



## ADDENDUM 002

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<b>project</b>	Stevens Henegar 4th Floor TI	<b>project no</b>	19140.00
<b>date</b>	2019-12-13	<b>no. pages</b>	1
<b>owner</b>	Intermountain Healthcare - Health Services, Inc.		
<b>contractor</b>			
<b>bid date</b>	2019-12-20	<b>bid time</b>	2:00 pm

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This Addendum shall be considered part of the Contract Documents and Project Manual for the above mentioned project as though it had been issued at the same time and shall be incorporated integrally therewith. Where provisions of the following supplementary data differ from those of the original Contract Documents and Project Manual, the Addendum shall govern and take precedence.

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### specifications

item	section#	description
2.1	24 4114	See attached specification for revised bidders.
2.2	27 4115	See attached specification for revised bidders.
2.3	27 4116	See attached specification for revised bidders.

**End of Addendum 002**

## **SECTION 27 41 14**

### **AUDIO SYSTEMS**

#### **PART 1 - GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections: The following division 27 sections contain requirements that relate to this section:
  - 1. Basic Communications Systems Materials and Methods
  - 2. Video Systems
  - 3. Control Systems
  - 4. Structured Cabling
  - 5. Sound Masking
- C. Related Sections: Several sections of division 26 contain requirements that relate to this section.

##### **1.2 SUMMARY**

- A. The audio system will provide for voice amplification and media device audio program amplification. Media device audio program and voice audio amplification will originate from various media sources and microphones, be switched through a source selection switcher, and/or be mixed, processed and amplified to the speaker system. In addition where specified, tele-conferencing is provided. All audio systems shall be in compliance with Intermountain Health Care standards and procedures.
- B. This Section includes requirements for audio system components including, but not limited to, the following:
  - 1. Microphones
  - 2. Mixers
  - 3. Power Amplifiers
  - 4. Cabinets
  - 5. Racks
  - 6. Speaker Systems
  - 7. Wiring
  - 8. Microphone Inputs
  - 9. Processors
  - 10. Combiners

##### **1.3 SYSTEM DESCRIPTION**

- A. General: The audio system shall be a complete system for amplifying sound signals from microphones and media source equipment and distributing them to loudspeakers at various locations.
- B. Functional Performance: Components and system features and functions shall include, but are not limited to, the following:
  - 1. Meet the following performance parameters as measured in 1/3 octave bands:
    - a. From 100 Hz to 2kHz, flat within plus or minus 2dB.
    - b. Above 2kHz, slope down along an approximate 3dB octave slope to 8kHz.
  - 2. Sound pressure levels at 2kHz octave band shall not deviate more than plus or minus 2dB.
  - 3. When driven to maximum output, clipping shall first occur in power amplifiers.
  - 4. No noise, hum, RFI pickup or distortion shall be audible under normal operating conditions.
  - 5. Sound system shall reproduce program material at a level of 90 dBA without audible distortion.

#### **1.4 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
  - 1. Product data for each type of product specified.
  - 2. Shop drawings detailing audio system including, but not limited to the following:
    - a. Connection panels.
    - b. Rack elevations showing component arrangement inside equipment racks.
  - 3. Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance.
  - 4. Provide software layouts, programs, presets, routing, etc... for all audio processors and echo cancelors.
  - 5. Maintenance data for materials and products, for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 13 Section "Basic A/V System Requirements." Provide complete operations and maintenance manual material concurrently with system submittal and provide updated final versions of manuals one month before completion of construction and final system turnover. Include the following:
    - a. Equipment list showing quantity, make, model, and serial number.
    - b. System operating instructions.
    - c. System maintenance instructions.
  - 6. Wiring codes for all system cable. (See "labeling", this section).
  - 7. Proposed labeling for system components. (See "labeling", this section).
  - 8. All special submittal instructions indicated on supplied design drawings.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sound system, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firms with at least 5 years of successful installation experience of A/V system projects similar to that required for this project. In addition, installers must have successfully completed a minimum of 3 similar installations over a period of 2 years prior to the date of the bid opening for this project. System installations must have included similar automatic mixers, matrices, and echo cancellers hardware and software. To qualify as similar, audio systems must have included complete installation, set up, programming, balancing, and equalization of automatic mixers, matrix routers, echo cancellers, and digital audio processors. All such installation, set up, programming, balancing, and equalization work must have been completed by a factory trained and certified technician of the specified mixer, matrix, echo canceller, and digital audio processor manufacturer. The certified technician must have successfully completed all relevant training courses recommended by the manufacturers of the above referenced equipment for proficiency in these skill sets. In addition, the certified technician must have been, and now be, a direct employee of the installer, in a permanent office staffed with factory qualified technicians, working for a minimum of 40 hours per week as a direct employee of the installer. The certified technician and factory trained installers must be the direct employees of the installer; sub-contracted, third party maintenance agreements, or similar arrangements are expressly prohibited, and do not qualify. Upon request, submit evidence of such qualifications to the A/V Consultant. All of the above requirements must be complied with prior to the bid opening for this project.
- C. Approved installers for this project are Marshall Industries and Cache Valley Electric Multimedia.
- D. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."
- E. EIA Compliance: Comply with the following Technology Industries Association Standards:
  - 1. Sound Systems, EIA-160.
  - 2. Loudspeaker, Dynamic Magnetic Structures, and Impedance, EIA-299-A.
  - 3. Racks, Panels, and Associated Equipment, EIA-310-A.
  - 4. Amplifiers for Sound Equipment, SE-101-A.
  - 5. Speakers for Sound Equipment, SE-103.
  - 6. Microphones for Sound Equipment, SE-105.
- F. UL Compliance: Comply with requirements of UL 50.
- G. All installation practices shall be in accordance with, but not limited to, these specifications and drawings. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of the Uniform Building Code, the National Electrical Code and all local authorities having jurisdiction. All installation work shall follow "standard broadcast wiring" and installation practices, as excerpted from "Recommended Wiring Practices," Sound System Engineering, (2nd

Edition), D. Davis, and performed to the highest standards of acknowledged industry practices.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

## **1.7 WARRANTY REQUIREMENTS**

- A. Audio system shall be subject to warranty requirements as stated in Division 1.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by those manufacturers identified in the equipment list. Firms regularly engaged in manufacture of sound system components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. All equipment and material shall be new, and must have been commercially available for at least one year prior to bid.
- C. All equipment must be UL listed or built to UL standards.

### **2.2 SYSTEM REQUIREMENTS**

- A. General: Provide complete and fully functional audio systems using materials and equipment of types, sizes, ratings, and performances as indicated in the equipment list in the accompanying drawings. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information. Coordinate the features of materials and equipment so they form an integrated system with components and interconnections matched for optimum performance of specified functions.
- B. Provide all wire, cable, and connectors as required to complete the installation of all systems as designed and specified.

### **2.3 EQUIPMENT AND MATERIALS**

- A. General: Provide equipment selected from equipment list on drawings, using all solid-state components fully rated for continuous duty at the ratings indicated or specified. Select equipment for normal operation on input power supplied at 105-130 V, 60 Hz.

- B. Provide equipment as indicated on drawings.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the Audio System work.
- B. Do not proceed until unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three times the weight of the equipment being installed. Any structural mounting that is not able to meet this requirement due to the specific nature of the equipment, manufacturer's requirements or limitations of the facility, shall not be installed without prior approval of the Engineer. Install all boxes, equipment, hardware, and other materials plumb, level, and square.
- C. Install all technology equipment and support equipment in podium, and the other millwork in a neat and cosmetically dressed-out manner. All saw cuts, holes and recesses into laminates and woodwork shall be straight, all radius and circular cuts shall be consistent, and all uneven surfaces shall be corrected. This shall include the use of moldings, grommets, bushings, laminates, and wood products as required to dress out the installation of equipment. Assure that the installation of equipment and panels in the technology racks and podiums are completed by using matching screws, hardware and grommets.
- D. Speakers:
  - 1. Confirm polarity of speaker before installation and wire to maintain uniform polarity.
  - 2. Mount transformers with screws securely to speaker brackets or enclosures.
  - 3. Neatly mount speaker grilles, panels, connector plates, control panels, etc., tight, plumb, and square unless indicated otherwise on drawings.
  - 4. Provide brackets, screws, adapters, springs, rack mounting kits, etc., recommended by manufacturer for correct assembly and installation of speaker assemblies and technology components.
  - 5. Make speaker cable connections with rosin core solder or wire nut or equivalent connections.
  - 6. Loosely but completely fill speaker back boxes that do not have fiberglass installed with fiberglass.
  - 7. Seal cone speakers to backbox so air will not pass from one side of speaker to another.

8. Securely mount theater style speaker systems to custom wall mount brackets as detailed in the supplied design drawings. Comply with applicable seismic codes and requirements.

E. Technology:

1. Assure sufficient ventilation for adequate cooling of equipment.
2. Mount amplifiers at top of equipment cabinet. Install vent rack panels in unused spaces. Install vent panels at top and bottom and above each power amplifier.
3. Securely fasten equipment plumb and square in place. Where equipment is installed in rack cabinets, utilize all fastening holes and cover open spaces with perforated panels.
4. Securely fasten relays and small components. Do not use sticky-back tape for fasteners.
5. Install balancing transformer on each unbalanced input or output that connects to device outside equipment cabinet, or that connects to balanced input or output within equipment cabinet.
6. Connect powered components to 120 VAC outlets on transient voltage surge suppressors. Do not connect to outlets on other components.
7. Leave sufficient service loops of uniform length on cables to allow operation of system with chassis outside cabinet.
8. All equipment shall be held firmly in place with proper types of mounting hardware as recommended and/or supplied by the manufacturer. All mounting hardware provided with equipment shall be used when practical. This shall include, but not be limited to, front and rear rack rails, angle brackets and rack mount kits. All equipment shall be installed so as to provide reasonable safety to the operator. The Lessor shall supply adequate ventilation for all enclosed equipment items which produce heat.

F. Cable, Wire, and Connectors:

1. All cable and wire shall be new and unspliced. Splicing of cables and conductors is expressly prohibited in any location other than the equipment racks. Splicing of audio and video cables will not be allowed in any location. Splicing of control conductors shall be accomplished via punch block or terminal strip connections only.
2. Additional cable length shall be provided at all connector locations. Duplex box, junction box, and floor box locations shall be installed with sufficient cable length behind cover plates to permit wiring maintenance and connector replacement in the future.
3. When cable runs utilize the vertical cable raceways located within walls, the acoustic integrity of the walls shall be maintained. All cables that pass through cover plates of junction boxes and raceways, through slab-to-slab walls, and through conduit lines shall be properly gasketed and sealed and all acoustic material shall be restored or replaced.
4. Separation between system cables and all other services shall be maximized to prevent and/or minimize the potential for electro-magnetic interference (EMI). Particular care shall be taken to ensure at least a 12" separation from electrical lines whenever feasible. At points where separation is unavoidable, distribution cables shall cross other services at right angles whenever practical to minimize EMI.

5. Cables shall be installed in a manner that shall ensure no signal cables are placed on top of any lighting fixtures, ceiling speakers, video projector lifts, projection screens, HVAC controls or sensing devices, fire safety and sprinkler system detection technology, or any other technology or mechanical equipment.
6. No cables shall be laid directly on top of T-bar grid ceiling tiles.
7. System cables shall be installed in a manner that will not block access to other equipment or services, across removable service panels and/or in any other manner to prohibit routine maintenance of HVAC systems, fire safety equipment and building mechanical control systems.
8. All exposed cable shall be dressed with heavy duty neoprene heat-shrink tubing.
9. All inter-rack cabling shall be neatly laced, dressed, strain relieved and adequately supported.
10. After completion of wiring and cable installation, all trough and box covers shall be notched out and grommets for clearance of the various cable bundles, (i.e., separate audio, video, and control). These panel covers shall be screwed back in place and all gaskets shall be restored or replaced.
11. Do not place any wires and cables for this system in any conduit, raceway, wireway or cable tray that is used for the mechanical systems of the building.
12. Provide connectors of the type and quality as detailed in this contract, and/or as required to meet the minimum bandwidth requirements of the equipment to which the connectors are terminated. The overall quantity of connectors shall not be limited by the quantities indicated in the drawings and shall be provided as required.
13. No connectors shall be installed in non-accessible locations or used for splicing cables. All connectors shall be new.
14. All connectors shall incorporate strain relief mechanisms which firmly grip the jacket of connected cables. All connectors shall be properly polarized to prevent improper seating. Connectors shall provide appropriate electrical characteristics for the circuitry to which they are attached.
15. All inner-rack cables shall be grouped according to the signals being carried to reduce signal contamination. Separate groups shall be formed for the following:
  - a. Power
  - b. Control
  - c. Video
  - d. Audio cables carrying signals less than -20 dBm.
  - e. Audio cables carrying signals between -20 dBm and +20 dBm.
  - f. Audio cables carrying signals over +20 dBm.
16. Route all cable and wiring within equipment racks, cabinets and millwork according to function, separating wires of different signal levels (microphone, line level, amplifier output, AC, control, etc.) by as much distance as possible. Neatly arrange, harness and bundle all cable with nylon U/V rated ties.
17. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of equipment racks as viewed from the rear. All other cables shall be run on the right side of all equipment racks as viewed from the rear.
18. All cables, except video cables which must be cut to an electrical length, shall be cut to the length dictated by the cable run.
19. Terminal blocks, boards, strips or connectors, shall be furnished by the installer for all cables which interface with racks, cabinets, consoles, or equipment modules.



- Affix terminal blocks, boards, strips or connectors to equipment racks using screws only. Double sided tape will not be accepted.
20. Comply with industry standard circuit polarity and loudspeaker wiring polarity. No cables shall be terminated with a polarity reversal between connectors at either end.
  21. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire ends shall be accepted.
  22. Heat-shrink type tubing shall be used to insulate and dress the ends of all wire and cables including a separate tube for the ground or drain wire.
  23. All solder connections shall be made with rosin-core solder. Temperature controlled soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns, gas or butane, or temperature unregulated irons shall be used on the job site.
  24. The presence of such soldering tools on the job site shall constitute evidence of solder connections made with unauthorized tools and shall provide sufficient grounds for rejection of all solder connections in the system, and the subsequent re-work of same
  25. All mechanical connections shall be made with approved crimp lugs of the correct size and type for the connection. Wire nuts shall not be permitted. Each connector shall be attached with the proper size controlled-duty-cycle ratcheting crimp tool which has been approved by the manufacturer of the connectors.
  26. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on the job site. The presence of such tools on the job site shall constitute evidence of mechanical connections made with unauthorized tools and shall provide sufficient grounds for rejection of all mechanical connections in the system, and the subsequent re-work of same.
  27. Shields for audio cables shall be grounded at the input end only, of the various equipment items on the system to prevent potential for ground loops.

G. Identification and Labeling:

1. All cables, regardless of length, shall be marked with wrap-around number or letter cable markers at both ends. These labels shall be self laminating to ensure durability. The label format used shall be equal, or better than, the system detailed.
2. There shall be no unmarked cables any place in the system.
3. Marking codes used on cables shall correspond to codes provided with submittals, and/or the written documentation of the "as built" drawings.
4. All connectors, controls, equipment components, terminal blocks and equipment racks are to be permanently labeled in a format approved during the submittal process.
5. All equipment labels are to be permanently engraved in metal. Any alternative method shall be approved during the submittal process.
6. Clearly and permanently label all jacks, controls, connections, and so forth. Embossed or printed label tape shall not be used and is considered unacceptable for this system. Attach labels with double stick tape as required.
7. All labeling shall be completed prior to acceptance of the final system.

- H. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation, or accidentally marred during installation, repair, restore, and refinish to original appearance.

### **3.3 GROUNDING**

- A. Provide equipment grounding connections for audio system as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to eliminate ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- C. Provide one #10 ground conductor with green insulation between all equipment racks and the main electrical panel ground bus. Connect at each end.

### **3.4 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Services: Provide services of a factory authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new, and retest until materials satisfactory performance and conditions are achieved.
- C. Balance and Equalization: Perform the final balance and equalization. Comply with the equalization requirements stated above.
- D. A/V Consultant Final Review:
  - 1. Contractor shall assist A/V Consultant in performing the final review, and spot checking the balance and equalization.
  - 2. Coordinate final inspection schedule with A/V Consultant two weeks minimum prior to Consultant's final inspection.
  - 3. Have copy of red-lined as-built documents available at time of inspection.
  - 4. Have loose equipment (microphones, cables, etc) available at time of inspection.
  - 5. Assist Sound/Acoustic Consultant in final inspection of completed system.
  - 6. Provide the following test equipment in good working order:
    - a. Battery operated hand-held 1/3 octave real-time audio spectrum analyzer with SPL meter and precision microphone.
    - b. Digitally generated random pick noise generator, 20Hz-20kHz, minimum 2 hr repetition rate.

- c. Direct reading audio impedance meter, minimum 3 frequencies, 10% accuracy.
  - d. Digital Volt-Ohmmeter.
  - e. Audio oscillator, variable frequency, 20Hz-20kHz.
  - f. Battery operated oscilloscope, 1 MHz minimum bandwidth.
  - g. Necessary charger, cables, test leads, adapter, power strip, etc, for test equipment.
- 7. Correct minor items so A/V Consultant may certify satisfactory completion during his visit.
  - 8. Pay Consultant's additional fees and expenses if building or system have not been completed properly or sufficiently, requiring A/V Consultant to make subsequent visits to balance, equalize, inspect, or certify completion.

### **3.5 COMMISSIONING**

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Provide a minimum of six hours training.
- B. Schedule training with Owner through the Architect, with at least 7 days advance notice.
- C. Occupancy Adjustments: When requested by the Owner or the A/V Consultant within one year of date of substantial completion, provide on-site assistance in adjusting sound levels, resetting matching transformer taps, and adjusting controls to suit actual occupied conditions. Provide up to three visits to the site for this purpose at no additional cost to the owner.

### **3.6 CLEANING AND PROTECTION**

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 274114

## SECTION 274115

### VIDEO SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to this Section.
- B. Related Sections: The following division 27 sections contain requirements that relate to this section:
  - 1. Basic Communications Systems Materials and Methods
  - 2. Audio Systems
  - 3. Control Systems
  - 4. Structured Cabling
- C. Related Sections: Several sections of Division 26 contain requirements that relate to this section.

##### 1.2 SUMMARY

- A. The video system will provide for large screen viewing of multiple media sources. Video and data signals will originate in media devices, be processed, selected and displayed. In addition, where specified, video conferencing is provided. All video systems shall be in compliance with Intermountain Health Care standards and procedures.
- B. This Section includes requirements for video system components including, but not limited to, the following:
  - 1. Video/data Projectors
  - 2. Front Projection Screens
  - 3. Digital Signage.
  - 4. Distribution Switchers
  - 5. Matrix Switchers
  - 6. Video Conferencing CODECs
  - 7. Cameras
  - 8. Computer Interfaces
  - 9. Various Media Source Devices
  - 10. Monitors
  - 11. Video Distribution Systems
  - 12. Racks
  - 13. Wire, Cable, and Connectors

### **1.3 SYSTEM DESCRIPTION**

- A. General: The video system shall be a complete system for the large screen projection and monitoring of video, data, and graphics signals.
- B. Video/Data Functional Performance: Components and system features and functions shall include, but not be limited to:
  - 1. Processing, routing and display of any video, data, or graphic signal up to and including native resolutions of at least 1920 by 1080.
  - 2. Large screen projection systems.
  - 3. Large flat screen monitors
  - 4. Video conferencing.

### **1.4 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
- C. Shop drawings detailing video system including, but not limited to the following:
  - a. Connection panels.
  - b. Rack elevations showing component arrangement inside equipment racks.
  - c. Shop drawings which identify proposed projector lift and electric roll up screen mounting details.
- 2. Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance.
- 3. Maintenance data for materials and products, for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 27 Section "Basic Technology Systems Requirements." Provide complete operations and maintenance manual material concurrently with system submittal and provide updated final versions of manuals one month before completion of construction and final system turnover. Include the following:
  - a. Equipment list showing quantity, make, model, and serial number.
  - b. System operating instructions.
  - c. System maintenance instructions.
- 4. Wiring codes for all system cable. (See "labeling", this section).
- 5. Proposed labeling for system components. (See "labeling", this section).
- 6. All special submittal instructions indicated on supplied design drawings.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of video system, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firms with at least 5 years of successful installation experience of A/V system projects similar to that required for this project. In addition, installers must have successfully completed a minimum of 3 similar installations over a period of 2 years prior to the date of the bid opening for this project. System installations must have included similar switchers, matrices, scalars, processors, CODECS, and projectors. To qualify as similar, video systems must have included complete installation, set up, programming, calibration, and equalization of switchers, matrix routers, scalars, processors, CODECS, and projectors. All such installation, set up, programming, calibration, and equalization work must have been completed by a factory trained and certified technician of the specified switchers, matrix routers, scalars, processors, CODECS, and projectors manufacturer. The certified technician must have successfully completed all relevant training courses recommended by the manufacturers of the above referenced equipment for proficiency in these skill sets. In addition, the certified technician must have been, and now be, a direct employee of the installer, in a permanent office staffed with factory qualified technicians, working for a minimum of 40 hours per week as a direct employee of the installer. The certified technician and factory trained installers must be the direct employees of the installer; sub-contracted, third party maintenance agreements, or similar arrangements are expressly prohibited, and do not qualify. Upon request, submit evidence of such qualifications to the A/V Consultant. All of the above requirements must be complied with prior to the bid opening for this project.
- C. Approved installers for this project are Marshall Industries and Cache Valley Electric Multimedia.
- D. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."
- E. EIA Compliance: Comply with the following Technology Industries Association Standards.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

## **1.7 WARRANTY REQUIREMENTS**

- A. Video system shall be subject to warranty requirements as stated in Division 1.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by those manufacturers identified in the equipment list.

## 2.2 SYSTEM REQUIREMENTS

- A. General: Provide a complete and fully functional video system using materials and equipment of types, sizes, ratings, and performances as indicated in the project drawings. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information. Coordinate the features of materials and equipment so they form an integrated system with components and interconnections matched for optimum performance of specified functions.
- B. Video Projection System: Provide complete projection system set up services including but not limited to convergence, focusing, preset programming, and alignment. Include manufacturer direct services and on site support.
  - 1. Set Up: Provide complete setup and convergence services as defined in the manufacturer's installation manual. Assure that all display devices automatically lock onto all owner designated horizontal scan frequencies and save to memory locations. Provide all equipment required to accomplish programming. At a minimum, without implying limitation, and in addition to those horizontal scan frequencies requested by the owner during the final system set up phase, program display systems to automatically lock onto horizontal scan frequencies for the following resolutions:
    - a. NTSC
    - b. CGA
    - c. VGA
    - d. EGA
    - e. SVGA
    - f. XGA
    - g. SXGA
    - h. UXGA
    - i. MAC II
    - j. MAC QUADRA
    - k. IBM workstations
    - l. UNIX workstations
    - m. SUN workstations
    - n. DVI
    - o. HDMI
    - p. HD resolutions 1080i, 1080p, 720p
  - 2. Mounting, Alignment, and Focusing: Provide all mounting brackets, threaded rod, unistrut, fasteners, and associated mounting hardware to securely affix the projector/lift to building structure. Suspend the projector/lift in compliance with industry recognized rigging procedures and in compliance with seismic codes. Coordinate exact mounting location with architect, mechanical and electrical. Align projector with the optical center of the screen and focus the video projector in relation to the image size, mounting systems, and video projection

screen. All images shall be level, square, and aligned for optimum overall positioning with respect to the optical center line.

3. All projected images shall be free of visible vibration and/or motion. Provide vibration isolation and dampening equipment where required.

## **2.3 EQUIPMENT AND MATERIALS**

- A. General: Provide equipment selected from equipment list on drawings, using all solid-state components fully rated for continuous duty at the ratings indicated or specified. Select equipment for normal operation on input power supplied at 105-130 V, 60 Hz.
- B. Furnish and install adaptor cables and patch cables which comply with all requirements specified in the project notes.
- C. Provide equipment as indicated on drawings.
- D. All Electronic Displays are to be Energy Star compliant.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the video system work.
- B. Do not proceed until unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three times the weight of the equipment being installed. Any structural mounting that is not able to meet this requirement due to the specific nature of the equipment, manufacturer's requirements or limitations of the facility, shall not be installed without prior approval of the Architect. Install all boxes, equipment, hardware, and other materials plumb, level, and square.
- C. Install all technology equipment and support equipment in all podiums, and the other millwork in a neat and cosmetically dressed-out manner. All saw cuts, holes and recesses into laminates and woodwork shall be straight, all radius and circular cuts shall be consistent, and all uneven surfaces shall be corrected. This shall include the use of moldings, grommets, bushings, laminates, and wood products as required to dress out the installation of equipment. Assure that the installation of equipment and panels in the technology racks and podiums are completed by using matching screws, hardware and grommets.



D. Electronics:

1. Assure sufficient ventilation for adequate cooling of equipment.
2. Install vent rack panels in unused spaces.
3. Securely fasten equipment plumb and square in place. Where equipment is installed in rack cabinets, utilize all fastening holes and cover open spaces with perforated panels.
4. Securely fasten relays and small components. Do not use sticky-back tape for fasteners.
5. Install balancing transformer on each unbalanced input or output that connects to device outside equipment cabinet, or that connects to balanced input or output within equipment cabinet.
6. Connect powered components to 120 VAC outlets on transient voltage surge suppressors. Do not connect to outlets on other components.
7. Leave sufficient service loops of uniform length on cables to allow operation of system with chassis outside cabinet.
8. All equipment shall be held firmly in place with proper types of mounting hardware as recommended and/or supplied by the manufacturer. All mounting hardware provided with equipment shall be used when practical. This shall include, but not be limited to, front and rear rack rails, angle brackets and rack mount kits. All equipment shall be installed so as to provide reasonable safety to the operator. The Lessor shall supply adequate ventilation for all enclosed equipment items which produce heat.

E. Cable, Wire, and Connectors:

1. All cable and wire shall be new and unspliced. Splicing of cables and conductors is expressly prohibited in any location other than the equipment racks. Splicing of audio and video cables will not be allowed in any location. Splicing of control conductors shall be accomplished via punch block or terminal strip connections only.
2. Additional cable length shall be provided at all connector locations. Duplex box, junction box, and floor box locations shall be installed with sufficient cable length behind cover plates to permit wiring maintenance and connector replacement in the future.
3. When cable runs utilize the vertical cable raceways located within walls, the acoustic integrity of the walls shall be maintained. All cables that pass through cover plates of junction boxes and raceways, through slab-to-slab walls, and through conduit lines shall be properly gasketed and sealed and all acoustic material shall be restored or replaced.
4. Separation between system cables and all other services shall be maximized to prevent and/or minimize the potential for electro-magnetic interference (EMI). Particular care shall be taken to ensure at least a 12" separation from electrical lines whenever feasible. At points where separation is unavoidable, distribution cables shall cross other services at right angles whenever practical to minimize EMI.
5. Cables shall be installed in a manner that shall ensure no signal cables are placed on top of any lighting fixtures, ceiling speakers, video projector lifts, projection screens, HVAC controls or sensing devices, fire safety and sprinkler system detection technology, or any other technology or mechanical equipment.
6. No cables shall be laid directly on top of T-bar grid ceiling tiles.

7. System cables shall be installed in a manner that will not block access to other equipment or services, across removable service panels and/or in any other manner to prohibit routine maintenance of HVAC systems, fire safety equipment and building mechanical control systems.
8. All exposed cable shall be dressed with heavy duty neoprene heat-shrink tubing.
9. All inter-rack cabling shall be neatly laced, dressed, strain relieved and adequately supported.
10. After completion of wiring and cable installation, all trough and box covers shall be notched out and grommets for clearance of the various cable bundles, (i.e., separate audio, video, and control). These panel covers shall be screwed back in place and all gaskets shall be restored or replaced.
11. Do not place any wires and cables for this system in any conduit, raceway, wireway or cable tray that is used for the mechanical systems of the building.
12. Provide connectors of the type and quality as detailed in this contract, and/or as required to meet the minimum bandwidth requirements of the equipment to which the connectors are terminated. The overall quantity of connectors shall not be limited by the quantities indicated in the drawings and shall be provided as required.
13. No connectors shall be installed in non-accessible locations or used for splicing cables. All connectors shall be new.
14. All connectors shall incorporate strain relief mechanisms which firmly grip the jacket of connected cables. All connectors shall be properly polarized to prevent improper seating. Connectors shall provide appropriate electrical characteristics for the circuitry to which they are attached.
15. All inner-rack cables shall be grouped according to the signals being carried to reduce signal contamination. Separate groups shall be formed for the following:
  - a. Power
  - b. Control
  - c. Video
  - d. Audio cables carrying signals less than -20 dBm.
  - e. Audio cables carrying signals between -20 dBm and +20 dBm.
  - f. Audio cables carrying signals over +20 dBm.
16. Route all cable and wiring within equipment racks, cabinets and millwork according to function, separating wires of different signal levels (microphone, line level, amplifier output, AC, control, etc.) by as much distance as possible. Neatly arrange, harness and bundle all cable with nylon U/V rated ties.
17. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of equipment racks as viewed from the rear. All other cables shall be run on the right side of all equipment racks as viewed from the rear.
18. All cables, except video cables which must be cut to an electrical length, shall be cut to the length dictated by the cable run.
19. Terminal blocks, boards, strips or connectors, shall be furnished by the installer for all cables which interface with racks, cabinets, consoles, or equipment modules. Affix terminal blocks, boards, strips or connectors to equipment racks using screws only. Double sided tape will not be accepted.
20. Comply with industry standard circuit polarity and loudspeaker wiring polarity. No cables shall be terminated with a polarity reversal between connectors at either end.

21. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire ends shall be accepted.
22. Heat-shrink type tubing shall be used to insulate and dress the ends of all wire and cables including a separate tube for the ground or drain wire.
23. All solder connections shall be made with rosin-core solder. Temperature controlled soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns, gas or butane, or temperature unregulated irons shall be used on the job site.
24. The presence of such soldering tools on the job site shall constitute evidence of solder connections made with unauthorized tools and shall provide sufficient grounds for rejection of all solder connections in the system, and the subsequent re-work of same.
25. All mechanical connections shall be made with approved crimp lugs of the correct size and type for the connection. Wire nuts shall not be permitted. Each connector shall be attached with the proper size controlled-duty-cycle ratcheting crimp tool which has been approved by the manufacturer of the connectors.
26. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on the job site. The presence of such tools on the job site shall constitute evidence of mechanical connections made with unauthorized tools and shall provide sufficient grounds for rejection of all mechanical connections in the system, and the subsequent re-work of same.
27. Shields for audio cables shall be grounded at the input end only, of the various equipment items on the system to prevent potential for ground loops.

F. Identification and Labelling:

1. All cables, regardless of length, shall be marked with wrap-around, or better, number or letter cable markers at both ends. These labels shall be self laminating to ensure durability. The label format used shall be equal, or better than, the system detailed.
2. There shall be no unmarked cables any place in the system.
3. Marking codes used on cables shall correspond to codes provided with submittals, and/or the written documentation of the "as built" drawings.
4. All connectors, controls, equipment components, terminal blocks and equipment racks are to be permanently labeled in a format approved during the submittal process.
5. All equipment labels are to be permanently engraved in metal or plastic laminate and affixed with double-stick tape. Any alternative method shall be approved during the submittal process.
6. Clearly and permanently label all jacks, controls, connections, and so forth, with engraved laminated plastic labels. Embossed or printed label tape shall not be used and is considered unacceptable for this system. Attach labels with double stick tape as required.
7. All labeling shall be completed prior to acceptance of the final system.

- G. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation , repair, restore, and refinish to original appearance.

### 3.3 GROUNDING

- A. Provide equipment grounding connections for satellite earth-station systems and components, including dish antenna and supporting structures, and lead-in wires to antenna-discharge units. Tighten connections in accordance with manufacturer's recommended tightening torques. If not manufacturer-specified, comply with tightening torques specified in UL Stds 486A and B to assure permanent and effective grounds.
- B. Provide equipment grounding connections for audio system as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- C. Ground equipment, conductor, and cable shields to eliminate shock hazard and to eliminate ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- D. Provide one #10 ground conductor with green insulation between all equipment racks and the main electrical panel ground bus. Connect at each end.

### **3.4 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Services: Provide services of a factory authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new, and retest until materials satisfactory performance and conditions are achieved.
- C. A/V Consultant Final Review & Equalization:
  - 1. Contractor shall assist A/V Consultant in performing the final balance, equalization, and review.
  - 2. Coordinate final inspection schedule with A/V Consultant two weeks minimum prior to Consultant's final inspection.
  - 3. Have copy of red-lined as-built documents available at time of inspection.
  - 4. Have loose equipment (microphones, cables, etc) available at time of inspection.
  - 5. Assist Sound/Acoustic Consultant in final inspection of completed system.
  - 6. Provide the following test equipment in good working order:
    - a. Digitally generated test signal generator for all signals identified above.
    - b. Digital Volt-Ohmmeter.
    - c. Field strength meter.
    - d. Battery operated oscilloscope, 1 MHz minimum bandwidth.
    - e. Necessary charger, cables, test leads, adapter, power strip, etc, for test equipment.

7. Correct minor items so A/V Consultant may certify satisfactory completion during his visit.
8. Pay Consultant's additional fees and expenses if building or system have not been completed properly or sufficiently, requiring A/V Consultant to make subsequent visits to balance, equalize, inspect, or certify completion.

### **3.5 WARRANTY**

- A. Provide warranty as indicated in Division 1. In addition all projectors dual listed on the drawings in equipment list with Hitachi shall comply with the Hitachi as indicated on the Hitachi USA website.

### **3.6 COMMISSIONING**

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Provide a minimum of eight hours training.
- B. Schedule training with Owner through the Architect, with at least 7 days advance notice.
- C. Occupancy Adjustments: When requested by the Architect or the A/V Consultant within one year of date of substantial completion, provide complete auto convergence services, on-site assistance in adjustment of signal levels, and adjusting controls to suit actual occupied conditions. Provide up to six visits to the site for this purpose at no additional cost to the owner.

### **3.7 CLEANING AND PROTECTION**

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 274115

## SECTION 27 41 16

### CONTROL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to this Section.
- B. Related Sections: The following division 27 sections contain requirements that relate to this section:
  - 1. Basic Communications Systems Materials and Methods
  - 2. Audio Systems
  - 3. Video Systems
- C. Related Sections: Several sections of division 26 contain requirements that relate to this section.

##### 1.2 SUMMARY

- A. All work specified in this section will be furnished and installed by the owner. It is included herein for purposes of coordination between trades under this contract, and the owner's designated installer.
- B. The control system will be a microprocessor based, modular card frame and card system, with control system intercommunication via a serial loop. Human interface will occur through color, programmable touch screen control panel(s), and/or miscellaneous control panels. The control system will control all room A/V functions and equipment, as well as dimmer packs for the room lighting system. The control system will interface to components via infra-red, serial, and contact closure control signals. The control system will include all hardware, firmware, software, and programming to provide complete system control functions including but not limited to all requirements specified in the programming outline included herein. Programming and touch panel layout shall comply with all Intermountain Health Care standards and layouts.
- C. This Section includes requirements for control system components including, but not limited to, the following:
  - 1. Touch Panels
  - 2. Control Panels
  - 3. Modular card frame systems
  - 4. Control cards
  - 5. Volume controllers
  - 6. General bus devices

7. Racks
  8. Wire, Cable, and Connectors
- D. Related Sections: The following division 13 and division 16 sections contain requirements that relate to this section:
1. Basic Technology Systems Materials and Methods
  2. Audio System
  3. Video
  4. Technology Systems Electrical

### **1.3 SYSTEM DESCRIPTION**

- A. Comply with the Control System Programming Outline in developing the software programming for control system operations. The programming outline provides an in-depth narrative which describes the touch panel page design and specific button operating details. All general A/V systems functions will be associated with a specific color. For example, in the common button bar(s), each button will be a different color. When access is gained into control pages, the same color will be carried through to show related functions and controls. All touch panel buttons, graphics, and page configurations shall be developed and designed by the installer as required to produce a fully functioning system. All final page layouts shall be approved by the A/V Consultant and the Owners representative prior to final programming. This shall include all "help" pages, and all new pages and/or buttons which may not be described in the programming outline, but, nevertheless are required to provide a fully functional A/V control system. Submit proposed page layouts for approval in conjunction with the specified submittal process. The intent of the programming outline is not to eliminate the field engineering required of the contractor, but rather to give a clear course of logic desired for the touch panel buttons and pages.
- B. The control panels shall communicate with all specified A/V system components via the specified control system devices.
- C. Where applicable, the control system software will be written to include the video conference code as a single block of programming. All other A/V system code will be written as a separate block, and added to the code for video conferencing code. Provide sufficient "remark statements" to identify various blocks of code.
- D. The fluorescent and/or incandescent overhead lights in each room shall be controlled by the control system.
- E. The Installer shall provide the complete source code to the Owner for the completed functioning control system. In addition, the Installer must relinquish ownership of said software code, in writing, to the owner.
- F. The control system shall be an all digital touch panel system which permits easy operation of all room functions from a single unified panel. This shall include all "technician level" set-up parameters, default settings, presets, and other operational functions as described in this specification and/or required to accomplish fully functioning system.

- G. The control system shall include complete help functions as detailed in the Control System Programming Outline.
- H. The control system shall include operation of power controllers to energize the designated rack mounted system equipment per the Control System Programming requirements, and the system installation guidelines.
- I. The control system hardware shall be supplied by a manufacturer that offers factory-level training in advanced control operations and system programming. This training shall be available to enable the Owner's technical staff to acquire the technician-level skills needed to maintain the control system, and make programming modifications after the initial programming and installation of these system at the completion of the warranty period.
- J. The control system, and its associated equipment, shall interface and operate all equipment and devices, as detailed in the control system programming outline, and as illustrated in the supplied design drawings including, but not limited to lighting dimmers, video cassette recorder/players, Mixers, audio cassette players, compact disc players, document cameras, power controllers, volume controllers, satellite receivers, source selection switchers, signal scalars, video projectors, conferencing equipment, and any and all other system devices as required.
- K. The control system touch panel system shall include a "technician level" of operation separate from the "user level" of operation. This shall be provided to prevent unauthorized manipulation of set-up and control parameters, as detailed in the control system programming section, and as deemed appropriate by the owner. This shall include additional features as dictated by equipment and control operations.
- L. Installer shall provide "user level" hard copy basic steps of operation for each available level of source operation.

#### **1.4 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
  - 1. Product data for each type of product specified.
  - 2. Shop drawings detailing control system including, but not limited to the following:
    - a. Document of proposed system programming logic tree, showing integrated control of all specified equipment, as well as the type of control signal planned for each type of equipment.
    - b. Provide to owner for view all touch panel pages from a internet based processor for review. Make available for a minimum of 2 weeks on at least 2 different occasions. Coordinate exact dates with owner/engineer prior to posting. Upon request provide a paper document of proposed touch panel programming showing scaled, color printout's of all touch panel pages which identify button colors, configurations, icons, graphics, and text.
    - c. Provide completed programs for all Extron IP link control systems and make available to the owner for review over the internet.
    - d. Rack elevations showing component configuration inside equipment racks.



- e. Proposed modular control card for A/V or lighting system component to be controlled.
3. Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance.
  4. Maintenance data for materials and products, for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 13 Section "Basic A/V System Requirements." Provide complete operations and maintenance manual material concurrently with system submittal and provide updated final versions of manuals one month before completion of construction and final system turnover. Include the following:
    - a. Equipment list showing quantity, make, model, and serial number.
    - b. System operating instructions.
    - c. System maintenance instructions.
  5. Wiring codes for all system cable. (See "labeling", this section).
  6. Proposed labeling for system components. (See "labeling", this section).
  7. All special submittal instructions indicated on supplied design drawings.

## **1.5 QUALITY ASSURANCE**

- A. **Manufacturer's Qualifications:** Firms regularly engaged in manufacture of control system, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. **Installer's Qualifications:** Firms with at least 5 years of successful installation experience of A/V system projects similar to that required for this project. In addition, installers must have successfully completed a minimum of 3 similar installations over a period of 2 years prior to the date of the bid opening for this project. System installations must have included similar control system hardware and software. To qualify as similar, control systems must have included touch panel(s), central processing unit(s), and custom programming for touch panel pages. All custom programming code writing must have been written and de-bugged by a factory trained and certified programmer of the specified control system manufacturer who has successfully completed all relevant training courses recommended by the control system manufacturer for proficiency in system programming. In addition, the certified programmer must have been, and now be, a direct employee of the installer, in a permanent office staffed with factory qualified technicians, working for a minimum of 40 hours per week as a direct employee of the installer. The certified programmer and factory trained installers must be the direct employees of the installer; sub-contracted, third party maintenance agreements, or similar arrangements are expressly prohibited, and do not qualify. Upon request, submit evidence of such qualifications to the A/V Consultant. All of the above requirements must be complied with prior to the bid opening for this project.
- C. Approved installers for this project are Marshall Industries and Cache Valley Electric Multimedia.
- D. **Electrical Component Standard:** Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."

- E. Codes and Standards: Comply with the following Codes and Standards:
1. Racks, Panels, and Associated Equipment, EIA-310-A.
  2. NESC Compliance: Comply with National Electrical Safety Code requirements.
  3. FCC Compliance: Comply with Subpart J of PART 15, FCC Rules pertaining to computing devices including Class A, Class B, personal and peripheral types. Provide equipment which complies with technical standards for both radiated and power line conducted interference.
  4. UL Compliance: Comply with applicable requirements of UL Standards 486A and B, 813, 983, 1409, 1410, 1412, 1414, 1416, 1417, and 1418 pertaining to control system products. Provide control system and components which are UL-listed and labeled.
  5. All installation practices shall be in accordance with, but not limited to, these specifications and drawings. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of the Uniform Building Code, the National Electrical Code and all local authorities having jurisdiction. All installation work shall follow "standard broadcast wiring" and installation practices, as excerpted from "Recommended Wiring Practices," Sound System Engineering, (2nd Edition), D. Davis, and performed to the highest standards of acknowledged industry practices.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

#### **1.7 WARRANTY REQUIREMENTS**

- A. Control system shall be subject to warranty requirements as stated in Division 1.

### **PRODUCTS**

#### **1.8 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by those manufacturers identified in the equipment list.

#### **1.9 SYSTEM REQUIREMENTS**

- A. General: Provide a complete and fully functional control system using materials and equipment of types, sizes, ratings, and performances as identified in the equipment list. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information. Coordinate the features of materials and equipment so they form an integrated system with components and interconnections matched for optimum performance of specified functions.

- B. The control system programming outline, as defined in these specifications, constitutes the minimum control system requirements for adequate control of the A/V and lighting systems. The programming outline is a guideline only, provided for the sole purpose of demonstrating intent. It is likely that touch panel/control system buttons, pages, and/or programming will be required which are not identified in the programming outline. During the final software programming, the installer shall work in a close and cooperative manner with the A/V consultant and owners representative, to make additional modifications, and/or changes in programming procedural events, changes in touch panel functions, and changes in programming features as needed at no additional cost to the owner. These adjustments to the system programming outline in this section shall include, but not be limited to, changes in the system programming code, page layouts, equipment operating modes, and system logic from the parameters outlined here to ensure the flexible and user friendly operation of the A/V system. Include all costs necessary to make moderate changes to the control system programming code and touch panel buttons and pages in the base bid.
- C. The final program shall have sufficient "remark statements" at various points in the program to enable easy identification of blocks of programming code.
- D. The Installer shall include a complete functioning code for the lighting system via control from both the touch panel pages as well as from the wall mounted lighting control panel as described.
- E. Upon completion of system installation, a complete set of backup source code programs for the touch panels and mainframe technology of each room shall be provided on 3 1/2" floppy disk or CD to the owner's representative.

#### **1.10 EQUIPMENT AND MATERIALS**

- A. General: Provide equipment selected from equipment list on drawings, using all solid-state components fully rated for continuous duty at the ratings indicated or specified. Select equipment for normal operation on input power supplied at 105-130 V, 60 Hz.
- B. Provide equipment as indicated on the drawings.

### **EXECUTION**

#### **1.11 EXAMINATION**

- A. Examine conditions for compliance with requirements and other conditions affecting the performance of the control system work.
- B. Do not proceed until unsatisfactory conditions have been corrected.
- C. Verify compliance of following items before beginning control equipment installation.
  - 1. No cables spliced except at standard barrier terminal blocks or approved method inside equipment racks.
  - 2. Cables marked at each end with permanent wire labels such as Brady or equal.

3. Specified conduit, cables, enclosures and equipment cabinets are properly installed.
4. Location and angle of loudspeaker cabinets.
5. Location and stability of projection system mounting supports.

## **1.12 INSTALLATION**

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. System Programming and Programming Outline: Provide complete control system programming services including but not limited to the creation of custom software required to meet all contract document requirements including but not limited to the programming outline specified below. Include manufacturer direct services and on site support. Please note that not all equipment, functions, and/or controls may not be specified or required for all rooms. Program software based on the following programming outline as applicable to individual single line diagrams identified in the accompanying drawings.
  1. GENERAL PROGRAMMING REQUIREMENTS: The following programming outline contains control system programming requirements. In addition to these requirements, these specifications mandate the use of previously written code blocks, and system functionality descriptions prepared by the control system manufacturer. Installer shall comply with the design standards and touch panel layouts has provided by Rio Tinto. Where the programming outline conflicts with Rio Tinto standards Rio Tinto standards shall have precedence.
  2. SYSTEM ACTIVATION: When the A/V system has been deactivated by the system off button, or when the touch panel has entered its "time out" mode, display the following message on the touch screen: "TOUCH SCREEN TO ACTIVATE". This message will remain constantly on, and shift positions if recommended by the manufacturer to prevent burn in.
  3. INDIVIDUAL SYSTEM SHUTDOWN: Regardless of the time of day, the control system CPU in each individual classroom shall monitor system usage. If a control command has not been issued within a user adjustable period of time, a pop up window will ask "Do you want the A/V system to remain on?" with a "yes" button. If the yes button is engaged within 30 seconds, the system will remain on. If the yes button is not engaged within 30 seconds, a system off command will be issued, and the A/V system will proceed through orderly shut down. In addition, the control system in each classroom will automatically issue an off command each day at a user adjustable time of day.
  4. BUTTON HIGHLIGHTING: When any button is engaged on any touch panel control page, that button shall be highlighted for the duration of physical contact between the finger and touch screen. In addition, when a any system function is activated/selected, the button will remain highlighted to identify the active status of the control system. In addition, comply with additional button highlighting requirements stated in the programming outline.
  5. ICONS: The programming outline is a written description of buttons, pages, and commands. Even though the buttons are described with words, it is required that the installer make a reasonable use of icons when programming the touch panel pages.

6. PAGE FLIPS AND POP UP WINDOWS: Page flips and pop up windows are specified throughout the programming outline. If, at a specific location in the touch panel pages, the programmer believes one is more appropriate than the other, the programmer is encouraged to consult with the AV designer. Where pop up windows are used, program automatic time outs so that the pop up window will be automatically removed from the screen after a user adjustable period of time.
7. HELP BUTTONS: Where specified, help buttons will be provided on touch panel pages. All help buttons will be a question mark within a diamond. Selecting will bring up a help screen for the page in question only. The installer shall provide and customize as required, clear, concise, brief text which helps the operator to understand the button choices and their actions on the applicable page. The language for these help page messages shall be approved by the A/V Consultant and the Owners representative prior to programming. A RETURN button shall be provided on the help page to bring the operator back to the page in question.
8. PODIUM TOUCH PANEL: The specified touch panel will also serve as the video preview monitor for the rear wall mounted camera. The active portion of the touch panel used for monitoring purposes will be consistently located on all touch panel pages. All controls required for moving the monitor image, re-sizing the monitor image, minimizing (go partial screen) the monitor image, and maximizing (go full screen) the monitor image will be provided.
9. GREETING PAGE: Upon first touching the screen a GREETING PAGE shall be displayed. This page will contain the OWNER'S LOGO, a welcome message, the DATE, the TIME, have the SYSTEM ON button, a HELP button (question mark within a diamond) and a LIGHTS button.
  - a. BUTTON - SYSTEM ON: Selecting brings a 10 key numeric pad to the display for password entry to operate the A/V system. The password entry page shall also be equipped with a return button, to return the user to the greeting page. The password shall not be more than four (4) digits. The password shall be user programmable, and accessible through the technician set up page. If entered correctly, bring up a START PAGE containing all common button bars. In addition, turn on the power controllers for all applicable A/V equipment with a 3 second delay between them. The last power controller circuit turned on shall be the audio amplifiers. In addition, all A/V applicable system parameters shall be set to default values. As an example only, without implying limitation, all volume levels shall be set to default values; the audio and video mutes shall be disengaged if previously left on; etc.... An incorrect password shall return the display back to the GREETING PAGE with no action taken.
10. COMMON BUTTON BARS: With the exception of the greeting page, all control system touch panel pages will contain all "common button bars" for the purpose of allowing access to fundamental control functions from any location in the touch panel page/software program. When a button in the common button bar group is selected, that button shall become highlighted, and remain highlighted until interaction with the corresponding page is terminated. At a minimum, without implying limitation, the common button bars shall contain the following:
  - a. COMMON BUTTON BAR 1, GENERAL, (top center):

- 1) BUTTON - SOURCE SELECT: Selecting brings up the source selection page.
- 2) BUTTON - CONFERENCING (if applicable): Selecting brings up the conferencing select page.
- 3) BUTTON - PROJECTOR/SCREEN: Selecting brings up the projector/screen control page.
- 4) BUTTON - CURRENT STATUS: Selecting displays the current status of the AV system. Items to be identified include, but are not limited to: Power to individual system components, projector standby, system muting, audio levels, lighting levels, input currently selected.
- 5) BUTTON - DISPLAY MODIFY (for rooms where multiple display devices serve a single physical space): Selecting brings up the display modify page.
- 6) BUTTON - WINDOW COVERINGS (if applicable): Selecting brings up the motorized window coverings control page.
- 7) BUTTON - SYSTEM OFF: Selecting shall display a text prompt asking "Are you sure?" with a text message stating that a certain period of time must elapse (time to be determined by the projector manufacturer) before the system can be powered on again; in addition, provide buttons YES, and NO. IF YES, the system shall power off the AC power controllers in reverse order of turn on, turning the audio amplifiers off first, followed, three (3) seconds later, by the rest of the designated A/V equipment. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 8) BUTTON - HELP: Provide as specified above.
- 9) BUTTON - TECHNICIAN SET UP: (Hidden button, no border). Selecting brings a 10 key numeric pad to the display for password entry to technician set-up pages. The password shall not be more than four (4) digits. This password shall be user programmable, and accessible through a technician set up page. If entered correctly, operator will be allowed access to the technician set up pages.
- 10) DISPLAY - DATE: Will display the correct date.
- 11) DISPLAY - TIME: Will display the correct time of day.

b. COMMON BUTTON BAR 2, LIGHTING, (left):

- 1) BUTTON - FULL, (100%): Selecting shall cause selected room lighting to fade to programmed presets in 3 seconds.
- 2) BUTTON - MEETING: Selecting shall cause selected room lighting to fade to programmed presets in 3 seconds.
- 3) BUTTON - VIDEO CONFERENCE (for rooms with video conferencing only): Selecting shall cause selected room lighting to fade to programmed presets in 3 seconds.
- 4) BUTTON - PROJECTION: Selecting shall cause selected room lighting to fade to programmed presets in 3 seconds.
- 5) BUTTON - ROOM LIGHTS INCREASE: Selecting shall increase scene lighting levels. Minimum and maximum levels shall be programmed into the dimming system. Button shall operate incrementally and continuously. When selected incrementally, the room light levels shall increase incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the light levels

- shall increase continuously within the preprogrammed minimum and maximum parameters.
- 6) BUTTON - ROOM LIGHTS DECREASE: Selecting shall decrease scene lighting levels. Minimum and maximum levels shall be programmed into the dimming system. Button shall operate incrementally and continuously. When selected incrementally, the room light levels shall decrease incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the light levels shall decrease continuously within the preprogrammed minimum and maximum parameters.
  - 7) BUTTON - OFF: Selecting shall cause selected room lighting to fade to off in 3 seconds.
  - 8) BUTTON - HELP: Provide as specified above.
- c. COMMON BUTTON BAR, MISCELLANEOUS (bottom left):
- 1) BUTTON - BACK: Selecting shall return the user to the previous page selected, similar to a common web browser. This function shall be provided on every touch panel page except for the GREETING PAGE and START PAGE.
- d. COMMON BUTTON BAR 3, VOLUME CONTROL, (right):
- 1) BUTTON - MICROPHONE VOLUME UP: Selecting shall simultaneously increase the input levels of all microphone inputs to the mixer. All mixer levels will change independently, without changing relative levels between microphone inputs. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall increase incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall increase continuously within the preprogrammed minimum and maximum parameters. If microphones were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume up control.
  - 2) BUTTON - MICROPHONE VOLUME DOWN: Selecting shall simultaneously decrease the input levels of all microphone inputs to the mixer. All mixer levels will change independently, without changing relative levels between microphone inputs. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall decrease incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall decrease continuously within the preprogrammed minimum and maximum parameters. If microphones were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume down control.
  - 3) DISPLAY - MICROPHONE VOLUME UP AND DOWN BAR GRAPH: Bar graph shall be continuously displayed adjacent to volume up and

- down buttons. Bar graph shall graphically display the window between the preprogrammed minimum and maximum volume settings. The bar graph shall be divided into a minimum of 10 segments which shall incrementally or continuously appear or disappear according to the volume button selected. The bar graph display shall be removed from the screen when the mute function is selected. The bar graph shall be restored to its previous setting when the mute function is toggled off.
- 4) BUTTON - MICROPHONE MUTE (toggle function): Selecting shall highlight and flash the button, and simultaneously mute all microphone inputs to the mixer. Mute shall be defined as a minimum 60 dBA decrease in sound pressure level. Bar graph display shall be removed. Selecting again will simultaneously un-mute all microphone inputs to the mixer, and the bar graph display will be restored showing its previous setting.
  - 5) BUTTON - AUDIENCE MICROPHONE MUTE (toggle function) (where applicable): Selecting shall highlight and flash the button, and simultaneously mute all student microphone inputs to the mixer. Mute shall be defined as a minimum 60 dBA decrease in sound pressure level. Bar graph display shall be removed. Selecting again will simultaneously un-mute the student microphone inputs to the mixer, and the bar graph display will be restored showing its previous setting.
  - 6) BUTTON - MEDIA SOURCE VOLUME UP: Selecting shall simultaneously increase the input levels of all media source inputs to the mixer. All mixer levels will change independently, without changing relative levels between microphone inputs. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall increase incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall increase continuously within the preprogrammed minimum and maximum parameters. If the media source mixer inputs were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume up control.
  - 7) BUTTON - MEDIA SOURCE VOLUME DOWN: Selecting shall simultaneously decrease the input levels of all media source inputs to the mixer. All mixer levels will change independently, without changing relative levels between microphone inputs. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall decrease incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall decrease continuously within the preprogrammed minimum and maximum parameters. If the media source mixer inputs were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume down control.
  - 8) DISPLAY - MEDIA SOURCE VOLUME UP AND DOWN BAR GRAPH: Bar graph shall be continuously displayed adjacent to volume up and down buttons. Bar graph shall graphically display the window



between the preprogrammed minimum and maximum volume settings. The bar graph shall be divided into a minimum of 10 segments which shall incrementally or continuously appear or disappear according to the volume button selected. The bar graph display shall be removed from the screen when the mute function is selected. The bar graph shall be restored to its previous setting when the mute function is toggled off.

- 9) **BUTTON - MEDIA SOURCE MUTE (Toggle function):** Selecting shall highlight and flash the button, and simultaneously mute the media source inputs to the mixer. Mute shall be defined as a minimum 60 dBA decrease in sound pressure level. Bar graph display shall be removed. Selecting again will simultaneously un-mute the media source inputs to the mixer, and the bar graph display will be restored showing its previous setting.
- 10) **BUTTON - PLATFORM SPEAKERS VOLUME UP:** Selecting shall increase the level of the mixer output which feeds the platform speaker amplifier. Button shall operate incrementally and continuously. When selected incrementally, the volume shall increase incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall increase continuously within the preprogrammed minimum and maximum parameters. If the platform speakers were muted prior to selection, disengage the mute function, display the bar graph, and engage the volume up control.
- 11) **BUTTON - FAR END AUDIO VOLUME UP (required where teleconferencing/video conferencing capability is specified):** Selecting shall increase the conferencing far end audio input to the mixer. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall increase incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall increase continuously within the preprogrammed minimum and maximum parameters. If the far end audio was muted prior to selection, disengage the mute function, display the bar graph, and engage the volume up control.
- 12) **BUTTON - FAR END AUDIO VOLUME DOWN (required where teleconferencing/video conferencing capability is specified):** Selecting shall decrease the conferencing far end audio input to the mixer. Minimum and maximum levels shall be programmed into the volume control which shall prevent complete inaudibility and/or feedback. Button shall operate incrementally and continuously. When selected incrementally, the volume shall decrease incrementally within the preprogrammed minimum and maximum parameters. When touched continuously, the volume shall decrease continuously within the preprogrammed minimum and maximum parameters. If the far end audio was muted prior to selection, disengage the mute function, display the bar graph, and engage the volume down control.
- 13) **DISPLAY - FAR END AUDIO VOLUME UP AND DOWN BAR GRAPH:** Bar graph shall be continuously displayed adjacent to volume up and down buttons. Bar graph shall graphically display the window between the preprogrammed minimum and maximum volume

settings. The bar graph shall be divided into a minimum of 10 segments which shall incrementally or continuously appear or disappear according to the volume button selected. The bar graph display shall be removed from the screen when the mute function is selected. The bar graph shall be restored to its previous setting when the mute function is toggled off.

- 14) BUTTON - MICROPHONE MUTE (toggle function): Selecting shall highlight and flash the button, and mute far end audio input to the mixer. Mute shall be defined as a minimum 60 dBA decrease in sound pressure level. Bar graph display shall be removed. Selecting again will un-mute the far end audio input to the mixer, and the bar graph display will be restored showing its previous setting.
- 15) BUTTON - HELP: Provide one help button for all audio volume and mute controls as specified above.

e. COMMON BUTTON BAR 5, MISCELLANEOUS, (bottom right):

- 1) BUTTON - PROJECTOR STANDBY (toggle function): Selecting shall highlight and flash the button, stop the light output from the projector (video mute), and place the projector in standby. Selecting again shall "un-mute" the video projector light output and return the projector to normal operation. (Projector standby will not effect the podium monitor).
- 2) BUTTON - MAKE-A-POINT (toggle function), (Icon: hammer and a head): Selecting shall highlight and flash the button, place the projector in standby, pause the transport motor on any source device in use, and fade lighting to the meeting preset. Selecting again will take the projector out of standby, disengage the transport motor pause of any source device in use, and fade lighting to the projection preset.
- 3) BUTTON - ANNOTATION: Selecting will engage the annotation (Boeckeller Pointmaker) system capability. In addition, selecting will cause the monitor image to maximize, and will bring up an annotation system function control pop-up window.
- 4) BUTTON - HELP: Provide as specified above.

f. INFRA-RED SENSORS (if applicable): Infra-red sensors are specified to monitor the position of folding partition walls. Connect infra-red sensor signal outputs to control system voltage sensing cards:

- 1) AUDIO SYSTEMS: Upon sensing a closed partition, the audio matrix mixer will route audio signals to facilitate the use of fully functional, separate sound systems in all room sections simultaneously. The specified audio system will operate as completely separate, multiple systems including, but not limited to all automatic mixer functions, volume level change functions, and tele-conferencing functions fully operational in each room section. Upon sensing a closed partition, the audio matrix mixer will route audio signals to facilitate the use of a single, fully functional sound system in all combined room sections. The specified audio system will operate as a single system in all combined sections including, but not limited to all automatic mixer

- functions, volume level change functions, and tele-conferencing functions fully operational in each room section.
- 2) VIDEO SYSTEMS: Upon sensing a closed partition, the RGBHV matrix switcher will route video signals to facilitate the use of fully functional, separate video systems in all room sections simultaneously. The specified video systems will operate as completely separate, multiple systems including, but not limited to source selection and display of video signals in various formats. Upon sensing an open partition, the RGBHV matrix switcher will route video signals to facilitate the use of a single, fully functional video system in all combined room sections. The specified video system will operate as a single system in all combined sections including, but not limited to source selection and display of video signals in various formats.
  - 3) LIGHTING SYSTEMS: Upon sensing a closed partition, the lighting systems will operate as fully functional, separate systems in all individual room sections simultaneously. The specified lighting systems will operate as completely separate, multiple systems including, but not limited to, preset changes, on/off commands, and dimmer level changes. Upon sensing an open partition, the lighting systems will operate as a single, fully functional, system in all combined room sections. The specified lighting system will operate as a single system including, but not limited to, preset changes, on/off commands, and dimmer level changes.
11. SOURCE SELECTION PAGE: (Use j-pegs of actual component photographs for source button icons).
- a. BUTTON - DVD: (if applicable) Selecting shall power up the applicable equipment (if not already on), set all applicable parameters to default values, route the stereo audio and video through the switching technology and audio reinforcement system to the appropriate display devices and to the audio amplification system. In rooms where multiple display devices serve a single physical space, the appropriate display devices will be selected utilizing a pop up graphic of the applicable room floor plan. The floor plan will show a button icon representing each display device at the appropriate location within the room graphic, and prompt: "PLEASE SELECT DESIRED DISPLAY DEVICES". As display devices are selected, buttons will become and remain highlighted. In addition, provide an ENTER button to implement display device selection commands to the switching technology. In addition, lower motorized projection screens and projector lifts to the show position, (if applicable). In addition, selecting will adjust lighting levels to the projection preset. In addition, selecting will close all motorized window coverings (if applicable). In addition, selecting will bring up the VCR function control page.
  - b. BUTTON - COMPUTER INPUT (TYPICAL): Selecting shall power up the applicable equipment (if not already on), route the stereo audio and analog RGB video through the switching technology and audio reinforcement system to the appropriate display devices and to the audio amplification system. In rooms where multiple display devices serve a single physical space, the appropriate display devices will be selected utilizing a pop up graphic of the applicable room floor plan. The floor plan will show a button icon representing each display device at the

appropriate location within the room graphic, and prompt: "PLEASE SELECT DESIRED DISPLAY DEVICES". As display devices are selected, buttons will become and remain highlighted. In addition, provide an ENTER button to implement display device selection commands to the switching technology. In addition, lower motorized projection screens and projector lifts to the show position, (if applicable). In addition, selecting will adjust lighting levels to the projection preset. In addition, selecting will close all motorized window coverings (if applicable). In addition, selecting will bring up the computer input function control page.

- c. BUTTON - VIDEO INPUT (TYPICAL OF YC AND COMPOSITE WHERE APPLICABLE): Selecting shall power up the applicable equipment (if not already on), route the stereo audio and video through the switching technology and audio reinforcement system to the appropriate display devices and to the audio amplification system. In rooms where multiple display devices serve a single physical space, the appropriate display devices will be selected utilizing a pop up graphic of the applicable room floor plan. The floor plan will show a button icon representing each display device at the appropriate location within the room graphic, and prompt: "PLEASE SELECT DESIRED DISPLAY DEVICES". As display devices are selected, buttons will become and remain highlighted. In addition, provide an ENTER button to implement display device selection commands to the switching technology. In addition, lower motorized projection screens and projector lifts to the show position, (if applicable). In addition, selecting will adjust lighting levels to the projection preset. In addition, selecting will close all motorized window coverings (if applicable). In addition, selecting will bring up the video input function control page.
- d. BUTTON - HELP: Provide as specified above.

## 12. CONFERENCING SELECT PAGE:

- a. BUTTON - VIDEO CONFERENCE (if applicable): Selecting shall power up the applicable equipment (if not already on), set all applicable parameters to default values, route the CODEC audio and video through the through the switching technology and audio reinforcement system to the appropriate display devices and to the audio amplification system. The appropriate display devices will be selected utilizing a pop up graphic of the applicable room floor plan. The floor plan will show a button icon representing each display device at the appropriate location within the room graphic, and prompt: "PLEASE SELECT DESIRED DISPLAY DEVICES". As display devices are selected, buttons will become and remain highlighted. In addition, provide an ENTER button to implement display device selection commands to the switching technology. In addition, selecting will adjust lighting levels to the video conferencing preset. In addition, selecting will close all motorized window coverings (if applicable). In addition, selecting will bring up the video conferencing function control page.
- b. BUTTON - TELE-CONFERENCE (if applicable): Selecting shall power up the applicable equipment (if not already on), and set all applicable mixer and telephone interface parameters to default values. In addition, selecting will bring up the teleconference function control page.
- c. BUTTON - HELP: Provide as specified above.

## 13. PROJECTOR/SCREEN CONTROL PAGE:

- a. BUTTON - PROJECTION ENVIRONMENT: Selecting shall power on the projector(s), close window coverings (if applicable) and fade all lighting to the "projection" preset. In addition, cause a brief text message to be displayed recommending a 5 minute warm up time for quality display of computer data images. In addition, the projector shall reset to preprogrammed default settings.
  - b. BUTTON - MEETING ENVIRONMENT (typical): Selecting shall display a text prompt asking "Are you sure, approximately (insert time recommended by the manufacturer) minutes must elapse prior to powering up the projector again?" with buttons YES, and NO. IF YES, the system shall power off the projector in accordance to the shut down procedure recommended by the manufacturer. In addition the projection screen shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. IF NO, the system shall return the touch panel back to the previous page with no action taken.
  - c. BUTTON - PROJECTOR ON (typical): Selecting shall power on the projector, and cause a brief text message to be displayed recommending a 10 minute warm up time for quality display of computer data images. In addition, the projector shall reset to preprogrammed default settings.
  - d. BUTTON - PROJECTOR OFF (typical): Selecting shall display a text prompt asking "Are you sure, approximately (insert time recommended by the manufacturer) minutes must elapse prior to powering up the projector again?" with buttons YES, and NO. IF YES, the system shall power off the projector in accordance to the shut down procedure recommended by the manufacturer. IF NO, the system shall return the touch panel back to the previous page with no action taken.
  - e. BUTTON - PROJECTOR STANDBY (Toggle function) (typical): Selecting shall highlight and flash the button, and place the video projector in stand by. Selecting again will take the projector out of stand by.
  - f. BUTTON - PROJECTOR DEFAULT SETTINGS: Selecting shall reset all the projector's applicable adjustments to a preprogrammed default settings (i.e. Brightness, contrast, color, hue, etc.)
  - g. BUTTON - FRONT PROJECTION SCREEN LOWER (typical): Selecting shall cause the projection screen to lower to its "show" position.
  - h. BUTTON - FRONT PROJECTION SCREEN RAISE (typical): Selecting shall cause the projection screen to raise to its "store" position.
  - i. BUTTON - FRONT PROJECTION SCREEN STOP (typical): Selecting shall cause the projection screen motion to stop.
  - j. BUTTON - PROJECTOR LIFT, STORE POSITION (if applicable) (typical): Selecting shall highlight button and raise projector lift into the finished ceiling for storage.
  - k. BUTTON - PROJECTOR LIFT, SHOW POSITION (if applicable) (typical): Selecting shall highlight button and lower projector lift to the show position.
  - l. BUTTON - HELP: Provide as specified above.
14. DISPLAY MODIFY PAGE: Provide a room graphic of the applicable room floor plan. The floor plan will show a button icon representing each display device at the appropriate location within the room graphic. In addition, include a HELP button as specified above. Selecting a button shall bring up a pop up window with the following buttons:
- a. BUTTON - ON: Turns the selected display device on (if not already on).

- b. BUTTON - OFF: Turns the selected display device off (if not already off).
  - c. BUTTON - STANDBY (For the projectors only) (Toggle function): Selecting places the projector in standby. Selecting again takes the projector out of standby.
  - d. BUTTON - CLEAR: Clears all control commands issued to modify the source selection to the selected display device. Relinquish source selection control to the standard source selection specified above.
  - e. BUTTONS - AVAILABLE SOURCES: Provide one button icon for each available source device. Once a source device is selected, command the switching technology to route the selected source to the selected display device and remove the pop up window from the screen.
  - f. BUTTON - HELP: Provide as specified above.
15. WINDOW COVERING CONTROL PAGE (IF APPLICABLE):
- a. BUTTON - WINDOW COVERINGS CLOSE: Selecting shall cause all window coverings at the designated location to close.
  - b. BUTTON - WINDOW COVERINGS OPEN: Selecting shall cause all window coverings at the designated location to open.
  - c. BUTTON - WINDOW COVERINGS STOP: Selecting shall cause all window coverings at the designated location to stop.
16. FUNCTION CONTROL PAGES:
- a. DVD FUNCTION CONTROL PAGE (if applicable):
    - 1) BUTTONS: Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
    - 2) BUTTON - NEW SOURCE: Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
    - 3) BUTTON - EXIT: Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
    - 4) BUTTON - HELP: Provide as specified above.

b. COMPUTER INPUT FUNCTION CONTROL PAGE (TYPICAL):

- 1) TEXT MESSAGE: "You have selected computer input XX as an input source for display".
- 2) BUTTON - NEW SOURCE: Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) BUTTON - EXIT: Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 4) BUTTON - HELP: Provide as specified above.

c. VIDEO INPUT FUNCTION CONTROL PAGE (TYPICAL):

- 1) TEXT MESSAGE: "You have selected XX video input as an input source for display".
- 2) BUTTON - NEW SOURCE: Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) BUTTON - EXIT: Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 4) BUTTON - HELP: Provide as specified above.

d. TUNER FUNCTION CONTROL PAGE:

- 1) BUTTONS: Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch

- panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
- 2) BUTTON - NEW SOURCE: Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
  - 3) BUTTON - EXIT: Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
  - 4) BUTTON - HELP: Provide as specified above.
- e. VIDEO CONFERENCE FUNCTION CONTROL PAGE:
- 1) BUTTONS: Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
  - 2) BUTTON - NEW SOURCE: Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
  - 3) BUTTON - EXIT: Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
  - 4) BUTTON - HELP: Provide as specified above.
- f. TELE-CONFERENCE FUNCTION CONTROL PAGE, (TYPICAL):



- 1) **BUTTONS:** Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
- 2) **BUTTON - NEW SOURCE:** Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) **BUTTON - EXIT:** Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If NO, the system shall return the touch panel back to the previous page with no action taken.
- 4) **BUTTON - HELP:** Provide as specified above.

g. **VIDEO CAMERA FUNCTION CONTROL PAGE:**

- 1) **BUTTONS:** Provide all buttons necessary to control all functions of the selected device/system. As a general rule, without implying limitation, provide control buttons on touch panel function control pages which duplicate the control buttons provided on or in the device/system control panel, remote controller, and/or control software. Where sensible, configure and label buttons on touch panel function control pages in the same way system/device control buttons are configured and labeled on their own control panels, remote controllers, and/or control software.
- 2) **BUTTON - NEW SOURCE:** Selecting shall highlight button and discontinue all transport functions (if any) associated with the function control page. In addition, selecting shall bring up the SOURCE SELECT PAGE without turning off display devices (if applicable), systems and/or devices; raising the projection screen(s)/lift(s) (if applicable); opening window coverings (if applicable), or changing lighting levels (if applicable).
- 3) **BUTTON - EXIT:** Selecting shall highlight button and display a text prompt asking "Are you sure?" with buttons YES, and NO. If YES is selected, discontinue all transport functions (if any) associated with the function control page, and place the projector in standby (if applicable). In addition the projection screen(s)/lift(s) shall be raised to the "store" position, and the room lighting shall fade to the "full" preset. In addition, selecting shall return the user to the START PAGE. If

NO, the system shall return the touch panel back to the previous page with no action taken.

4) BUTTON - HELP: Provide as specified above.

h. TECHNICIAN SET-UP PAGES: NOTE: Unlike all other control system pages, the technician set up pages are described in general terms. The intent is to provide the installer flexibility in page creation and software programming.

1) BUTTONS - PASSWORD PROGRAMMING: Provide required buttons to program and save four digit password(s) for access to the specified pages. Password to be comprised of any combination of numbers and/or letters.

2) BUTTONS - DATE AND TIME SET: Provide required buttons to set and enter the correct date, including day, month, and year. Provide required buttons to set and enter the correct time of day including hours and minutes.

3) BUTTONS - PROJECTOR LIFT (if applicable): Provide required buttons to lower the projector lift to a "service" position.

4) BUTTON - HELP: Provide as specified above.

END OF PROGRAMMING OUTLINE

i. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three times the weight of the equipment being installed. Any structural mounting that is not able to meet this requirement due to the specific nature of the equipment, manufacturer's requirements or limitations of the facility, shall not be installed without prior approval of the A/V consultant. Install all boxes, equipment, hardware, and other materials plumb, level, and square.

j. Install all technology equipment and support equipment in all podiums, and the other millwork in a neat and cosmetically dressed-out manner. All saw cuts, holes and recesses into laminates and woodwork shall be straight, all radius and circular cuts shall be consistent, and all uneven surfaces shall be corrected. This shall include the use of moldings, grommets, bushings, laminates, and wood products as required to dress out the installation of equipment. Assure that the installation of equipment and panels in the technology racks and podiums are completed by using matching screws, hardware and grommets.

C. Technology:

1. Assure sufficient ventilation for adequate cooling of equipment.
2. Install vent rack panels in unused spaces.
3. Securely fasten equipment plumb and square in place. Where equipment is installed in rack cabinets, utilize all fastening holes and cover open spaces with perforated panels.
4. Securely fasten relays and small components. Do not use sticky-back tape for fasteners.
5. Connect powered components to 120 VAC outlets on transient voltage surge suppressors. Do not connect to outlets on other components.
6. Leave sufficient service loops of uniform length on cables to allow operation of system with chassis outside cabinet.

7. All equipment shall be held firmly in place with proper types of mounting hardware as recommended and/or supplied by the manufacturer. All mounting hardware provided with equipment shall be used when practical. This shall include, but not be limited to, front and rear rack rails, angle brackets and rack mount kits. All equipment shall be installed so as to provide reasonable safety to the operator. The Lessor shall supply adequate ventilation for all enclosed equipment items which produce heat.

D. Cable, Wire, and Connectors:

1. All cable and wire shall be new and unspliced. Splicing of cables and conductors is expressly prohibited in any location other than the equipment racks.
2. Additional cable length shall be provided at all connector locations. Duplex box, junction box, and floor box locations shall be installed with sufficient cable length behind cover plates to permit wiring maintenance and connector replacement in the future.
3. When cable runs utilize the vertical cable raceways located within walls, the acoustic integrity of the walls shall be maintained. All cables that pass through cover plates of junction boxes and raceways, through slab-to-slab walls, and through conduit lines shall be properly gasketted and sealed and all acoustic material shall be restored or replaced.
4. Separation between system cables and all other services shall be maximized to prevent and/or minimize the potential for electro-magnetic interference (EMI). Particular care shall be taken to ensure at least a 12" separation from electrical lines whenever feasible. At points where separation is unavoidable, distribution cables shall cross other services at right angles whenever practical to minimize EMI.
5. Cables shall be installed in a manner that shall ensure no signal cables are placed on top of any lighting fixtures, ceiling speakers, HVAC controls or sensing devices, fire safety and sprinkler system detection technology, or any other technology or mechanical equipment.
6. No cables shall be laid directly on top of T-bar grid ceiling tiles. Support cables installed outside of conduit at a maximum of four foot intervals from the building structure. Do not utilize support wires from other trades or systems.
7. System cables shall be installed in a manner that will not block access to other equipment or services, across removable service panels and/or in any other manner to prohibit routine maintenance of HVAC system, fire safety equipment and building mechanical control system.
8. All exposed cable shall be dressed with heavy duty neoprene heat-shrink tubing.
9. All inter-rack cabling shall be neatly laced, dressed, strain relieved and adequately supported.
10. After completion of wiring and cable installation, all trough and box covers shall be notched out and grommited for clearance of the various cable bundles, (i.e., separate audio, video, and control). These panel covers shall be screwed back in place and all gaskets shall be restored or replaced.
11. Do not place any wires and cables for this system in any conduit, raceway, wireway or cable tray that is used for the mechanical systems, electrical systems, or voice/data systems of the building.
12. Provide connectors of the type and quality as detailed in this contract, and/or as required to meet the minimum bandwidth requirements of the equipment to which the connectors are terminated. The overall quantity of connectors shall

not be limited by the quantities indicated in the drawings and shall be provided as required.

13. No connectors shall be installed in non-accessible locations or used for splicing cables. All connectors shall be new.
14. All connectors shall incorporate strain relief mechanisms which firmly grip the jacket of connected cables. All connectors shall be properly polarized to prevent improper seating. Connectors shall provide appropriate electrical characteristics for the circuitry to which they are attached.
15. All inner-rack cables shall be grouped according to the signals being carried to reduce signal contamination. Separate groups shall be formed for the following:
  - a. Power
  - b. Control
  - c. Video
  - d. Audio cables carrying signals less than -20 dBm.
  - e. Audio cables carrying signals between -20 dBm and +20 dBm.
  - f. Audio cables carrying signals over +20 dBm.
16. Route all cable and wiring within equipment racks, cabinets and millwork according to function, separating wires of different signal levels (microphone, line level, amplifier output, AC, control, etc.) by as much distance as possible. Neatly arrange, harness and bundle all cable with nylon U/V rated ties.
17. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of equipment racks as viewed from the rear. All other cables shall be run on the right side of all equipment racks as viewed from the rear.
18. All cables, except video cables which must be cut to an electrical length, shall be cut to the length dictated by the cable run.
19. Terminal blocks, boards, strips or connectors, shall be furnished by the installer for all cables which interface with racks, cabinets, consoles, or equipment modules. Affix terminal blocks, boards, strips or connectors to equipment racks using screws only. Double sided tape will not be accepted.
20. Comply with industry standard circuit polarity and loudspeaker wiring polarity. No cables shall be terminated with a polarity reversal between connectors at either end.
21. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire ends shall be accepted.
22. Heat-shrink type tubing shall be used to insulate and dress the ends of all wire and cables including a separate tube for the ground or drain wire.
23. All solder connections shall be made with rosin-core solder. Temperature controlled soldering irons rated at least 60 watts shall be used for all soldering work.
24. All mechanical connections shall be made with approved crimp lugs of the correct size and type for the connection. Wire nuts shall not be permitted. Each connector shall be attached with the proper size controlled-duty-cycle ratcheting crimp tool which has been approved by the manufacturer of the connectors.
25. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on the job site. The presence of such tools on the job site shall constitute evidence of mechanical connections made with unauthorized tools.

and shall provide sufficient grounds for rejection of all mechanical connections in the system, and the subsequent re-work of same.

26. Shields for audio cables shall be grounded at the input end only, of the various equipment items on the system to prevent potential for ground loops.

E. Identification and Labelling:

1. All cables, regardless of length, shall be marked with wrap-around number or letter cable markers at both ends. These labels shall be self laminating to ensure durability. The label format used shall be equal, or better than, the system detailed.
2. There shall be no unmarked cables any place in the system.
3. Marking codes used on cables shall correspond to codes provided with submittals, and/or the written documentation of the "as built" drawings.
4. All connectors, controls, equipment components, terminal blocks and equipment racks are to be permanently labeled in a format approved during the submittal process.
5. Clearly and permanently label all jacks, controls, connections, etc... Embossed or printed label tape shall not be used and is considered unacceptable for this system.
6. All labeling shall be completed prior to acceptance of the final system.

- F. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation , repair, restore, and refinish to original appearance.

### **1.13 GROUNDING**

- A. Provide equipment grounding connections for audio system as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to eliminate ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- C. Provide one #10 ground conductor with green insulation between all equipment racks and the main electrical panel ground bus. Connect at each end.

### **1.14 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Services: Provide services of a factory authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new, and retest until materials satisfactory performance and conditions are achieved.

C. A/V Consultant Final Review:

1. Contractor shall assist A/V Consultant in reviewing the final system set up.
2. Coordinate final inspection schedule with A/V Consultant two weeks minimum prior to Consultant's final inspection.
3. Have copy of red-lined as-built documents available at time of inspection.
4. Have loose equipment (microphones, cables, etc) available at time of inspection.
5. Provide the following test equipment in good working order:
  - a. Digital Volt-Ohmmeter.
6. Correct minor items so A/V Consultant may certify satisfactory completion during his visit.
7. Pay Consultant's additional fees and expenses if building or system have not been completed properly or sufficiently, requiring A/V Consultant to make subsequent visits to inspect, or certify completion.

**1.15 COMMISSIONING**

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Comply with the requirements identified in section 13130, project closeout.
- B. Train Owner's A/V system users in the procedures for control system operation and related media device operation. Provide a minimum of four hours training on two non-consecutive days.
- C. Schedule training with Owner through the Architect, with at least 7 days advance notice.
- D. Occupancy Adjustments: When requested by the Architect or the A/V Consultant within one year of date of substantial completion, provide on-site assistance in controls to suit actual occupied conditions, including but not limited to minor programming changes, and touch panel page reconfiguration. Provide up to eight visits to the site for this purpose at no additional cost to the owner.

**1.16 CLEANING AND PROTECTION**

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 274116