

SECTION 27 41 00
AUDIOVISUAL SYSTEMS

PART 1 – GENERAL

1.01 PROJECT DESCRIPTION

- A. Project is a Physical Education (PE) and Student Union (SU) complexes on Los Medanos College Campus in Pittsburgh, CA.
- B. All material and devices in this specification section shall be Owner-Furnished, Contractor-Installed (OFICI)

1.02 DEFINITIONS

- A. "AV" - Audiovisual
- B. "AV Contractor" - Company contracted to provide scope of work as described in this specification section
- C. "Consultant" - Charles M. Salter Associates, Inc.
- D. "Owner" – Los Medanos College
- E. "Architect" – LPA Architects
- F. "AV Drawings" – "AV" Series Drawings
- G. "OFE" - Owner-Furnished Equipment
 - 1. Equipment furnished by Owner and installed by the AV Contractor as described in this specification section
- H. "GUI" - Graphical User Interface

1.03 SCOPE OF WORK

- A. This specification section and associated AV Drawings provide a full description of AV Contractor scope of work.
- B. Refer to general conditions and drawings by others for related work. AV Drawings include infrastructure that may be provided by other divisions; verify AV Contractor scope of work with General Contractor prior to bidding.
 - 1. Infrastructure such as conduit, pull boxes, junction boxes, and other cable pathway devices may be provided by another division. Confirm with General Contractor prior to bidding.

2. Projection screens, lifts, and other mounting hardware integrated into walls, floors, or ceilings may be provided by another division. Confirm with General Contractor prior to bidding.
- C. Refer to general conditions, and the following specification sections and drawing series for related work:
1. Architectural
 2. Interiors
 3. Telecommunications
 4. Security
 5. Electrical
- D. The following spaces require audiovisual installation under this scope of work:
1. Building A - PE Complex
 - a. Digital Signage Locations
 - (1) Lobby (PE-101)
 - b. Trainer's Room (PE-131)
 - c. Conference Room (PE-127)
 - d. Classrooms (PE-109, PE-111)
 - e. Fitness Spaces (PE-106, PE-108)
 - f. Team Locker Rooms (PE-144, PE-145, PE-156, PE-157)
 - g. General Training (PE-104)
 - h. Athletic Weight Training (PE-105)
 - i. BDF (PE-158)
 2. Building B - SU Complex
 - a. Digital Signage Locations
 - (1) Lobby (SU-101)
 - (2) Circulation (SU-102)
 - (3) Bookstore (SU-134)
 - (4) Server room (SU-124)
 - (5) Circulation (SU-201)
 - b. Active Space (SU-104)
 - c. Bookstore (SU-134)
 - d. Divisible Meeting Room A, B, C (SU-106, SU-108, SU-109)
 - e. Large Conference Room (SU-231)
 - f. Conference Room (SU-223)
 - g. Learning Spaces (SU-215, SU-218, SU-221, SU-224)
 - h. Shared Social Space (SU-213)
 - i. BDF (SU-123)
- E. Contractor shall coordinate with Owner to provide demonstration of specified Divisible Meeting Room camera, as well as up to (2) similar cameras. Contractor shall assume (1) 8-hour day of set-up, demonstration to Owner representatives, and tear down at or near the job site. Owner will provide space for Contractor to set up demonstration, Contractor shall provide camera and any additional equipment required to provide Owner

representatives with an accurate representation of how camera views will look in Divisible Conference Room, i.e. monitors, switchers, extenders, pan-tilt-zoom controllers, etc.

1.04 SYSTEM DESCRIPTIONS

A. Digital Signage Locations

1. Digital signage LCD displays for campus, building, or general information as deemed relevant by Owner
2. Digital Signage Media Player manufacturer(s) and model(s) to be determined by Owner
3. Digital Signage Media Player mounted behind display

B. Trainer's Room (PE-131)

1. Trainer's Room shall feature the following:
 - a. Single LCD display with internal loudspeakers for user content
 - b. HDMI and VGA +Audio inputs on wall for laptop connection
 - c. Button Control Panel on wall for display on/off, source selection, image mute, and volume control
 - d. HDMI Receiver mounted behind display

C. Conference Room (PE-127)

1. Conference Room shall be used for presentations, conference calls, and meetings and will feature the following:
 - a. Single short-throw projector with dual projection/whiteboard surface on wall (dual projection/whiteboard by other divisions)
 - b. HDMI and VGA +Audio inputs at table for laptop connection
 - c. Ceiling loudspeakers for video conference far-end microphone(s) and audio associated with video content
 - d. Tabletop speakerphone for audio calls
 - e. Touch Control Panel on table for system on/off, source selection, image mute, and volume control
 - f. AV equipment shall be housed in credenza rack
 - g. Video conferencing system with USB pan-tilt-zoom camera

D. Classrooms (PE-109, PE-111)

1. Classrooms shall be used for presentations and instructor-led classes and will feature the following:
 - a. Dual projection system with (2) video projectors with projection/whiteboard surface on wall (dual projection/whiteboard by other divisions)
 - (1) Ability to show different content from each video projector, or same content on both screens
 - (2) Recommended active projected image sizes: 104"W x 58"H

- b. Sit-stand lectern for instructor with:
 - (1) HDMI and VGA +Audio inputs on top surface for instructor laptop connection
 - (2) Installed computer
 - (3) Document camera for viewing paper or other physical objects on projection system
 - (4) Rack space for video switcher and AV headend equipment
- c. Tabletop Touch Control Panel for system on/off, source selection, image mute, and volume control
- d. BYOD device for wireless content sharing from instructor and/or students
- e. Overhead loudspeakers for voice reinforcement and audio associated with video content

E. Fitness Spaces (PE-106, PE-108)

- 1. Fitness Spaces shall feature the following:
 - a. Single LCD display for user content
 - b. Audio plate on wall above casework for user device audio connection to overhead loudspeakers
 - c. HDMI and VGA +Audio input plate for laptop connection to LCD display
 - d. BYOD device for wireless content sharing
 - e. Overhead loudspeakers for instructor speech reinforcement, user device audio, and audio associated with video
 - f. Wireless headset microphone for instructor-led fitness classes
 - g. Button Control Panel on wall for display on/off, audio source selection, image mute, and volume control
 - h. AV equipment shall be housed in BDF rack
 - i. HDMI Receiver and BYOD device mounted behind display

F. Team Locker Rooms (PE-144, PE-145, PE-156, PE-157)

- 1. Team Locker Rooms shall feature the following:
 - a. Single LCD display with integrated loudspeakers for user content
 - b. HDMI and VGA +Audio input plate for laptop connection to LCD display
 - c. BYOD device for wireless content sharing
 - d. Button Control Panel on wall for display on/off, source selection, image mute, and volume control
 - e. HDMI Receiver and BYOD device mounted behind display

G. General Training (PE-104)

- 1. General Training shall feature the following:
 - a. Multiple LCD displays for user content
 - (1) Note all displays will show same content
 - b. (2) HDMI and VGA +Audio input plates for laptop connection to LCD displays at staff desk
 - c. Digital Signage Media Player for “canned” video content when HDMI/VGA inputs not in use

- d. Overhead loudspeakers for instructor speech reinforcement, user device audio, and audio associated with video
 - e. Wireless headset microphone for instructor-led fitness classes
 - f. Touch Control Panel at staff desk for display(s) on/off, source selection, image mute, and volume control
 - g. AV equipment shall be housed in BDF rack
 - h. HDMI Receiver mounted behind display
- H. Athletic Weight Training (PE-105)
- 1. Athletic Weight Training shall feature the following:
 - a. Dual LCD displays for user content
 - (1) Note both displays will show same content
 - b. HDMI and VGA +Audio input plate adjacent to each display for laptop connection to associated display
 - c. Digital Signage Media Player at each display for “canned” video content when HDMI/VGA inputs not in use
 - d. Overhead loudspeakers for voice reinforcement and audio associated with video
 - e. Touch Control Panel at staff desk for display(s) on/off, source selection, image mute, and volume control
 - f. AV equipment shall be housed in BDF rack
 - g. HDMI Receiver mounted behind display
- I. BDF (PE-158)
- 1. BDF will house headend Control Processor for entire building AV systems, as well as some headend devices for room without equipment racks (refer to functional diagrams for devices within BDF).
- J. Active Space (SU-104)
- 1. Active Space shall feature the following:
 - a. Dual LCD displays for user content with integrated loudspeakers
 - (1) Each display's audio will be available as a source through a headset with wireless receiver (checked out from staff) to allow users to listen to content wirelessly
 - (2) Displays will have ability to show individual content, or both show the same content
 - b. HDMI inputs at credenza underneath displays via table boxes
 - c. Additional HDMI and VGA +Audio input wall plate at staff desk
 - d. Touch Control Panel at staff desk display(s) on/off, source selection, image mute, and volume control
 - e. Equipment rack within credenza underneath displays for AV equipment
 - f. HDMI Receiver mounted behind display
- K. Bookstore (SU-134)

1. Bookstore shall feature the following:
 - a. Audio system for background music and announcements via overhead loudspeakers
 - b. Announcements via push-to-talk microphone station at Reception desk
 - (1) Announcements shall “duck” background music audio
 - c. Includes overhead loudspeakers in Shipping & Receiving area (SU-136)
 - d. Control of audio system volume via table-top volume knob/control panel on Reception desk
 - (1) Tabletop control panel will also house line-level inputs for user devices
 - e. Digital Signage Media Player and LCD Display for Bookstore-specific content behind reception desk

- L. Divisible Meeting Room A, B, C (SU-106, SU-108, SU-109)
 1. Divisible Meeting Room shall be a versatile space, suitable for college use, or for outside entities to rent out as an event space. The room may be used as a single large space, or divided into two or three separate spaces, and shall feature the following:
 - a. Room partition sensors to allow AV system to automatically adjust audio and video routing and settings based on room partition open/closed status
 - b. Multiple projection systems with video projectors on motorized ceiling lifts and motorized projection screens at strategically placed positions for viewing user content
 - (1) Recommended projection screen sizes based on furthest viewer and ceiling height is 213”W x 120”H for screens along south wall. This will put the screen approximately 36” AFF to bottom of screen, and should provide adequate viewing for participants up to 60’ away from the screen.
 - (2) Since projection screens along east wall will only be used to supplement other displays, or only used when room is divided, screens for east wall display systems will be 116”W x 65”, with bottom of screen at 48” AFF.
 - c. HDMI and VGA inputs at wall box locations for laptop connection
 - d. Pan-tilt zoom cameras in each room division
 - e. Wireless microphone system(s) with (6) handheld and (4) clip-on microphones for voice reinforcement
 - f. Overhead loudspeakers for voice reinforcement and audio associated with video content
 - g. Intuitive control of AV devices via wall-mounted Touch Control Panels in each room division
 - (1) Advanced features may be accessed by staff via password-protected Touch Control Panel “pages” to allow advanced room configuration and routing schemes
 - (2) Room scheduling displays outside of each room division to show event information
 - h. Two (2) portable lecterns, each with a gooseneck microphone, gooseneck microphone shockmount, table box with HDMI, VGA, and

Audio pass-thru cables, and control touch panel mounted to the surface, for use in any of the spaces.

(1) Contractor shall provide umbilical cable sleeve for HDMI, VGA, audio, and power cable with approximately 6' of cable length from bottom of lecterns for connection to AV plates.

2. The room shall also facilitate operator-assisted events, where operator(s) can perform live sound mixing and processing, as well as dynamic video switching and routing. This functionality shall feature the following, accessible to operators via a single wall plate at the rear of the center room division:
 - a. Dante-enabled audio mixer will override audio DSP routing configurations to allow microphones and other sound sources to be directly input into mixer, with overall mix sent back to audio DSP to be routed to room division(s) based on partition sensor status
 - b. Video production switcher will allow operator to route video input signals to multiple projection screens in the space, or to owner-furnished recording and/or streaming device(s)
 - c. Additional SDI video inputs for portable cameras on walls

M. Large Conference Room (SU-231)

1. Large Conference Room shall be used for presentations, conference calls, and meetings and will feature the following:
 - a. Single projection system with video projector and motorized projection screen for displaying user content
 - b. Recommended active projection screen sizes: 116"W x 65"H
 - c. HDMI and VGA +Audio inputs on wall for laptop connection
 - d. BYOD device for wireless content sharing
 - e. Overhead loudspeakers for audio associated with video content
 - f. Touch Control Panel on wall for system on/off, source selection, image mute, and volume control
 - (1) Motorized shades will close when projection system is turned on
 - g. Equipment to serve the room will be stored in free-standing, locking equipment cabinet
 - h. HDMI Receiver and USB Transmitter mounted behind display

N. Conference Rooms (SU-223)

1. Conference Rooms shall be used for presentations and meetings, and will feature the following:
 - a. Single touch-enabled LCD display with integrated loudspeakers for user content
 - b. HDMI and VGA +Audio inputs at table for laptop connection
 - c. Button Control Panel on table for system on/off, source selection, image mute, and volume control
 - d. Equipment will be housed behind display
 - e. Video conferencing system with fixed USB camera and microphone combination unit

- f. HDMI Receiver and Zoom computermounted behind display
- g. Note Conference Room SU-117 is infrastructure only

O. Learning Spaces (SU-215, SU-218, SU-221, SU-224)

- 1. Learning Spaces are closed rooms for impromptu presentations and instructor-led classes and shall feature the following:
 - a. Single 70" LCD display with integrated loudspeakers for user and digital signage content
 - b. HDMI and VGA +Audio inputs on wall for laptop connection
 - c. BYOD device for wireless content sharing
 - d. Button Control Panel on wall for system on/off, source selection, image mute, and volume control
 - e. HDMI Receiver, BYOD device, and Digital Signage Media Player mounted behind display

P. Shared Social Space (SU-213)

- 1. Shared Social Space is an open area used for impromptu presentations and shall feature the following in (2) locations:
 - a. Single 70" LCD display with integrated loudspeakers for user and digital signage content
 - b. HDMI and VGA +Audio inputs on wall for laptop connection
 - c. Digital Signage Media Player at each display for "canned" video content when HDMI/VGA inputs not in use
 - d. Button Control Panel on wall for system on/off, source selection, image mute, and volume control
 - e. HDMI Receiver and Digital Signage Media Player mounted behind display

Q. BDF (SU-123)

- 1. BDF will house Divisible Meeting Room headend equipment, as well as headend Control Processor for entire building AV systems.

R. Assistive Listening

- 1. Assistive Listening Systems (ALS) are provided by other divisions. Coordinate with GC to ensure proper connection and implementation of AV systems and ALS.

1.05 AV 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” are not to be provided.

- B. By bidding on this scope of work, the AV Contractor confirms that the system functionality described herein can be achieved with the equipment and conditions described. Additional labor, materials, or connections required are the responsibility of the AV Contractor. AV Contractor shall notify the Owner if it is believed the described system functionality cannot be achieved with the equipment or conditions identified in this scope of work.
- C. IT Coordination: Coordination as required with the Owner’s IT representative where network related system configuration is required.
- D. Verify site conditions including dimensions, clearances, conduit sizes, and routing. Coordinate the exact location of the equipment with the architectural drawings. Report any conflicts that may interfere with systems installation.
- E. Verify that 120-volt AC power has been supplied near each equipment rack location, or any other location requiring AC power. Provide connection in flex-conduit from nearby AC power to equipment racks, where AC power receptacles are not located within the equipment rack enclosure. Provide and install all AC power receptacles within the equipment racks. Provide low-voltage turn-on controllers and switched outlets to activate and distribute AC power within the equipment racks.
- 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. Verify that the systems have been engineered prior to installation of suspended devices including, but not limited to, loudspeakers, microphones, flat panel monitors, video projectors, etc. Verify any attachment points and methods with licensed structural engineer prior to installation.
- H. Provide ventilation as required for equipment housed in millwork so that manufacturer-recommended temperatures are maintained during normal operating conditions.
- I. 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.
- J. 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.
- K. Provide system operation training as described in this specification section.
- L. Provide “as-built” drawings of all systems, including modifications to the as-built infrastructure if any, on full sized sheets. Revisions are to be made to the actual CAD computer files (red pen revision markups on paper drawing sheets are not acceptable) prior to print out. Provide CAD files on USB flash drive or storage format preferred by the Owner. Provide touch panel and control system source code, DSP system configuration

files, and all systems initial configuration preset files to Owner. Store files on site in the system documentation binders in disk sleeves.

- M. Owner Furnished Equipment: The AV Contractor shall be responsible for integrating owner-furnished equipment into the audiovisual systems as shown on the AV drawings.
- N. Perform all operations necessary to complete the installation.
- O. The audiovisual systems and components described in this specification section shall be free of any manufacturing, engineering, installation, or operational defects.
- P. AV Contractor shall provide installation that meets or exceeds applicable building codes.
- Q. System Programming and Graphical Interface Design
 - 1. The AV Contractor shall work with the Owner and/or Consultant to provide an agreed-upon GUI for all AV system Touch Control Panel interfaces.
 - 2. Provide all touch panel, control system, audio DSP, and audiovisual processing equipment source code created for the project to the Owner upon system acceptance.
 - 3. Millwork
 - a. Coordinate audiovisual system components in millwork and furniture. Contractor shall perform all cutting, patching and painting as required, and shall repair any damage done as a result.
 - b. Provide and coordinate adequate ventilation for audiovisual equipment housed in millwork within manufacturer-recommended temperature tolerances are maintained when cabinetry doors are closed and system is in normal use.

1.06 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)
 - 5. "B" stock and/or refurbished items are not acceptable.
- B. Contractor Qualifications
 - 1. Experience: The AV Contractor will specialize in the installation of audiovisual systems in professional/commercial environments. Installers and engineers must individually have a minimum of five years of documented experience in the field of audiovisual system installation.
 - 2. Dealership: AV Contractor shall be an authorized dealer for all products listed, and shall perform any manufacturer training, certification, or other specialized

requirements recommended by the manufacturer prior to installation. AV Contractor shall offer full factory warranty on all products provided.

3. Certification: Bidder must have at least (1) employee staffed on the project in a supervisory role with either CTS-D or CTS-I certification from InfoComm International.

C. Supervision

1. The AV 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.

- D. The Owner reserves the right to make use of the system prior to the completion of the punch list. 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 AV Contractor and the commencement of the warranty period will not begin for the system or any device prior to the completion of the punch list and final acceptance of the system by the Owner.

- E. Codes: AV Contractor will comply with all applicable laws, regulations and codes.

1.07 SUBMITTALS

- A. Comply with submittal requirements Division 01 General Requirements.

- B. Bid Submittals: Submit the following qualification documents:

1. Firm description.
2. Submit a list of authorized dealerships. The AV Contractor must be a dealer for any devices installed in this project to assure the installers are trained and that the dealer has a path for warranty repair as needed.
3. 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.
4. Resumes of project supervisor documenting related experience. Project supervisor must have completed at least one installation in the past 12 months.
5. Names and scope of work for any subcontractors whose work would be part of this contract.
6. Clearly list and describe any deviations from and exceptions to the specifications or drawings.
7. As part of the AV Contractor's bid, a fully itemized list shall be provided showing the manufacturer's cost basis for each piece of equipment. This cost basis may be used by Owner to substitute in comparably priced up-to-date equipment that is brought to market after the construction submittal period.
8. Provide an optional price for maintenance contract extensions on an annual basis beyond the first one-year warranty period.

- 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.
2. Equipment Substitutions
 - a. All submitted equipment must meet the minimum performance requirements shown in Part 2 of this specification.
 - b. Post-Submittal Equipment Update Substitutions: As there is a time gap between construction submittals and equipment installation, the Owner reserves the right to request substitutions of outdated equipment for updated equipment of a comparative class and cost basis. This arrangement is required of video projectors and flat panel displays. For video projectors, the contractor should attempt to provide substitutions to limit the number of different equipment manufacturer's for ease-of-maintenance considerations. Specified projector and flat panel mounting hardware will need to be re-evaluated to meet the requirements of the final projector selection.
3. 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. Engineered drawings are not to have devices nor connections noted "typical". Show pin-specific wiring connections with wired numbers noted.
 - b. All receptacle plates and panels, including rack-mount panels labeling shown for engraving.
 - c. Equipment rack elevations.
4. Submit shop drawings of any proposed design changes for approval prior to fabrication. Shop drawings are submitted for review and approval prior to fabrication and installation. Make submittals at least fifteen (15) working days prior to scheduled fabrication. Note on the submittal the dates of scheduled fabrication.
5. Submit samples of engraved labels, cable marking system, and receptacle plate/panel etching.
6. Acceptance Test Submittals: Prior to requesting the completion of the acceptance tests, submit Preliminary Test Report including all information required in Part 3. The AV 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.

1.08 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.

1.09 GUARANTEES AND WARRANTIES

- A. Transfer all manufacturer warranties to the Owner at the time of acceptance.
- B. Guaranty all installation work to be free of faulty workmanship. Guarantee all components and workmanship to be free from defects for a period of one year from the final date of acceptance, including solid-state devices.
- C. Guaranty the replacement of faulty materials and workmanship within 48 hours of notification at no cost to the Owner if failure occurs during warranty period.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS FOR AUDIOVISUAL PRODUCTS

- A. Materials listed herein represent specific minimum levels of performance and function. These levels of performance and function are as published by the listed manufacturers. All material submitted shall be as listed, or shall be substitutions that meet or improve upon the performance and functional characteristics of the listed material.
- B. If conflicts exist within the specification or between the specification and the drawings, contact the Consultant for clarification. Where listed quantities differ from that shown on drawings, assume the greater quantity and contact AV consultant for clarification.
- C. Equipment shall be procured from the original equipment manufacturer, or a manufacturer-approved dealer. If procured from a manufacturer-approved dealer, product(s) shall be supported at the same level as if procured from manufacturer.
- D. Repair or replace any equipment damaged during installation.

2.02 EQUIPMENT

- A. Refer to Appendix A for list of equipment by space. Refer to AV Drawings for quantities.

2.03 MISCELLANEOUS HARDWARE

- A. Terminal cabinets and boxes: terminal cabinets, mud-rings, and junction boxes housing audio cabling shall be metallic. Terminal cabinets shall be verified for size by AV Contractor prior to beginning job-site work. Size cabinets for required base-bid wiring fill. Allow forty percent (40%) additional capacity for future system growth.
- B. Provide matching manufacturer vents and blanks as required.

- C. 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 or cabling pathways independent of AC power cabling.
- D. Connectors: Provide compatible plugs as indicated on the receptacle plate drawing sheets; all cable connectors shall have black anodized finish where available unless otherwise noted. Connector parts subject to any possible structural loading or stress shall be metal.
- E. Conduit: Provide removable seals at penetrations for acoustic isolation.
- F. Audiovisual System Faceplates: Silk-screened and coated lettering shall identify individual plate mounted receptacles. Connector identification shall denote function and unique input/output number. Lettering shall be centered above appropriate connector. Connector mounting will allow sufficient finger clearance for connector insertion and removal without interference from adjacent connectors.
- G. Receptacle Plates:
 - 1. Receptacle plates shall be steel or aluminum with etched and ink filled labeling. Confirm plate color preferences and requirements with Owner prior to fabrication or ordering. Plates ordered without Owner approval may be replaced at AV Contractor's expense. Refer to AV Drawings for specific plate connector requirements.
 - 2. Center lettering vertically over appropriate connector. Connector mounting shall allow sufficient finger clearance for connector insertion and removal without interference from adjacent connectors.
 - 3. Engraved plastic labels fastened with epoxy are acceptable only where custom engraving options are not available from manufacturer, and only with approval by the Owner.
- H. Provide black Techflex cable umbilical wrap as required for cable umbilicals.
- I. Provide acoustical insulation such as Rock Wool or acoustic cotton such as UltraTouch for loudspeakers mounted in wall cavities.
- J. Electronic component faceplate labels: Provide permanent labels on equipment to identify device, system, or control function as appropriate for operational purposes. All control knob and switch labels shall be located vertically adjacent over the appropriate control. Engraved plastic labels fastened with epoxy are acceptable. Dymo type labels are not acceptable.
- K. Rack Equipment
 - 1. Include blank or vent face plates where equipment is not mounted.
 - a. Custom rack mounts: Middle Atlantic, or equal
 - b. Equipment rack blanks: Middle Atlantic EB Series, or equal
 - c. Equipment rack vent panels: Middle Atlantic VT Series, or equal

- L. Provide placard at each AV equipment rack that states “Designed by Charles M. Salter Associates, Inc. & Installed by _____ (AV Contractor name with phone and website). For repairs call _____ (AV Contractor name with phone).” Provide as either a rackmount panel, or as a placard attached to one of the equipment racks in each major control room equipment location.

2.04 PRE-MANUFACTURED CABLES

- A. Pre-Manufactured Cables for Receptacle Plates (HDMI, VGA, Audio): Provide one cable with connectors for every receptacle for end-users to connect laptop computers, and other portable audiovisual source devices:
 - 1. Gold-Plated Connectors
 - 2. NEC CL2 rated non-plenum
 - 3. VGA Input: 1080p 1920 x 1200 verified
 - 4. HDMI/DVI Input: Cables must be rated for HDMI 2.0a specifications or better, capable of passing required resolutions, frame rates, and color space at distances under 10’ without an active equalizer.
 - 5. Audio: 20 to 20Khz
 - 6. Recommended Equipment: Extron, various models.
- B. HDMI(F)-to-Display Port(M) Adapter: For every pre-manufactured HDMI cable provided, provide an adapter for Display Port source devices.

2.05 INSTALLATION CABLE – ALL SPACES

- A. Loudspeaker Cable (8 or 4 ohm, less than 500 watts): West Penn Wire C207 (12 AWG, unshielded pair) or equal
- B. Distributed Non-Plenum Loudspeaker Cable (70volt, less than 60 watt tap): Belden 1309A (14 AWG, unshielded pair) or equal.
- C. Distributed Plenum Rated Loudspeaker Cable (70volt, less than 60 watt tap): Belden 6100UE (14 AWG, unshielded pair) or equal.
- D. Analog Microphone/Line Level Installation Cable: Belden model# 9464 (20 AWG conductor, jacketed, shielded, twisted-pair) or equal.
- E. Analog Microphone/Line Level Installation Cable (Dining Room inputs, high noise rejection): Mogami W2534 (24AWG 4-conductor, jacketed, shielded, twisted-pair) or equal.
- F. Analog Microphone/Line Level Equipment Rack Interconnect Cable: Belden model# 8450 (22 AWG conductor, jacketed shielded, twisted-pair) or equal.
- G. Antenna Cable: Conductor is 13 AWG (RG8/U) covered by braided shield. JSC model# 3040 or equal. Provide co-axial cable whose impedance matches devices requiring 50ohm antenna connection.

- H. Pre-Terminated HDMI or DVI-D cables: Extron, Atlona, or equal. (Note, 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.)
- I. Control System Device Control Cables (RS232, RS422, Serial (IR), Relay or Contact Closure): Supply pre-terminated serial control cables within equipment racks. Provide West Penn Wire 1992 (4 pair) signal cable, or equal for relay or contact closure application, as required.
- J. Network and twisted pair Cable for AV Signal Extenders: Provide project network standard Category 6 cable, or equal.
- K. All cabling shall be rated for the environment for which it is placed.
- L. Provide plenum rated cable for all cable where required by code. Any cable changes or substitutions must be submitted and approved prior to installation. Cable that has been installed without approval is replaced at the AV Contractor's expense.
- M. Portable Microphone Cable: For each microphone input receptacle at floorboxes and wall plates provide a pre-manufactured microphone cable
 - 1. Hi-Flex 25-foot (7.5 m) microphone cable with chrome XLR connectors, for low-impedance operation.
 - 2. Recommended Equipment: Shure CJ25.
- N. For HDMI runs over 25' AV Contractor shall provide HDMI over shielded CAT6 extension system.
- O. Cable installed without Owner approval may be replaced at the AV Contractor's expense.
- P. Acceptable Cable Manufacturers:
 - 1. Liberty
 - 2. Belden
 - 3. West Penn
 - 4. Canare
 - 5. Mogami
 - 6. Extron
 - 7. Crestron
 - 8. Windy City Wire

2.06 CONNECTORS

- A. Audio 1/4" panel-mount connector: Switchcraft 1/4" TS, solder back, or equal.
- B. Loudspeaker Connectors: Neutrik 4-Pole Speakon series.
- C. HD-SDI, Composite Video, Genlock (Sync), SMPTE BNC panel-mount connector: Provide a panel-mounted BNC jack with isolated ground bulkhead and compatible connector. Supply Canare BCP-C5FA male, or equal.

- D. Antenna connector: Provide receptacle plate-mounted general purpose UHF antenna connector. Coaxial bulkhead connector will match impedances of antenna cable and match style of connector on device requiring antenna. Supply Amphenol 83-1f.
- E. RS232/Control D-Shell Panel-Mount Connector: Mouser D-sub series, or equal.
- F. VGA D-Shell Panel-Mount Connector: ORA D-sub series, or equal.
- G. Specialty RJ45 connectors (UTP Extenders, etc): Supply Neutrik Ethercon series connectors where AV connections are to be terminated at AV receptacle plates and panels.
- H. VGA signal terminated on BNC will NOT be accepted.
- I. CAT6 8-Pin Modular Chassis Connector at Receptacle Plates
 - 1. CAT6 Compliant up to 10GBits/s
 - 2. CAT6 specifications according TIA / EIA 568B, ISO / IEC 11801, EN 50173
 - 3. Push Pull mating - secure and proven locking system
 - 4. Ground lead jumper on panel connector with selectable grounding option
 - 5. Gas-tight IDC termination without tool
 - 6. Recommended equipment: Neutrik NE8FDY-C6-B

2.07 FINISHES

- A. All enclosures, housings and fixtures supplied by the AV Contractor not having a standard factory protective finish are to be painted. Paint specifications are to be supplied by the Architect or indicated herein.
- B. Any equipment or materials supplied which are exposed to public view are to be approved by the Owner. Provide, as required by the Owner, custom color and/or finish for publicly-visible devices, if available.

PART 3 – EXECUTION

3.01 GENERAL DESCRIPTION

- A. The following is required for acceptance of the audiovisual system by the Owner:
 - 1. Install complete and functioning audiovisual system specified.
 - 2. Label equipment and cables as specified and corresponding to functional diagram.
 - 3. Conduct adjustments and preliminary testing.
 - 4. Report results of preliminary testing along with system documentation.
 - 5. Participate in acceptance test and deliver final system and documentation.
 - 6. Conduct any adjustments or re-testing that is required to adhere to the specifications.
 - 7. Provide training to individuals designated by the Owner.

- B. Installation shall meet or exceed industry standards and best practices, including, but not limited to, those described in the following publications:
 - 1. Avixa
 - a. "Basics of Audio and Visual Systems Design"
 - b. "AV Installation Handbook"
 - c. "AV Implementation Handbook"
 - 2. Building Industry Consulting Service International (BiCSi), "Telecommunications Distributions Methods Manual" (TDMM)
 - 3. Telecommunications Industry Association/Electronic Industries Alliance (TIA/EAI), "TIA/EIA Wiring Standards"

3.02 GENERAL REQUIREMENTS

- A. All equipment except portable equipment shall be held firmly in place. This includes racks, conduits, cables, receptacle plates and panels, and all electronic equipment. The Owner shall approve structural fastenings and supports.
- B. Submit shop drawings for custom fabrications including custom panels, receptacle plates, patch panel layouts, and rack elevations to the Owner for review and approval. Make submittals at least fifteen (15) days prior to scheduled fabrication. Note on the submittal the dates of scheduled fabrication. Submittal responses is expedited due to the compressed installation schedule.
- 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 is 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 AV Contractor shall exercise engineering supervision over the entire installation. Unless through illness, loss of personnel, or other circumstances beyond the control of the AV Contractor, keep the same individual in charge throughout the execution of the work.
- F. 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. 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.

- H. 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 3.6.

3.03 INSTALLATION REQUIREMENTS

A. General

1. All equipment and cabling shall be installed in accordance with manufacturer recommendations, in a clean, neat, and organized fashion.
2. Equipment requiring service or routine adjustments, such as equipment racks, shall be accessible for such services.
3. All permanently installed equipment shall be plumb and square, and firmly held in place.
4. Contractor shall take appropriate measures to minimize electromagnetic and/or electrostatic interference. Install all equipment and cabling with regard for minimization of induced electromagnetic and electrostatic noise.
5. 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.
6. Contractor shall provide appropriate protection for equipment and related wiring in locations where extreme environmental conditions may occur.
7. All audiovisual point-to-point signal cable is to be run in cabling pathways separate of AC power and network data conduit, except where identified on drawings.
8. Verify that all AC power circuits designated for audiovisual equipment, both fixed-in-place and portable, are properly wired, phased and grounded. Report any discrepancies found to the Owner.
9. Verify with Owner where secure attachments, such as Kensington locks or projector locks, are required for audiovisual equipment in public spaces due to theft or vandalism concerns. Provide such attachments where required.
10. Confirm finish color of publicly visible devices, such as loudspeakers, with Owner and/or Architect prior to ordering. Any publicly-visible devices installed without prior approval may be replaced at the AV Contractor’s expense.
11. Provide labels on input plates in rooms where there are multiple input plates within the same room (i.e. Active Space, Divisible Meeting Room, etc.). The input plate name shall be identifiable between the physical input plate(s) and the touch panel identification scheme.

B. Mounting

1. All permanently mounted equipment, shall be attached to the structure and held firmly in place. Provide brackets, braces and supports as required. Verify mounting with structural engineer prior to installation.
2. Provide for \pm (5) degrees of adjustability for any angular orientation shown in drawings.

3. Verify structural mounting, backing, and reinforcement points prior to installation.
4. Provide trim/escutcheon hardware for hardware penetrating finished ceilings. Verify finishes of trim components with Architect prior to ordering.

C. Cabling

1. General

- a. All cabling shall be continuous and without splices.
- b. Maintain proper positive/negative phase between all points in the system.
- c. Use care in wiring to avoid damage to cables. Where required, use temporary guides, sheaves, rollers, or other necessary devices to protect cables from excess tension, abrasion, bending, or any other damage during pulling. Provide wire pulling lubricants in accordance with wire and cable manufacturer's recommendations.
- d. Spacing between cable ties or is to be no less than six (6) inches.
- e. Provide rubber or nylon grommets over edges of cable pass through holes in chassis, racks, boxes, plates, etc.
- f. Provide ample service loops at cable endpoints so that plates, panels, and equipment can be demounted for inspection. Where no rear access to cable termination points on equipment exists, provide sufficient length of cabling so that equipment may be easily removed independent of other equipment.
- g. No length of cable over 18", with the exception of service loops, shall be unsupported by wire-way, raceway, conduit, or other approved cable support.
- h. Equipment that is to be moved during normal operation, such as slide-out shelves, shall be provided with adequate cable lengths to accommodate the full range of travel in each direction, and shall be dressed to avoid pinching or wedging in moving parts.
- i. Install cabling so that there is at least 6" of separation between circuits carrying AC power.
- j. Where cabling of different signal types must cross, they are to do so perpendicularly as to minimize interference from one another.
- k. Bending radii shall be minimum of (10) times the outer diameter of the cable jacket
- l. Conduit fill ratios are not to exceed 40% of internal conduit area.

2. Termination

- a. All connections to jacks and connectors shall employ rosin-core solder, with no cold joints or splatter.
- b. Except for the case of screw terminals, all bare wire conductors are to be tinned with resin flux.
- c. Screw-terminated conductors shall be wrapped in the same direction as screw rotation when tightening.
- d. Provide clear shrink tubing sleeve over each individual wire termination and solder lug. All exposed shield drain wire shall be sheathed in properly sized clear shrink tubing sleeves and protected against shorting to other conductors or connector shells.

3. Labeling/Identification

- a. All cabling shall be permanently labeled with unique numbers using wire makers printed via computer software program. Maintain consistent labeling practices across all cabling, including numbering, signal type identification, and text direction. Provide "run sheets" listing all cables by number, signal type, and termination type on both ends. Labeling information is to include the following:
- b. Cabling for audiovisual systems shall be of a different jacket color than other low-voltage cabling where pathways are shared between divisions or other systems.

4. Audio

- a. Audio system shall be free of audible hum, noise, buzz, and distortion.
- b. Balanced audio connectors shall be terminated in accordance with the international (IEC) standard: Pin 1: shield, Pin 2: audio positive, and Pin 3: audio negative.
- c. All audio signal conductors connected between active devices shall be electronically balanced or transformer balanced with respect to the audio signal ground. Unbalanced audio circuits, where possible, shall utilize level matching interfaces with active balanced circuitry or isolation transformers.
- d. When connecting unbalanced and balanced line-level signals, refer to RaneNote 110: "Sound System Interconnection" for proper wiring techniques.
- e. Where there are unused conductors in a cable assembly, fold unused cables along outer jacket and cover completely with heat-shrinkable tubing.
- f. Microphone and line level signal cabling shall be installed at least 3" from other low-voltage cabling
- g. Bridle rings suspended from ceiling or shared cable tray shall be provided in conditions where audio cabling is to share cable tray or pathways with other low-voltage cabling.

D. Equipment Racks

1. Cabling within equipment racks shall be neatly bundled and laced. AV Contractor shall, at no additional cost, re-bundle and lace cabling if directed by Owner and/or Consultant. Utilize cable tie-bars as necessary. Harnessed cables are to be combed straight.
2. Placement of equipment in equipment racks, as shown in the drawings, is for operator convenience, ventilation and/or circuit flow. Verify any changes in placement of the equipment with the Consultant prior to assembly.
3. Provide ventilation adequate to keep temperatures within equipment racks below 90 degrees F. Provide approved passive and/or active ventilation as required.
4. Racks shall be installed plumb and square within the room, and without twists in the frames or variations in level between adjacent racks.
5. Custom panels shall be manufactured in order to prevent panel deformation during normal plugging and switching operations.
6. Equipment requiring user interface shall be mounted between 18" and 48" AFF.

7. The front and rear of each rack-mounted device shall be labeled with lamicoid labels (i.e. "Video Switcher #"); as well as all occupied slots in card frame devices.
8. Mount equipment using equipment rack manufacturer-approved black machine screws with nylon washers.
9. Heavy and/or deep equipment shall be provided with additional mounting hardware to support rear of equipment.
10. Unless otherwise shown on AV Drawings, heavy equipment, such as amplifiers, shall be mounted towards the bottom of the rack.
11. Provide code-required seismic restraints as necessary.
12. Electrical Requirements:
 - a. Where power sequencing devices are required, the following On/Off sequencing shall be provided:
 - (1) Control system components shall remain powered up and functional to accept control system commands.
 - (2) Audio amplifiers and/or powered loudspeakers are to power up last and power down first to prevent loudspeaker damage.
 - (3) Sequence the turn-on of devices so that AC power in-rush current is minimized.

E. Loudspeakers

1. Provide structural support for wall and ceiling-suspended loudspeakers.
2. Adjust distributed loudspeaker transformer taps, audio DSP, and amplifier levels for uniform consistency in sound pressure level throughout serviced area(s).
3. Orient loudspeakers for optimal coverage of intended listening area. Perform adjustments as required to optimize coverage uniformity.
4. Provide rigid support members to prevent loudspeaker from moving during operation after final adjustments have been made.

F. Video Projectors and Monitors

1. AV Contractor shall review and assess field conditions and select video projector lens(es) with appropriate focal lengths prior to ordering. The image is to completely fill the screen. The AV Contractor shall adjust video projector(s) and lens(es) for optimal picture quality, including lens focus, lens shift, and keystone adjustments.
2. Refer to AV Drawings or Specification Section 11 52 13 for video projection screen sizes and locations.
3. Provide full video projector and monitor calibration, configuration, and adjustments for all used inputs. Adjust aspect ratio configuration so that all installed sources fill the projection screen completely, without unnecessary scaling or stretching.
4. Configure EDID settings for all analog and digital video sources as required for proper compatibility between video sources. Video scaling is to be minimized as much as possible, so that a video source is scaled no more than (1) time within the overall system.
5. Provide a query command via bi-directional protocol (serial or network) regarding projector lamp life, and provide a means to display that lamp life, either on a touch panel display at start-up, or via network settings that send notifications to

appropriate maintenance staff. Coordinate with Owner regarding desired notification format.

6. Video monitors shall be set to initiate "Standby" mode when no input source is detected and return to "On" state once a video source is detected.
7. Secure video receiver device(s) to video projector mounting hardware in a clean, neat, and visually unobtrusive way. Where possible, source devices shall be housed above accessible ceiling for the cleanest look possible. Where possible, cabling to video projector shall be hidden within mounting poles/hardware.
8. Video projectors shall be mounted as close to finished ceiling as lens will allow without the use of digital keystone correction.

G. Wireless AV Systems

1. Verify available wireless RF frequencies on site over a 24-hour period prior to ordering any wireless RF equipment, including wireless microphone or hearing assistance systems. Verify frequency selection with manufacturer. If available frequency spectrum does not allow for the use of specific wireless RF components, notify Owner in writing.
2. Coordinate frequencies of all wireless devices, including Owner-provided devices.
3. Locate wireless microphone receiver antennas for adequate signal reception. Provide additional antennas, amplifiers, Bias-Ts, or any other devices as required to ensure adequate signal reception in the intended area. If the intended area is unclear, verify with Consultant prior to installation.

H. Portable Equipment

1. Where portable equipment will be routinely connected and disconnected, provide clearly labeled, color-coded connectors to correspond with correct connection points.
2. Provide Techflex cable umbilical wrap, or equivalent, where multiple cables are connected at the same plate or location. All exposed cabling is to be bundled for a neat and clean appearance.
3. Provide finish samples and shop drawings to Owner for approval prior to ordering any AV Contractor-provided furniture or millwork.

I. Millwork Coordination

1. Verify final equipment and millwork clearances prior to ordering any audiovisual equipment. Notify the Owner in writing if any conflicts are identified.
2. Coordinate and submit dimensional information of audiovisual equipment to be incorporated into furniture or millwork provided by other divisions to Owner and/or Architect for approval prior to any cutting or penetrations.
3. Provide fans, ventilation slots/holes, or other hardware in millwork as required to conform to the manufacturers' operational temperature requirements.

J. Grounding

1. 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.

3.04 PROGRAMMING REQUIREMENTS

A. Audio DSP

1. Coordinate with Owner to provide contact closure from fire alarm system(s) to audio DSPs, mixers, processors, and/or amplifiers to mute all audio when fire alarm system is engaged. Test functionality in all locations and systems. Coordinate with local fire safety agency for verification and sign-off.
2. Verify specified audio DSP will provide adequate processing power with manufacturer to accommodate functionality as described in this specification section prior to ordering.
3. Provide required preset configurations to accommodate all routing conditions.
4. Provide automatic microphone mixing and proper mix-minus routing systems where multiple installed microphones are utilized.
5. All video source inputs are to include audio support, unless otherwise noted. All audio associated with video is to follow video source routing. Where identified, provide audio breakaway from video programming.
6. Provide separate equalization and dynamic processing for speech and playback source inputs. Provide separate volume control(s) for speech and playback sources, including volume up/down and mute.
7. Provide limiting on all drivers.
8. Once a room has been properly equalized for a flat response, if microphone feedback issues occur during initial testing, provide dynamic feedback equalizer filters with fixed notches for microphone signals. Dynamically assigned feedback filters are to reduce filter depth and return to a flat state once feedback has been addressed.
9. Ensure all playback source output within room is within 1.5 dB of one another when source output level is identical.
10. Use available DSP processing algorithms as required to optimize audio performance in all spaces.
11. Audio and Video Conferencing Requirements:
 - a. Provide Acoustic Echo Cancellation and Noise Reduction at individual microphones for any room utilizing audio or video conferencing system(s).

B. Video Switchers, Processors, and Extenders

1. Video systems are to be configured to output the highest resolution available for the specified screen aspect ratio.
2. EDID signals are to be managed throughout system. Where EDID management is not available, utilize EDID emulators.
3. Where twisted-pair video transmitters and receivers are utilized, perform distance compensation adjustments as required to achieve an image that is equivalent to the original signal.
4. Where possible, supply DC power remotely (via PoE or direct DC current) to video transmitters and receivers from equipment rack location(s) in an effort to avoid unnecessary power supplies within the room(s) served.

C. Control Systems

1. Coordinate with the Owner and Consultant regarding specific graphical control interface requirements. This includes individual system functional requirements, touch panel graphic appearance, page hierarchy, and other control interface parameters. The control interface design should be uniform in look, feel, and functionality across all spaces and systems throughout the project, unless otherwise noted in this specification section or directed by the Owner.
2. Coordinate with Owner regarding level of IP-based system status notification required for audiovisual system(s). This may include, but is not limited to, video projector lamp life, equipment failure notification, power failure notification, temperature level notification, after hours system use notification, room use and scheduling requirements, and digital signage display status.
3. All control system programming is to be provided by a programmer certified by the manufacturer of the control system to be provided.
4. Provide software necessary to operate and program audiovisual system components. The software is to be provided by the manufacturer(s) of system components.
5. Touch Panels
 - a. The AV Contractor is to submit touch panel pages and layouts to the Owner and Consultant in an interactive format prior to implementation. This interactive format is to emulate functionality, page hierarchy, and other interactive design parameters.
 - b. Touch panel pages and language is to be easy to understand for non-technical users. Technical terms not commonly used outside of the audiovisual industry are to be avoided whenever possible.
 - c. Provide ample time for touch panel review in order to address Owner-requested changes without negatively impacting the installation schedule. Provide, at no additional charge, reprogramming of control system components at Owner's request for a full (30) days after system acceptance.
 - d. DSP Audio presets are to be recalled seamlessly in the background as a result of source selection and intuitive control options.
 - e. Audio volume controls shall be slider-type (up for volume up, down for volume down), similar to modern audio mixer level control, and feature a "Mute" toggle button underneath.
 - f. All button panels, including motorized screen controllers, are to function in parallel with touch panel user interface, and provide appropriate visual feedback at touch panel display when button panel control parameters are utilized.
 - g. Coordinate with other divisions as required to incorporate control of other room systems within the touch panel user interface, including, but not limited to:
 - (1) Mechanical/HVAC
 - (2) Lighting/Shades
 - (3) Electrical systems
 - h. At a minimum, all touch panel user interfaces are to include the following control parameters:

- (1) Master audiovisual system On/Off control, including prompt at shutdown asking user "Are You Sure?" with "Yes" and "No" buttons to prevent accidental shut down.
- (2) In rooms where there is more than a single display, provide On/Off control for individual displays
- (3) For rooms with video projectors, provide a message during power-up on touch panel display indicating "The Projector is Powering Up. Please Wait..." until video projector is fully operational.
- (4) For rooms with video projectors, provide a message during power-down on touch panel display indicating "The Projector is Powering Down. Please Wait..." until video projector is fully shut down.
- (5) Separate speech and playback volume controls
- (6) Audio and video conferencing dialing controls
- (7) Playback devices, such as Blu-Ray/DVD Players, are to be controlled via touch panel interface. Commonly used buttons, such as Play, Stop, Forward, Backward, Menu, etc. are to be included. Where controls are uncommon or not intuitive, provide a graphical and functional emulation of the manufacturer-provided remote control device.
- (8) Source selection is to be provided for individual displays, unless otherwise noted in this specification section
- (9) Motorized video projection screen control is to be included. Projection screens are to lower when their associated video projector is turned on.

6. Button Panels

- a. Provide and configure button panels to enable system On/Off, Volume Up/Down, and Source Selection for all systems not utilizing a touch panel control interface, unless otherwise noted in this specification section or the AV Drawings.
- b. Where available, there are to be no unlabeled buttons on button panels. Coordinate with Consultant to assign functionality to all buttons provided.

D. Network Data Coordination

1. Coordinate with Owner regarding desired level of audiovisual network and other data network integration. If no interoperability is desired, the AV Contractor is to create an independent network for audiovisual equipment as required.

E. Digital Signage Locations

1. Coordinate with Owner regarding display on/off schedule, content schedule, content, and any other programming requirements.

F. Trainer's Room (PE-131)

1. Button Panel Controls

- a. Display On/Off
 - b. Source Selection (HDMI, VGA)
 - c. Image Mute
 - d. Volume Up/Down/Mute

- G. Conference Room (PE-127)
 - 1. Touch Panel Controls
 - a. Projector On/Off
 - b. Source Selection (HDMI, VGA, Computer)
 - c. Image Mute
 - d. Volume Up/Down/Mute
 - e. Microphone Mute

- H. Classrooms (PE-109, PE-111)
 - 1. Touch Panel Controls
 - a. Projector 1 On/Off
 - b. Projector 2 On/Off
 - c. Projector 1 Source Selection (HDMI, VGA, Document Camera, Computer, AirMedia)
 - d. Projector 2 Source Selection (HDMI, VGA, Document Camera, Computer, AirMedia)
 - e. Projector 1 Image Mute
 - f. Projector 2 Image Mute
 - g. Volume Up/Down/Mute

- I. Fitness Spaces (PE-106, PE-108)
 - 1. Button Panel Controls
 - a. Display On/Off
 - b. Source Selection (HDMI, VGA, AirMedia, Music)
 - c. Image Mute
 - d. Volume Up/Down/Mute
 - e. Microphone Volume Up/Down/Mute

- J. Team Locker Rooms (PE-144, PE-145, PE-156, PE-157)
 - 1. Button Panel Controls
 - a. Display On/Off
 - b. Source Selection (HDMI, VGA, AirMedia)
 - c. Image Mute
 - d. Volume Up/Down/Mute

- K. General Training (PE-104)

1. Touch Panel Controls
 - a. Display On/Off (Separate On/Off for each display)
 - b. Source Selection (West Wall HDMI, West Wall VGA, East Wall HDMI, East Wall VGA, Digital Signage)
 - (1) Note all displays shall show same content
 - (2) Sources shall default to Digital Signage Media Player when no HDMI or VGA is plugged in
 - c. Image Mute (all displays)
 - d. Volume Up/Down/Mute
 - e. Microphone Volume Up/Down/Mute

L. Athletic Weight Training (PE-105)

1. Touch Panel Controls
 - a. Display On/Off (Separate On/Off for each display)
 - b. Source Selection (HDMI, VGA, Digital Signage)
 - (1) Note all displays shall show same content
 - (2) Sources shall default to Digital Signage Media Player when no HDMI or VGA is plugged in
 - c. Image Mute (all displays)
 - d. Volume Up/Down/Mute
 - e. Microphone Volume Up/Down/Mute

M. Active Space (SU-104)

1. Touch Panel Controls
 - a. Display 1 On/Off
 - b. Display 2 On/Off
 - c. Display 1 Source Selection (HDMI, wall plate, VGA wall plate, HDMI-1, HDMI-2, VGA-1, VGA-2, Digital Signage)
 - (1) Source shall default to Digital Signage Media Player when no HDMI or VGA is plugged in
 - d. Display 2 Source Selection (HDMI-1, HDMI-2, VGA-1, VGA-2, Digital Signage)
 - (1) Source shall default to Digital Signage Media Player when no HDMI or VGA is plugged in
 - e. Display 1 Image Mute
 - f. Display 2 Image Mute
 - g. Volume Up/Down/Mute
2. Note Assistive Listening System channels will be specific to a display, i.e. Display 1 is associated with ALS Channel 1, Display 2 is associated with ALS Channel 2.

N. Bookstore (SU-134)

1. Single volume control knob for entire system (i.e. audio input and paging microphone)

2. Paging microphone audio will “duck” other audio sources by 12dB when engaged.
- O. Divisible Meeting Room A, B, C (SU-106, SU-108, SU-109)
1. Touch Panel Control
 - a. Startup page shall prompt user to select “Standard Event” or “Operator-Assisted Event” button when first touched.
 - (1) “Standard Event” button shall include a brief description underneath button stating “For standard presentations where no technician is needed to manually mix audio or route video from a single source to a single or multiple projectors”
 - (2) “Operator-Assisted Event” button shall include a brief description underneath button stating “For events or presentation where a technician will manually mix audio and route various video sources to video projectors”
 - (3) If required, text at the bottom of the page shall provide instructions and/or contact information for support personnel.
 - (4) “Volume” slider and “Mute” button will be available on Startup page
 - b. “Standard Event” Home Page
 - (1) User shall be prompted to select a Video Source Button (Wall Plate # HDMI, Wall Plate #VGA, Wall Plate #HD-SDI, Pan-tilt-zoom Camera #, etc.). Once source is selected, page will advance to a “Projector” page with map of available Projectors to send source to.
 - (a) When a Pan-tilt-zoom camera source button is selected, it shall advance to “Camera Control” page. When any camera is selected as a source, there shall be a “Camera Control” button on “Standard Event” Home Page and “Projector” page to allow quick adjustment or viewing of camera view(s).
 - (b) When a source is being routed to a projector, it will provide visual feedback on the source button to indicate it is active.
 - (c) “Shutdown” button will allow system shut-down of the associated room division(s) only (i.e. no ability to shut down AV systems in adjacent spaces when room is divided). User shall be prompted “Are you sure you want to shut system down?” with “Yes” and “No” buttons.
 - (2) “Projector” page shall provide a map of room and video projectors to send selected source to, based on layout of room relative to touch panel in use, as well as partition sensor status. It will list Source Selected and provide direction to user to select a Projector or Projectors to send Source to. There shall also be a “Select Source” button to go back to source selection page.
 - (3) “Audio Control” button shall route to “Audio Control” page, with volume sliders and mute buttons for all available wireless

microphones and wired microphone inputs in the room or room division, as well as a “Master” volume control slider and mute button. It shall also include a “Back” button to return to previous page.

- c. “Operator-Assisted Event” Page
 - (1) Page shall provide instructions that all video sources in room will be routed to HD-SDI outputs on Operator Panel (“OP”) at rear of middle room division, and manually routed to video projectors via HD-SDI inputs. Audio sources will be routed to Digital Audio Mixer via Dante connection, and overall mix routed back to overhead loudspeakers. Page shall also provide instructions that Operator-Assisted mode will not work without portable Video Production Switcher and Digital Audio Mixer.
 - (2) Page shall provide “Camera Control” buttons for all Pan-tilt-zoom Cameras.
- d. “Advanced” Page
 - (1) “Advanced” page will be password protected. Coordinate with Owner regarding how much time shall pass before “Advanced” page password requires re-entry (i.e. password needs to be re-entered after 15 minutes of last entry each time page is accessed)
 - (2) Page shall allow technical users to route any audio and video source to any projector and/or room division, regardless of room partition sensor status. This includes the ability to toggle between HDMI and HD-SDI source at each video projector.
 - (3) Page shall also allow volume control of any audio source, and audio breakaway from video.
 - (4) Page shall also include “Camera Control” button for each Pan-tilt-zoom Camera that will route to associated “Camera Control” page
- e. “Camera Control” Pages
 - (1) There shall be independent pages for each Pan-tilt-zoom Camera.
 - (2) Page shall provide preview video of associated camera, as well as pan and tilt arrow buttons, and zoom in/out buttons.
- f. All pages
 - (1) All pages shall feature a master volume slider and mute button
 - (2) All pages shall feature a “Advanced” button to route to password-protected “Advanced” page

- 2. Zone loudspeakers in front and back of rooms to allow front or back sections of room to be turned down to minimize microphone feedback.
- 3. Dante Programming

- a. All sources routed to Audio DSP during Standard operation shall be re-routed to Digital Audio Mixer inputs via Dante, and Digital Audio Mixer output shall be routed back to Audio DSP and distributed to the overhead loudspeakers.
- b. Sources shall automatically populate on Digital Audio Mixer with the following configuration:
 - (1) Inputs 1-6: “Wireless Handheld #”

- (2) Inputs 7-10: "Wireless Bodypack #"
- (3) Inputs 11-15: "Wired Mic ##" (with plate #)
- (4) Inputs 17-21: "HDMI/VGA Input ##" (with plate #)

- 4. Partition sensors shall communicate status of partition (open vs. closed) to control system, and control system interface shall adjust according to this status.
 - a. When room is fully combined (no partitions closed), all sources will be available to route to any projector.
 - b. When a partition is closed, sources within that room division will be only sources available on touch panel sources page.
 - c. Password-protected "Advanced" page will allow routing of sources to adjacent room divisions when partition(s) are closed.
- 5. Coordinate with Owner regarding Room Scheduling display views, calendar interface, database interface, network permissions, etc.

P. Large Conference Room (SU-231)

- 1. Touch Panel Control
 - a. Projector On/Off
 - b. Projection Screen Up/Down
 - (1) Projector On selection shall drop down projection screen
 - (2) Projector Off selection shall recess projection screen
 - c. Source Selection (HDMI, VGA, AirMedia)
 - d. Image Mute
 - e. Volume Up/Down/Mute
 - f. Mechanical shade and lighting controls
 - (1) Coordinate with mechanical shades and lighting contractors for implementation and uniformity of command language between touch panel and other physical interfaces
 - (2) Mechanical shades shall automatically go down when Projector On is selected
 - (3) Mechanical shades shall automatically recess when Projector Off is selected

Q. Conference Rooms (SU-223)

- 1. Touch Panel Controls
 - a. Display On/Off
 - b. Source Selection (HDMI, VGA, Computer)
 - c. Image Mute
 - d. Volume Up/Down/Mute

R. Learning Spaces (SU-215, SU-218, SU-221, SU-224)

- 1. Button Panel Controls

- a. Display On/Off
- b. Source Selection (HDMI, VGA, AirMedia, Digital Signage)
 - (1) Source shall default to Digital Signage Media Player when no HDMI or VGA is plugged in
- c. Image Mute
- d. Volume Up/Down/Mute

S. Shared Social Space (SU-213)

1. Button Panel Controls

- a. Display On/Off
- b. Source Selection (HDMI, VGA, Digital Signage)
 - (1) Source shall default to Digital Signage Media Player when no HDMI or VGA is plugged in
- c. Image Mute
- d. Volume Up/Down/Mute

3.05 PERFORMANCE SPECIFICATIONS

A. Unless restricted by the published specifications of a particular piece of equipment which would prevent other devices from doing so, the following performance standards shall be met or exceeded:

1. Audio Processing Equipment

- a. Signal-to-Noise ratio (including crosstalk and hum): 75dB minimum
- b. Total Harmonic Distortion (THD): 0.5% maximum from 20 Hz to 20 kHz
- c. Frequency Response: Flat within 0.5 dB, 20 Hz to 20 kHz

2. Video Processing and Routing Equipment

- a. HDMI
 - (1) HDMI 2.0
 - (2) HDCP 2.2 Compliant
- b. Analog Video
 - (1) Signal-to-Noise Ratio (peak to RMS), unweighted DC to 4.2 MHz: 45 dB minimum
 - (2) Crosstalk, unweighted DC to 4.2 MHz: 45 dB minimum
 - (3) Frequency Response (RGBHV): +/- 0.5 dB to 300 MHz
 - (4) Line and Field Tilt: 2% maximum
 - (5) Differential Gain: 3% maximum
 - (6) Differential Phase: 2 degrees maximum

3.06 VERIFICATION

A. Make all adjustments and modifications necessary so that the system is operational and functions as intended herein.

- B. Make all adjustment and modifications necessary for proper system gain structure as detailed herein and per equipment manufacturers' instructions and recommendations. Mark settings of all variable controls to be preset using Avery Label self-adhesive "dots" or equivalent.
- C. Upon completion of the installation (prior to Acceptance Testing), the AV Contractor is to perform verification testing of all elements of the system as follows:
 - 1. General Performance Verification
 - a. All cable lines are to be tested for continuity, phase, shielding, proper labeling, and unreasonable signal loss.
 - b. All equipment is to be tested for proper operation.
 - 2. Video Performance Verification
 - a. Signal Level, Distortion, Hum and Noise
 - (1) For analog video signals, utilizing a NTSC video signal generator, vector scope, and waveform analyzer with the video signal set at 1 Volt P-P and 75% saturation, check that the video performance specifications as stated previously are met at all display devices from all source inputs.
 - (2) Utilizing a laptop PC with 1080P and WUXGA color graphics capability, check that the video performance specifications are met at the display devices from all applicable source inputs.
 - b. Level Balance
 - (1) Adjust all video equipment to produce the best image possible according to manufacturer's instructions. Ensure that horizontal sweep circuitry is not overdriven to the point of audible sweep frequencies are being emitted.
 - (2) Adjust all video cameras, monitors and media players to produce the best image possible according to manufacturer's instructions.
 - (3) Adjust all video distribution amplifiers for unity gain of luminance and chrominance at the end devices.
 - 3. Audio Performance Verification
 - a. Upon completion of the systems testing, the AV Contractor is to adjust, and uniformly calibrate all gain adjustments of the audio systems and related system devices.

3.07 ACCEPTANCE TESTING

- A. After completing preliminary testing, the AV Contractor shall furnish Owner with a cover letter describing system performance, and a report documenting the results of the preliminary tests, along 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 AV Contractor's acknowledgment that the installation is complete and conforms to this specification, and is ready to be reviewed and tested by the Consultant.

- B. Acceptance testing shall be performed by the Consultant with assistance from the AV Contractor after receipt of report described above. AV Contractor shall provide a capable technician familiar with the installed AV systems for (1) single eight-hour day for each building (16 hours total).
 - 1. AV Contractor shall coordinate all site, room, millwork, and equipment cabinet access with Owner as required to fully test and verify installation.
 - 2. The AV Contractor shall furnish a laptop with all manufacturer supplied configuration software necessary for communicating with the Audio DSP. A review of system settings may be required for either of the programmable units at the Consultant's request, and settings may be adjusted if necessary.
 - 3. AV Contractor shall furnish all tools, test equipment, source equipment (including audio and video sources), and materials required to make necessary repairs, corrections, and adjustments required.
 - 4. Further electrical and acoustical measurements may be performed at the discretion of the Owner. Such measurements may include sound pressure levels, uniformity of coverage, distortion, or other pertinent characteristics.
 - 5. The Control System interface programmer shall be available during final testing to address and respond to control system interface questions, preset recall configuration assumptions etc.
- C. If further adjustments or work are required after acceptance testing, continue work until the system is made acceptable and at no additional cost to the Owner.
 - 1. If acceptance is delayed due to incomplete installation or programming, defects in or failure of equipment, or because the installation fails to meet the requirements of this specification, and additional site visits are required, AV Contractor shall retain the Consultant, at the Consultant's standard hourly rate, for any additional Consultant time and expenses required due to extension of the acceptance testing.

3.08 DOCUMENTATION

- A. Furnish all submittal documents as identified in Part 1 of this specification section.
- B. Furnish an Operations and Maintenance Manual prepared for the Owner's technical staff, in preferred Owner format(s) (i.e. USB flash drive, hard copies, etc.) containing the following sections:
 - 1. Service Reference Cover Sheet: Provide a cover sheet with AV Contractor name, address, telephone number, and website information.
 - 2. System Operation Instructions: Step-by-step operating instructions for the basic day-to-day use of the system, including power activation, connection of source devices, adjustment of volume levels, selection of sources, 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 by manufacturer and model.

5. As-built Drawings: Provide "as built" functional diagrams. Hard-copies, if required, shall be in reduced 11"x17" foldouts in clear plastic binder sleeves. Fold and insert drawings so that drawing title is clearly visible at the front of the sleeve.
 6. Provide software programmable device configuration files to the Owner for the following:
 - a. Control Systems (Source code, including any interfaces and computer-based application files).
 - b. DSP Audio System (DSP system configuration files).
 - c. Store files on site in the system documentation binders as CD-ROMs in disk sleeves. Provide the files on (2) USB flash drives.
 7. Maintenance: Devices requiring routine maintenance (such as video projector filters or lamps) shall be listed along with procedures and schedules for maintenance of those items. If information from the manufacturer is inadequate or item is custom, provide the information necessary for proper maintenance. Include parts lists and schematics as available from the manufacturer and for all custom items.
 8. Service and Warranty Information: Furnish a clear statement of the AV Contractor's guarantee for the system, and contact information for on-call services. Include manufacturer's warranty statement for all equipment including actual expiration dates.
- C. Submit a draft copy of the Operations and Maintenance manual to the Consultant prior to acceptance testing.

3.09 TRAINING

- A. Training shall only occur after final acceptance by the Consultant, unless otherwise directed by the Owner. AV Contractor shall furnish a complete Operations and Maintenance Manual to each participant at the time of training.
- B. At a time designated by the Owner, furnish (16) hours of instruction to the Owner's designated personnel in the use and operation of the system. The instructor is to be fully knowledgeable and qualified in system operation. If required by Owner, training sessions shall be video recorded in a format designated by the Owner for archiving.
- C. Furnish one (1) technician to be present and assist the Owner at the first two (2) major uses of the system as directed by the Owner.

END OF SECTION 27 41 00

**LOS MEDANOS COLLEGE, BUILDING A
BUILDING-WIDE AV SYSTEMS**

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
LCD DISPLAY MOUNT (DIGITAL SIGNAGE)	CHIEF	LSMU
AUDIO DEVICES		
VIDEO DEVICES		
LCD DISPLAY (DIGITAL SIGNAGE, UHD, 65")	SAMSUNG	QM65H
DIGITAL SIGNAGE MEDIA PLAYER	BRIGHTSIGN	LS423
DIGITAL SIGNAGE MEDIA PLAYER MEMORY UPGRADE	BRIGHTSIGN	USDHC-160C10-1
CONTROL DEVICES		
CONTROL PROCESSOR	CRESTRON	CP3
NETWORK SWITCH (OFCI)	OFE	OFE

LOS MEDANOS COLLEGE, BUILDING A
 TRAINER'S ROOM PE-101

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
LCD DISPLAY MOUNT	CHIEF	LSMU
AUDIO DEVICES		
VIDEO DEVICES		
LCD DISPLAY (UHD, 85")	SAMSUNG	LH85QMFLGC/ZA
HDMI/VGA TRANSMITTER/RECEIVER PAIR (Tx/Rx)	CRESTRON	HD-MD-300-C-E-B
CONTROL DEVICES		
CONTROL BUTTON PANEL	CRESTRON	MPC3-201-B

LOS MEDANOS COLLEGE, BUILDING A
CONFERENCE PE-127

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
IN-CREDENZA EQUIPMENT RACK FRAME	MIDDLE ATLANTIC	CFR-10-16
AUDIO DEVICES		
CEILING LOUDSPEAKERS	CRESTRON	SAROS ICI6T-W-T
POWER AMPLIFIER (1X50W, 70V)	CRESTRON	AMP150-70
AUDIO DSP (12X8, AEC, USB)	CRESTRON	DSP-1282
TABLETOP MICROPHONE (3-ELEMENT)	SHURE	MX396/C-TR
VIDEO DEVICES		
SHORT THROW PROJECTOR	EPSON	BRIGHTLINK 697UI
MULTI-FORMAT VIDEO SWITCHER	CRESTRON	DMPS3-4K-150-C
HDMI/VGA TRANSMITTER (Tx)	CRESTRON	DM-TX-201-C
HDMI RECEIVER (Rx)	CRESTRON	DM-RMC-4KZ-100-C
PAN/TILT/ZOOM USB CAMERA	LOGITECH	PTZ PRO 2
COMPUTER (OFOI)	OFE	OFE
CONTROL DEVICES		
CONTROL TOUCH PANEL	CRESTRON	TSW-760
USB EXTENDER RECEIVER (Rx)	CRESTRON	USB-EXT-DM-LOCAL
USB EXTENDER TRANSMITTER (Tx)	CRESTRON	USB-EXT-DM-REMOTE

LOS MEDANOS COLLEGE, BUILDING A
CLASSROOMS PE-109, PE-111

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
VIDEO PROJECTOR MOUNT	CHIEF	PRPMAU
TABLE BOX	EXTRON	CABLE CUBBY 202
INSTRUCTOR STATION (SIT-STAND)	FREEDOM ONE	55355 FMSG
INSTRUCTOR STATION RACK MOUNT DRAWER	FREEDOM ONE	97522
INSTRUCTOR STATION RACK MOUNT SHELF (3 RU, QTY 2)	FREEDOM ONE	97502
INSTRUCTOR STATION RACK MOUNT POWER STRIP	FREEDOM ONE	99021
INSTRUCTOR STATION RACK MOUNT BLANK (3 RU, QTY 4)	FREEDOM ONE	97512
INSTRUCTOR STATION RACK MOUNT BLANK (2RU)	FREEDOM ONE	97511
INSTRUCTOR STATION KEYBOARD TRAY	FREEDOM ONE	55356
INTRUCTOR STATION REAR LOCKING DOOR (LS0004 CORE)	FREEDOM ONE	68152
AUDIO DEVICES		
CEILING LOUDSPEAKERS	CRESTRON	SAROS ICI6T-W-T
VIDEO DEVICES		
VIDEO PROJECTOR (WXGA, 7500 LUMENS)	EPSON	POWERLITE PRO G7200W
VIDEO SWITCHER (8X2, DSP, CONTROL SYSTEM, 50W AMP, BYOD)	CRESTRON	DMPS3-4K-250-C-AIRMEDIA
DOCUMENT CAMERA (OFOI)	CRESTRON	DM-RMC-4K-100-C
HDMI TRANSMITTER (Tx)	CRESTRON	HD-EXT3-C
COMPUTER W/ TOUCH SCREEN (OFOI)	DELL	OPTIPLEX 3240
CONTROL DEVICES		
CONTROL TOUCH PANEL	CRESTRON	TSW-760-B-S
CONTROL TOUCH PANEL TABLE TOP KIT	CRESTRON	TSW-760-TTK-B-S

LOS MEDANOS COLLEGE, BUILDING A
 FITNESS PE-106, PE-108

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
LCD DISPLAY MOUNT	CHIEF	LSMU
AUDIO DEVICES		
CEILING LOUDSPEAKERS	CRESTRON	SAROS ICI6T-W-T
POWER AMPLIFIER (1X100W)	CRESTRON	AMP-1200-70
AUDIO PLATE	RDL	DB-CIJ3
WIRELESS MICROPHONE SYSTEM	SHURE	ULXS14/85
HEADWORN WIRELESS MICROPHONE	SHURE	MX153
AUDIO DSP/MIXER (SHARED BETWEEN 2 FITNESS SPACES)	CRESTRON	DSP-860
VIDEO DEVICES		
LCD DISPLAY (UHD, 85")	SAMSUNG	LH85QMFLGC/ZA
HDMI TRANSMITTER/RECEIVER (Tx/Rx)	CRESTRON	HD-MD-300-C-E
BYOD DEVICE	CRESTRON	AM-200
CONTROL DEVICES		
CONTROL BUTTON PANEL	CRESTRON	MPC3-201-B

LOS MEDANOS COLLEGE, BUILDING A
GENERAL TRAINING PE-104

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
LCD DISPLAY MOUNT	CHIEF	LSMU
AUDIO DEVICES		
PENDANT LOUDSPEAKERS	CRESTRON	SAROS PD4T-W-T
POWER AMPLIFIER (2x210W)	CRESTRON	AMP-2210T
WIRELESS MICROPHONE SYSTEM	SHURE	ULXS14/85
HEADWORN WIRELESS MICROPHONE	SHURE	MX153
AUDIO DSP/MIXER (SHARED BETWEEN 2 TRAINING SPACES)	CRESTRON	DSP-860
VIDEO DEVICES		
LCD DISPLAY (UHD, 65")	SAMSUNG	QM65H
MULTI-FORMAT VIDEO SWITCHER	CRESTRON	DMPS3-4K-150-C
HDMI/VGA TRANSMITTER/RECEIVER PAIR (Tx/Rx)	CRESTRON	HD-MD-300-C-E-B
HDMI TO DM TRANSMITTER & DISTRIBUTION AMPLIFIER (HDBTx)	CRESTRON	DM-DA4-4K-C
HDMI RECEIVER (Rx)	CRESTRON	DM-RMC-4KZ-100-C
DIGITAL SIGNAGE MEDIA PLAYER	BRIGHTSIGN	LS423
DIGITAL SIGNAGE MEDIA PLAYER MEMORY UPGRADE	BRIGHTSIGN	USDHC-160C10-1
CONTROL DEVICES		
CONTROL TOUCH PANEL	CRESTRON	TSW-760-B-S

LOS MEDANOS COLLEGE, BUILDING A
 ATHLETIC WEIGHT TRAINING PE-105

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
LCD DISPLAY MOUNT	CHIEF	LSMU
AUDIO DEVICES		
PENDANT LOUDSPEAKERS	CRESTRON	SAROS PD4T-W-T
POWER AMPLIFIER (2x210W)	CRESTRON	AMP-2210T
WIRELESS MICROPHONE SYSTEM	SHURE	ULXS14/85
HEADWORN WIRELESS MICROPHONE	SHURE	MX153
AUDIO DSP/MIXER (SHARED BETWEEN 2 TRAINING SPACES)	CRESTRON	DSP-860
VIDEO DEVICES		
LCD DISPLAY (UHD, 65")	SAMSUNG	QM65H
HDMI/VGA TRANSMITTER/RECEIVER PAIR (Tx/Rx)	CRESTRON	HD-MD-300-C-E-B
HDMI TO DM TRANSMITTER & DISTRIBUTION AMPLIFIER (HDBTx)	CRESTRON	DM-DA4-4K-C
HDMI RECEIVER (Rx)	CRESTRON	DM-RMC-4KZ-100-C
DIGITAL SIGNAGE MEDIA PLAYER	BRIGHTSIGN	LS423
DIGITAL SIGNAGE MEDIA PLAYER MEMORY UPGRADE	BRIGHTSIGN	USDHC-160C10-1
CONTROL DEVICES		
CONTROL TOUCH PANEL	CRESTRON	TSW-760-B-S

LOS MEDANOS COLLEGE, BUILDING B
 BUILDING-WIDE AV SYSTEMS

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
LCD DISPLAY MOUNT (DIGITAL SIGNAGE)	CHIEF	LSMU
AUDIO DEVICES		
VIDEO DEVICES		
LCD DISPLAY (DIGITAL SIGNAGE, UHD, 65")	SAMSUNG	QM65H
DIGITAL SIGNAGE MEDIA PLAYER	BRIGHTSIGN	LS423
DIGITAL SIGNAGE MEDIA PLAYER MEMORY UPGRADE	BRIGHTSIGN	USDHC-160C10-1
CONTROL DEVICES		
CONTROL PROCESSOR	CRESTRON	CP3
NETWORK SWITCH (OFCI)	OFE	OFE

LOS MEDANOS COLLEGE, BUILDING B
ACTIVE SPACE SU-104

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
LCD DISPLAY MOUNT	CHIEF	LSMU
MILLWORK EQUIPMENT RACK	MIDDLE ATLANTIC	CFR-10-16
TABLE BOX	EXTRON	CABLE CUBBY 202
AUDIO DEVICES		
ASSISTIVE LISTENING/WIRELESS AUDIO DEVICE	BY GC	BY GC
VIDEO DEVICES		
LCD DISPLAY (UHD, 65")	SAMSUNG	QM65H
MULTIFORMAT VIDEO SWITCHER	CRESTRON	DMPS3-4K-350-C
HDMI/VGA TRANSMITTER WALL PLATE (Tx)	CRESTRON	DM-TX-200-C
HDMI RECEIVER (Rx)	CRESTRON	DM-RMC-4K-100-C
DIGITAL SIGNAGE MEDIA PLAYER	BRIGHTSIGN	LS423
DIGITAL SIGNAGE MEDIA PLAYER MEMORY UPGRADE	BRIGHTSIGN	USDHC-160C10-1
CONTROL DEVICES		
CONTROL TOUCH PANEL	CRESTRON	TSW-760-B-S

LOS MEDANOS COLLEGE, BUILDING B
 DIVISIBLE MEETING ROOMS SU-106, SU-108, SU-109

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
RACK-MOUNTED INPUT/OUTPUT PANEL	CUSTOM	CUSTOM
VIDEO PROJECTOR MOUNT CEILING PLATE W/ADJUSTABLE COLUMN	CHIEF	CMA100
OPERATOR INPUT/OUTPUT PLATE	CUSTOM	CUSTOM
PORTABLE LECTERN (LIGHT OAK FINISH)	FORBES	4895
PORTABLE LECTERN GOOSENECK LIGHT OPTION	FORBES	6065
GOOSENECK MICROPHONE SHOCKMOUNT	CLOCK AUDIO	SM 70
TABLE BOX (CREDENZA SURFACE)	EXTRON	CABLE CUBBY 202
AUDIO DEVICES		
AUDIO DSP (DANTE, BRIDGED)	CRESTRON	DSP-1281
CEILING LOUDSPEAKERS	CRESTRON	SAROS IC18T
POWER AMPLIFIER (4X250W)	LAB GRUPPEN	E 10:4
POWER AMPLIFIER (2X250W)	LAB GRUPPEN	E 5:4
GOOSENECK MICROPHONE	SHURE	MX418/C
WIRELESS MICROPHONE RECEIVER (4 CHANNEL)	SHURE	ULXD4Q
WIRELESS MICROPHONE RECEIVER (2 CHANNEL)	SHURE	ULXD4D
WIRELESS MICROPHONE ANTENNA DISTRIBUTION (DA)	SHURE	UA844+SWB
WIRELESS MICROPHONE IN-LINE ANTENNA AMPLIFIER (ILAA)	SHURE	UA834WB
WIRELESS MICROPHONE SPLITTER/COMBINER (S/C)	SHURE	UA221
WIRELESS HANDHELD MICROPHONE	SHURE	ULXD2/B58
WIRELESS MICROPHONE BODYBACK TRANSMITTER	SHURE	ULXD1
WIRELESS MICROPHONE LAVALIER MICROPHONE	SHURE	WL93
DIGITAL AUDIO MIXER (PORTABLE)	ALLEN & HEATH	SQ-5
DIGITAL AUDIO MIXER DANTE CARD	ALLEN & HEATH	M-DANTE
VIDEO DEVICES		
VIDEO PROJECTOR (SOUTH WALL, W/ STANDARD LENS)	EPSON	POWERLITE PRO Z10000UNL
VIDEO PROJECTOR (EAST WALL, W/ STANDARD LENS)	EPSON	PRO L1300U
DIGITAL MEDIA SWITCHER	CRESTRON	DM-MD16x16
DM INPUT CARD	CRESTRON	DMC-4KZ-C
SDI INPUT CARD	CRESTRON	DMC-4K-HD-HDCP2
HDMI INPUT CARD	CRESTRON	DMC-4K-HD-HDCP2
DM OUTPUT CARD	CRESTRON	DMC-4K-CO-HD-HDCP2
HDMI OUTPUT CARD	CRESTRON	DMC-4K-HDO
STREAMING OUTPUT CARD	CRESTRON	DMC-STRO
HDMI/VGA TRANSMITTER WALL PLATE (Tx)	CRESTRON	DM-TX-200-C-2G
HDMI RECEVIER (Rx)	CRESTRON	DM-RMC-4K-100-C
HDMI-TO-HDSDI CONVERTER	ENSEMBLE DESIGNS	BRIGHT EYE 83-H
PAN-TILT-ZOOM CAMERA (HD-SDI, W/ MOUNT)	VADDIO	ROBOSHOT 30 HD-SDI
VIDEO PRODUCTION SWITCHER (PORTABLE)	BLACKMAGIC DESIGN	ATEM 4M/E
VIDEO PRODUCTION SWITCHER CONTROL PANEL (PORTABLE)	BLACKMAGIC DESIGN	ATEM 1M/E PANEL
CONTROL DEVICES		
CONTROL TOUCH PANEL	CRESTRON	TSW-760
CONTROL TOUCH PANEL TABLETOP MOUNTING KIT (LECTERN)	CRESTRON	TSW-560/760/1060-SMK
ROOM SCHEDULING DISPLAY	CRESTRON	TSS-7

LOS MEDANOS COLLEGE, BUILDING B
 BOOKSTORE SU-134

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
DESKTOP MOUNTING BOX (2-GANG)	RDL	DSKB-2G-WHT
AUDIO DEVICES		
CEILING LOUDSPEAKERS	CRESTRON	SAROS ICI6T-W-T
PENDANT LOUDSPEAKERS	CRESTRON	SAROS PD4T-W-T
POWER AMPLIFIER (4X125W)	LAB GRUPPEN	E 5:4
PAGING STATION	SHURE	MX412D/S
AUDIO DSP	SYMETRIX	JUPITER 4
AUDIO PLATE	RDL	BD-CIJ3
VIDEO DEVICES		
CONTROL DEVICES		
VOLUME CONTROL PANEL	SYMETRIX	ARC-K1E

LOS MEDANOS COLLEGE, BUILDING B
 LARGE CONFERENCE SU-231

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
IN-CREDENZA EQUIPMENT RACK FRAME	MIDDLE ATLANTIC	CFR-10-16
VIDEO PROJECTOR MOUNT	CHIEF	RPMAU
AUDIO DEVICES		
CEILING LOUDSPEAKERS	CRESTRON	SAROS ICI6T-W-T
POWER AMPLIFIER (1X50W, 70V)	CRESTRON	AMP150-70
VIDEO DEVICES		
VIDEO PROJECTOR	EPSON	POWERLITE PRO G7200W
MULTI-FORMAT VIDEO SWITCHER	CRESTRON	DMPS3-4K-150-C
HD VIDEO TRANSMITTER (Tx)	CRESTRON	DM-TX-200-C
BYOD DEVICE	CRESTRON	AM-200
CONTROL DEVICES		
CONTROL TOUCH PANEL	CRESTRON	TSW-760-B-S

LOS MEDANOS COLLEGE, BUILDING B
 LEARNING SPACES SU-215, SU-218, SU-221, SU-224

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
LCD DISPLAY MOUNT	CHIEF	LSMU
AUDIO DEVICES		
VIDEO DEVICES		
LCD DISPLAY (UHD, 85")	SAMSUNG	LH85QMFLGC/ZA
HDMI TRANSMITTER/RECEIVER (Tx/Rx)	CRESTRON	HD-MD-300-C-E
BYOD DEVICE	CRESTRON	AM-200
DIGITAL SIGNAGE MEDIA PLAYER	BRIGHTSIGN	LS423
DIGITAL SIGNAGE MEDIA PLAYER MEMORY UPGRADE	BRIGHTSIGN	USDHC-160C10-1
CONTROL DEVICES		
CONTROL BUTTON PANEL	CRESTRON	MPC3-201-B

LOS MEDANOS COLLEGE, BUILDING B
 SHARED SOCIAL SPACE SU-213

DESCRIPTION	BRAND	MODEL
HARDWARE DEVICES		
LCD DISPLAY MOUNT	CHIEF	LSMU
AUDIO DEVICES		
VIDEO DEVICES		
LCD DISPLAY (UHD, 65")	SAMSUNG	QM65H
HDMI TRANSMITTER/RECEIVER (Tx/Rx)	CRESTRON	HD-MD-300-C-E
DIGITAL SIGNAGE MEDIA PLAYER	BRIGHTSIGN	LS423
DIGITAL SIGNAGE MEDIA PLAYER MEMORY UPGRADE	BRIGHTSIGN	USDHC-160C10-1
CONTROL DEVICES		
CONTROL BUTTON PANEL	CRESTRON	MPC3-201-B