contractor shall be a dealer for all devices provided and installed and shall provide full factory warranty on all products.
 - H. Control System Programming: Contractor shall have all control system programming provided by a certified programmer.
- 1.6 SUBMITTALS
- A. Comply with submittal provisions of the Owner.
 - B. Bid Submittals: Submit the following qualification documents:
 1. Firm description.
 2. List of related projects. Related project list to include project name and location, description of project, contract amount, reference name, and telephone number. One of the related projects must have been completed within the last 12 months.
 3. Resumes of project supervisor documenting related experience. Project supervisor must have completed at least one installation in the past 12 months.
 4. Names and scope of work for any subcontractors whose work would be part of this contract.
 5. Clearly describe any deviations from and exceptions to the specifications or drawings.
 6. For the base bid, provide an equipment list including all major devices. The bid shall not be considered complete without this list.
 7. Along with the quoted price, provide a factor for additive changes and delete changes. The add change factor should include the product, installation, engineering, tax and shipping. Delete change factor should include listed devices,

installation, tax, return shipping and verified restocking charges. No change in scope will be considered without line item documentation. These factors will also provide a basis for product changes necessitated by product advancement between the time of the writing of this specification, and the final integration.

C. Construction Submittals:

1. Submit complete equipment list by manufacturer, model number, and type. Include all accessories, options and functional components, and quantity to be supplied. Note that due to the project schedule, this may be submitted at the time of product ordering, and any changes required will be made knowing that restocking and expedited shipping charges will apply. Submit shop drawings to consultant for review, comment and approval. Installation is not to commence until approval has been received.
2. Submit shop drawings for each building space included in this specification with the following drawings (as required by specific system):
 - a. Point-to-point functional wiring diagrams for all audio, video, control, and related signal system wiring diagrams. Must be connector pin-specific. Re-used Audiovisual Consultant design drawings with wire run numbers added are not acceptable for field construction use. Devices and connections including connection plates noted "typical" with quantity designations and net acceptable as each plate is to have unique labels and numbers.
 - b. All receptacle plates and panels, including rackmount panels with labeling shown for engraving.

D. Submit samples of engraved labels, cable marking system, and receptacle plate/panel etching.

E. Submit all proposed button panel labels for all physically engraved button panels.

F. Acceptance Test Submittals: Prior to requesting the completion of the acceptance tests, submit Preliminary Test Report including all information required in Part 3. The Contractor is to provide a letter on company letterhead verifying that all devices and signal inputs have tested and are operable. This letter is to be signed by the project manager and sent to the consultant before acceptance testing can proceed.

1.7 PERMITS AND INSURANCE

- A.** Permits: Obtain any necessary permits for the execution of this work in conformance with applicable union regulations, local, State and Federal codes and regulations.
- B.** Insurance: Provide evidence of insurance for the full value of equipment and material located on site. Insurance will cover all losses until the work is formally accepted. Maintain additional liability insurance to protect the supplier and/or Owner against damage claims for personal injury, including death, which may arise during the performance of this work.

1.8 WARRANTY

A. Installation Contractor Warranty

1. Contractor shall provide a one (1) year warranty. This warranty is to cover installed devices, wiring, terminations, and adjustments. This warranty is not to cover vandalism, mischief, Owner or user misuse, or subsequent activities out of the control of the installing contractor.
2. Warranty period shall begin upon formal acceptance following execution and acceptance of all punch list items.

B. Manufacturer Warranty

1. Standard products provided and installed by subcontractors shall be enforceable for the length of that warranty. If the extended specialty warranty is beyond the one year contractor warranty, full contact information and warranty terms must be

provided to the Owner. This information shall be provided as part of the Owner's manuals. The installing contractor will serve as the agent for these warranty returns.

PART 2 - PRODUCTS

2.1 GENERAL: All submitted equipment must meet the minimum performance requirements of this equipment. Refer to drawings for quantity verification. Any device shown on the drawing or listed in the specification is required.

2.2 Devices found in all rooms:

Item	Brand	Model	Units
Wire and Cable			
Loudspeaker Cable	Liberty	16-2C-P-VIOLET	1
Audio Cable	Liberty	18-3P-PINDSH-WHT	1
RS-232 Cable	Liberty	22-10C-SH-GRY	1
Control Cable	Liberty	16-4C-P-YELLOW	1
Connectors and Terminations	Liberty	Connectec	1
Custom Plate	RCI Custom	Custom	2
Misc Connectors, Cables, Hardware	Various	Various	1
Video Devices			
HDMI Extender (TX/RX Pair)	SP Controls	Catline HDMI	2
HDMI Cable	Neutrik	NKHDMI-3	2
HDMI Connector	Neutrik	NAHDMI-W-B	2
HDMI Connector	Liberty	DL-AR	4
Control Devices			
Wall Mount Control Panel (OFE)	Extron	MLC 62 RS D	3
Accessories	Extron	Button caps, programming	3
Hardware Items			
Training Room wall backbox "D"	FSR	PWB-253	1
Video Projector Mounting Hardware	Chief	RPMU	1
Video Projector Column Storage Shelf	Chief	CMA480W	1
Video Monitor Wall Mount	Chief	LSMU	2
Misc Connectors, Cables, Hardware	Various	Various	1

2.3 Training Room with Front Teaching Station:

Item	Brand	Model	Units
Hardware Items			

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Media Services Relocation**

Video Projector Column Mount	Chief	CMA	1
Ceiling Projection Screen with LVC	Da-Lite	84328LS	1
Under table mounting brackets	Extron	UTM 100	1
Under table secondary mount	Extron	UTM 150	1
Marking Video Monitor	Smarttech	Smart Podium 500	2

Audio Devices

Shallow ceiling mount Loudspeakers	Atlas	FA- 6T	6
Ceiling Loudspeaker Amplifier	Extron	XPA 2001	1
Ceiling Microphone Array	Clear One	910-001-014	2
Ceiling Microphone EX Box	Clear One	910-154-020	2
Ceiling Microphone Teleconference	Clear One	910-154-010 (Interact AT)	1
Audio Conference Dialer	Clear One	910-154-035	1
Audio Passive Combiner	RDL	STD- 10K	1

Video Devices

Ceiling Mounted Video Projector	NEC	PE-401H	1
Ceiling Mount Camera	Panasonic	AW-HE2	1
Marking Video Monitor	Smarttech	Smart Podium 500	2

2.4 Media Services Conference Room:

Item	Brand	Model	Units
Video Devices			
Wall Mounted Video Monitor	Sharp	LC60LE657U	1
HDMI Extender (TX/RX Pair)	Kramer	SID-X1N/TP574	1
Video Conference Camera	Panasonic	AW-HE2	1
Video Conference Camera Mount	Panasonic	Accessory	1
Audio Conference Array Microphone	Voice Tracker II	Model II	1
Audio Conference Microphone Shelf	Custom	Custom	1
Video Conference PC	Owner:	OFE	1
Wireless Keyboard and Mouse	Owner	OFE	1

2.5 Media Services Meeting Area:

Item	Brand	Model	Units
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Video Devices

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Wall Mounted Video Monitor	Sharp	LC60LE657U	1
HDMI Extender (TX/RX Pair)	Kramer	SID-X1N/TP574	1

2.6 Recording Room:

Item	Brand	Model	Units
Video Devices			
Marking Video Monitor	Smarttech	Smart Podium 500	2
Ceiling Mount Camera: Whiteboard	Panasonic	AW-HE2	1
Ceiling Mount Camera: Podium	Panasonic	AW-HE2	1
Video Conference Camera Mount	Panasonic	Accessory	2
HDMI Extender (TX/RX Pair)	Atlona	AT-HD4-S140SR	2
Ceiling mounted Microphone	Beyer	OM304 US	1
Microphone to USB	Shure	X2E	1
Podium	Spectrum	Media Manager Lectern V2	1

2.7 2.7 Lighting:

Item	Brand	Model	Units
Control Devices			
DMX Wireless Controller	Elation	SDC12	2
Wireless Dimmer Pack	Elation	Uni Bar	4
Wireless DM Transmitter	Elation	EWDMMXT	1
DMX Cables	Elation	AC3PDMX55pro	2
DMX Cables	Elation	AC3PDMX15pro	2
Power Cables: 20' 14/3 with U ground	Misc	Misc	10

Studio Lighting Instruments

LED flat panel with U ground plug	Elation	TVL 1000 II	2
Stand	Elation	PRO FS Stand	2
Trucolor LS Tungsten Studio Kit	Cineo	901.001	1
4 leaf Barn Door	Cineo	900.0048	3
Floor Turtle C-stand	Impact	LS-CT40M	2
High Light	Elation	ARENA PAR zoom RGBWA	2
Ceiling LED Panels	Microbeam	1024	6
LED Panels on Stands	Microbeam	512	2
Ceiling clip for hanging lights	EZ Clip		AR

2.8 Cable

A. Pre-Terminated HDMI or DVI-D cables:

1. Cables must be rated for HDMI 1.3a specifications or better, capable of passing 1080p or 1920x1200 resolution at distances under 10' without an active equalizer.
2. Manufacturer
 - a. Extron
 - b. Crestron
 - c. Neutrik
 - d. Liberty

B. UTP Cabling: CMR/CMP Rated. Tested to 550 MHz. Acceptable material: Liberty Category 6E.

C. Provide plenum-rated cable for all audiovisual cabling where required by code.

2.9 HARDWARE, AND MISCELLANEOUS

A. Provide matching manufacturer vents and blanks as required.

B. Rack Connections: AC power cables to the power strips shall be run in steel conduit. All in-going and out-going signal cabling shall be run in conduit independent of AC power conduit.

C. Connectors: Provide compatible plugs as indicated on the drawing sheets; all cable connectors shall have black anodized finish where available. Connector parts subject to any possible structural loading or stress shall be metal.

D. Portable Cables: For each wall, floor, or I/O panel receptacle that is not to be used by installed equipment, provide one portable cable with compatible connector for connection of portable devices to the system. Acceptable Material: Extron various models.

E. Conduit: Provide removable seals at penetrations for acoustic isolation.

F. Receptacle plates: steel or aluminum with etched and ink-filled labeling.

PART 3 - EXECUTION

3.1 GENERAL

A. The following is required for acceptance of the audiovisual system by the Owner:

1. Coordinate with the Owners representative for all OFE equipment. Coordinate for equipment type and connectivity for function.
2. Install complete and functioning audiovisual systems specified.
3. Label equipment and cables with names and corresponding to functional diagram. Label both ends of any installed or portable cables. Labels can be names.
4. Conduct adjustments and preliminary testing.
5. Report results of preliminary testing along with system documentation.
6. Participate in acceptance test and deliver final system and documentation.
7. Conduct any adjustments or re-testing required to meet specifications.
8. Provide training to individuals designated by the Owner.

3.2 GENERAL REQUIREMENTS

A. All equipment except portable equipment shall be held firmly in place. This includes racks, conduits, cables, amplifiers, and other electronic equipment. A licensed structural engineer shall approve fastenings and supports.

B. Submit shop drawings for custom fabrications including custom panels, receptacle plates, and rack elevations to the Owner for review and approval. Make submittals at least fifteen (15) working days prior to scheduled fabrication. Note on the submittal the dates of scheduled fabrication.

- C. Do not commence work on any portion of the project requiring Owner's approval prior to obtaining such approval. Work commenced and installed prior to review and approval shall be accepted at the Owner's discretion. Installation does not imply acceptance or review for acceptance.
- D. Keep at the job site an up-to-date complete record set of prints and specification. Make daily corrections and show all changes from the original contract drawings. Final As-Built drawings will be required at the conclusion of the project.
- E. Keep the job adequately staffed at all times. A qualified engineer approved by the Owner and employed by the Audiovisual Contractor shall exercise engineering supervision over the entire installation. Unless through illness, loss of personnel, or other circumstances beyond the control of the Audiovisual Contractor, keep the same individual in charge throughout the execution of the work.
- F. Cooperate with other trades in order to achieve well-coordinated progress and satisfactory results. Watch for conflicts with work for other contractors on the job. Execute, without claim for additional payment, moderate moves or changes as necessary or required by the Owner prior to installation to accommodate minor design changes, rack layout changes, or to preserve symmetry and pleasing appearance.
- G. Cables and wiring in racks, consoles, connector boxes and on terminal strips shall be clearly marked between 2" and 4" from end of cable gasket/harness. Provide maximum label visibility. Indicate the signal type, wire number, source and destination and jack, receptacle or socket to which connector should be mated. Use appropriate diameter clear shrink tubing over surface of label for protection and permanence. Extend shrink tubing over label by approximately 1/4" at each end.
- H. Label all devices including switches, control panels, monitors, and equipment. Label to be logical and permanent with clarity and legibility. Submit samples for approval.

3.3 EQUIPMENT CONNECTION

- A. Wiring: All wiring shall be installed in strict accordance with broadcast standard practices. Cabling jacket color shall be coordinated to maintain consistent identification.
- B. Cabling: Install vertical cable runs in conduit. All cable is to be continuous and without splices. Permanently label all cabling at termination points. Cables shall be bundled and laced neatly to maintain convenient access to all equipment connections. All audiovisual signal cabling are to be separate from all power lines.
- C. Power: Power conduit to be separated from other conduits containing signal lines. Connect AC power to the equipment from junction boxes designated by the Electrical Engineer.
- D. Connectors: Connections to screw clamp or binding post terminals require flanged or snap spade type lugs appropriately color-coded. Bare wire connected to a binding post is not acceptable. Soldered connections shall be soldered with rosin core solder.
- E. Grounding: Use the equipment chassis as a common point of grounding the sound system; the equipment chassis is to be grounded to earth. Cable shields shall only be used for shielding (not signal) and connected to ground at the rack. All equipment shall be checked for ground continuity.
- F. Fasteners, Hangers, Supports: Provide fasteners, supports and seismic restraints to adequately support the load as required by local codes.
- G. Markings: Permanently mark all connectors, cables, and cable terminations to indicate their function corresponding to the wiring diagram. All cable pairs shall be coded with permanently attached numbers on the cable ends with consistent color-coded markings to indicate their function.

3.4 INSTALLATION AND PROGRAMMING REQUIREMENTS

- A. Remote Control Software Programming:** Provide all necessary software programming to access all commonly used features for each item to be controlled. Submit control panel layouts for approval prior to on-site installation, either electronically or as printed screen copies. Revise control panels as required prior to the acceptance of the system. Provide at no extra charge, any reprogramming of the control system or control panels requested by the Owner's Representative within thirty days of acceptance of the system for user functionality issues. Provide all necessary programming for the functions listed below to be controlled individually via the control panel. Refer to the functional diagrams for additional information.
- 1. Power On/Off:** Provide a master On/Off control switch, which can be used to power down all equipment (except 'always on' control devices). All devices will be powered down from the master On/Off switch, including displays.
 - 2. Volume Controls:** Provide Up/Down/Mute controls for playback volume levels, with appropriate level control ranges set to prevent extremely loud playback levels. All volume and mute buttons are to operate in parallel between all available control panels. Buttons should "track" and actively update to display the current state with minimal delay.
 - 3. Source Select:** Provide audio-follow-video source selection for all sources and receptacle plate inputs.
 - 4. Projector Control:** Seamless source switching as necessary, and projector on/off. Provide a projector lamp-life query upon system power-up and display this number in hours next to the projector power on button. Projector control is to be bi-directional RS232, not 1-way serial control. Remote monitoring and control shall be possible via the network connection.
 - 5. Screen Control:** Provide control system programming for screen controls.
 - 6. The control system and all audio and video switchers will feature some capacity for future growth, and will not be completely filled by the system outlined in this specification. Switching capacity is not to be reduced, and all unused video inputs should be properly terminated.**
 - 7. Power Sequencing:** Provide power up sequencing such that power amplifiers turn on last and power down first.
- B. Custom Back boxes:** Provide custom back boxes for wall-mount control panels and docking stations to the project Electrical Contractor for installation and conduit termination at appropriate time based on the construction schedule.
- C. Loudspeaker Installation:** Use rigid support members to prevent movements of mounted loudspeaker components. All loudspeakers will be wired in positive phase.
- D. Equipment Mounting Coordination:** Audiovisual Contractor is responsible for coordination with the General Contractor and Electrical Contractor to ensure cable management solution provided to the AV equipment maximizes the usable lower rack-space, and minimizes the visibility and exposure of installation wiring.
- E. Audiovisual Contractor will review and assess the appropriate focal length between the video projectors and the video screens to ensure optimum picture sizing and focus. The image should completely fill the screen height available.**
- F. Coordinate with Architect and Owner's Representative for finish preferences. Submit for finish approval prior to ordering.**

3.5 WORKMANSHIP

- A. Installation of all work including cabling will be neat. All boxes including the loudspeaker enclosures, equipment, racks, etc., will be plumb, squarely located and, where appropriate, flush with adjacent surfaces. Replace all ceiling and floor tiles removed for**

this work when the work is complete. Leave the job site clean and free from marks and blemishes.

3.6 AUDIOVISUAL CONTRACTOR'S PRELIMINARY TESTING AND ADJUSTMENTS

- A. Furnish all equipment and personnel to conduct these tests in accordance with the performance specification requirements. ANSI S1.13 and EIA Standards RS-160, RS-219 and RS-189A will apply.
- B. Initially adjust all system gain controls for optimum signal to noise ratio. After all adjustments required to meet specification requirements are made, measure and report the resulting system electrical signal to noise ratio at the amplifier outputs from 20 Hz - 20 kHz in 1/3 octave bands.
- C. System Frequency Response: Measure the sound pressure level in audience areas using a calibrated type 1 precision sound level meter as defined by ANSI S1.4. Measure using the slow time constant. Report the unequalized house curve with the equalizer controls set to "0", by space.
- D. Audiovisual Contractor will ensure optimum picture sizing and focus. Make all adjustments necessary, including LCD projector keystone correction and lens shift to achieve the image size and shape required.
- E. Provide full video projector calibration and adjustments for optimal picture quality. Set all projector configuration presets required for control system recall coordination, and provide documentation with final system documentation.
- F. Controls: Adjust all controls to achieve the specified performance. Audiovisual Contractor will confirm that all control system operations are properly programmed and repeatable. Provide shaft-locks or covers for all level controls, as appropriate to prevent unauthorized gain changes.
- G. Report: Provide a letter/report documenting the results of these preliminary tests, including equalization curves for review by the Design Consultant.

3.7 ACCEPTANCE TESTS

- A. Qualification for Acceptance: Subsequent to completing preliminary testing, the Audiovisual Contractor shall furnish the Construction Manager with the letter/report documenting the results of the preliminary tests and two (2) copies of "as-built" wiring diagrams of the entire system including the connection numbers, and their locations. The receipt of this documentation will constitute the Audiovisual Contractor's acknowledgment that the installation is complete and conforms to this specification.
- B. Acceptance Test: The Owner's Representative and/or Construction Manager will be present during the acceptance testing and require the assistance and cooperation of the Audiovisual Contractor. In addition, provide the personnel who participated in the installation, preliminary testing and adjustment of the audiovisual systems.
- C. Equipment cabinet keys and any tamper-proof fastener tools must be available to the Owner's Representative.
- D. Each major component shall be demonstrated to function, as specified.
- E. Measurements: Further electrical and acoustical measurements may be performed at the discretion of the Owner and/or Owner's representatives. Such measurements may include sound pressure levels, uniformity of coverage, distortion, or other pertinent characteristics.
- F. The Audiovisual Contractor shall provide a laptop with all manufacturer supplied configuration software necessary for communicating with the Control System. A review of system settings may be required and settings may be adjusted if necessary.
- G. Such tests may be performed on any piece of equipment or system. If any test shows the equipment or system is defective or does not comply with the specifications, the

Audiovisual Contractor shall perform any remedies at his expense and pay the subsequent expenses of any retesting required.

- H. Delays: If the acceptance of the system is delayed because it does not meet the specification requirements, the Audiovisual Contractor shall reimburse the Owner for all expenses of consultants retained to represent the Owner during the final acceptance testing. This will include costs associated with travel to the site, and include reimbursable business travel expenses.

3.8 SYSTEM DOCUMENTATION, TRAINING, AND FIELD SUPPORT

- A. Operation and Maintenance Manuals: For each system, provide three (3) copies of system manuals per system, two (2) for the Owner and one (1) for the Design Consultant. Manuals shall be in adequately sized three-ring binders, clearly labeled on spine. Manuals shall contain the following:

1. Service Reference Cover Sheet: Provide a cover sheet with Audiovisual Contractor name, address, telephone and Fax numbers.
2. System Operation Instructions: Step-by-step operating instructions for the basic day-to-day use of the system including power activation, connection of microphones and other source devices, adjustment of volume levels, selection of sources and loudspeaker zones, etc. Include illustrations and references to individual equipment manuals as necessary.
3. Equipment Manuals: Include copies of individual equipment operation manuals separated by tabbed dividers. Order manuals in nominal signal path order (i.e. sources first, amplifiers/loudspeakers last), followed by control system manuals, followed by miscellaneous manuals.
4. Equipment List: List all system equipment including, connectors and specialty hardware, by manufacturer and model.
5. As-built Drawings: Provide reduced 8-1/2"x11" or 11"x17" foldout "as built" functional diagrams in clear plastic binder sleeves. Fold and insert drawings so that drawing title is clearly visible at the front of the sleeve.
- 6.

- B. Provide software programmable device configuration files to the Owner for all control system source code files. Store files on site in the system documentation binders in disk sleeves. Provide the files on CD-ROM. Store files on site in the system documentation binders in disk sleeves.

- C. Digital Documentation: Provide all technical and training documentation as files on a CD ROM to the Owners representative. All files are for use, reprinting and sharing within the Owners organization and are to be current will all changes and the final installation.

a)

- D. Training: Provide up to 4 hours of system training to user(s) designated by the Owner. Training time is to be non-contiguous, in at least two separate sessions. Some training time is to be used as live "first event" assistance. Assist and oversee user(s) during these events.

a)

END OF SECTION 27 41 16