SECTION 16710
MULTIMEDIA SYSTEMS

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PART 1 - GENERAL

1.00 RELATED DOCUMENTS

A. Washington State Information Services Board
   Information Technology Policy-Submission Requirements
   Computing and Telecommunications Architecture Standards
   Building Wiring: http://isb.wa.gov/policies/portfolio/701S.doc
B. American National Standard ANSI/TIA/EIA Telecommunications
   Building Wiring Standards.
C. Drawings and general provisions of the Contract, including General and
   Supplemental Conditions and other Division 1 Specification Sections,
   apply to this Section.
D. Refer to the following sections for additional requirements:
   3. Specification Section 16130 – Boxes (Sizes, Styles and Types).
   7. Specification Section 16651 – APPENDIX-B (Glossary of Terms).
   8. Specification Section 16651 – APPENDIX-C (EWU Building
      Abbreviations)
   9. Specification Section 16651 – APPENDIX-D (EWU Station Cable
      Record)
1.01 SCOPE

A. It is the intent of these specifications to provide complete multimedia systems for EWU classrooms. The multimedia systems can be composed of the following integrated subsystems: visual presentation system, videoconference system, sound reinforcement system, assisted listening system, and the control system. This equipment is to be furnished under the basic bid. Owner shall supply a list of the EWU classrooms with an equipment list for each room.

1. The video presentation systems shall include at least a video projector, system controller, projection switcher/scaler, distribution amplifier, DVD/VCR, document camera, outlets, switches, relays, wire, cable, and adapters as required for complete operable systems which perform the functions specified herein and on the drawings. Provide a complete operational projection system for the indicated room. The video presentation system may include video matrix switchers and interactive whiteboards.

2. The videoconferencing system shall consist of a rack mounted videoconferencing unit, microphones, PTZ cameras, monitors, projection screen, wire, cable, and adapters as required for complete operable systems which perform the functions specified herein and on the drawings. Provide a complete operational videoconferencing system for the indicated rooms.

3. The sound reinforcement systems shall consist of a wireless microphone system with lavaliere and handheld microphones, power amplifier, speakers, wire, cable, and adapters as required for a complete system which operates as described herein and on the drawings. Provide a complete operational sound reinforcement system for the indicated rooms.

4. The assisted listening systems shall consist of radio frequency (RF) transmitters, antennae, RF headphone receivers, power supplies, wire, cable, all mounting hardware, and any other ancillary devices or equipment required for a complete system which operates as described herein and on the drawings. The assisted listening systems may also include an automatic microphone mixer, equalizer and/or digital signal processor.

5. Provide a complete control system for control of audio, and presentation equipment as indicated on the drawings. Program the system in accordance with the Owner’s requirements as indicated on the sequence of operation that will be provided by the Owner. The control system shall include control panels, control modules,
interface modules, power supplies, relays, contacts, connector strips, wire and cable as required for a complete operable systems which perform the functions specified. Coordinate closely with supplier of the equipment to be controlled to assure that the controls will function as specified in conjunction with equipment actually furnished.

B. Quality Assurance

1. General
   a. Contractors wishing to bid on the Multimedia System installation of the project must submit qualification documentation to the owner and engineer at least two weeks prior to date of bid opening.
   b. Qualification of contractors will take place prior to the submission of bids. Bids from contractors not receiving prior qualification approval from the owner and owner’s engineer will not be accepted.
   c. Notification of approval of contractor’s qualifications and experience will be given one week prior to opening of bids.

2. Qualifications of Experience
   a. The following criteria shall be used as a standard for judging installation qualification and project experience:
      1) Installing Contractor to have previously installed jobs of similar magnitude completed within the last five years. Similar magnitude includes; equal or larger venue size, system cost and complexity. Provide evidence of at least one such completed job for inspection by the owner. The information shall include project scope, system description, system cost, and owner and engineer references.
      2) The installing Contractor shall have at least five years experience with equipment and systems of the types specified.
      3) The installing Contractor shall maintain a fully staffed and equipped service facility, and shall be a franchised dealer and authorized service facility for the major brands specified.
      4) The installing Contractor shall be a licensed contractor, business of five years minimum and maintain a service and installation staff of full time installation and service technicians dispatched from the Contractors full time place of business located within a 150-mile radius of the Project site.
      5) To qualify as a bidder, the installation shall be made
by a licensed and bonded contractor holding a valid Electrical Contractor’s License and Administrator’s Certificate as prescribed by the State of Washington. All work covered by this specification is to be performed by a holder of a current State of Washington Specialty Electrician for limited energy system license.

6) The Installing Contractor shall have staffing and computer systems to produce acceptable quality shop drawings and project record documents. Schematic diagrams, speaker location, orientation, rigging, fabrication and layout details to be produced using CAD software compatible with AutoCAD 2000 or later.

3. Contractor Qualification Submittals
   a. Submittals for qualification shall include all of the following:
      1) A description of the installing contractor’s fulfillment of qualifications and experience in all areas listed in the section above.
      2) A brief company description outlining company history including how long the company has been in business, the number of personnel employed, etc.
      3) Resumes of staff that will be involved in working on the project and their roles. Include education, training, experience, professional societies and notable contributions to the industry.
      4) Representative project list. Include a project description, company personnel who worked on the project with their involvement, and a reference point of contact. Note whether the key personnel involved in these projects are still employed with the company.
      5) Samples of project documentation. Include schematic diagrams, speaker orientation and rigging details, panel fabrication details, and any other applicable documentation.
      6) Contractors who are approved by addenda will submit pricing as an Alternate.

C. Project Conditions
   1. The contractor shall verify all conditions on the jobsite applicable to this work, and shall notify the Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.
   2. The drawings diagrammatically show cables, conduit, wiring, and
arrangements of equipment fitting the space available without interference. If conditions exist at the job site which make it impossible to install work as shown, recommend solutions and / or submit drawings to the Architect for approval, showing how the work may be installed.

D. Warranty
1. Installer shall warrant equipment to be free of defects in materials and workmanship for not less than one year after date of Substantial Completion. Defects occurring in labor or materials within one-year warranty shall be rectified by replacement or repair. Within the warranty period, provide answer to service calls and requests for information within a 24-hour period, and repair or replace any faulty item within a 72-hour period without charge, including parts and labor.
2. This warranty shall not void specific warranties issued by manufacturers for greater periods of time. Nor shall it void any rights guaranteed to the owner by law.
3. The Contractor shall provide Owner with exact beginning and ending dates of the warranty period, and shall include the name of the person to call for service and telephone number. This information is to be part of Project Record Drawings.

1.02 OPERATION - VIDEO PRESENTATION SYSTEM
A. The system shall accept broadcast-quality composite video input signals derived from in-room VCRs, and DVD players.
B. The system shall accept VGA or DVI graphic data input signals derived from the in-room PC, laptop computer, or document camera. Video, audio, network, and USB connections shall be provided to permit connection of various portable computers that may be supplied by the room users.
C. Switching shall be provided to select between the video inputs. A device selector switch shall determine which input signal is routed to the video display equipment.
D. Switching of inputs shall be accomplished by a control switcher. Input and output options shall be selected by means of the control system via RS-232 control interface.

1.03 OPERATION - VIDEOCONFERENCE SYSTEM
A. The system shall operate on both the H.323 and the H.239 protocols.
B. The system shall output to the video presentation system
C. The system may be controlled by the control system

1.04 OPERATION - SOUND REINFORCEMENT SYSTEM
A. The system shall accept audio input from an audio/video switcher and provide output to speakers located throughout the classrooms. The system shall receive an audio input from the microphones and provide automatic
muting of the switched signal so that audio follows the video signal.

B. The system shall provide audio output to the assisted listening system.

1.05 OPERATION - ASSISTED LISTENING SYSTEM
A. The system shall receive an output from the sound reinforcement system and through the use of radio frequency transmitter/emitter pairs the signal is converted to a radio frequency signal. The receiver headphone will decode the signal to retrieve the original audio signal.

1.06 OPERATION - CONTROL SYSTEM:
A. The system shall provide programmable, full-featured electronic control of equipment by means of a microprocessor controller.
B. Control output devices shall permit the control system to be readily modified to accommodate future growth and/or changes in the equipment controlled.
C. One control panel shall be touch screen or push button as specified by Owner
   1. Operation shall be by touch-screen control or push button control.
   2. Touch screen shall accommodate multiple nested touch panel pages.
   3. Controller configurations shall be programmable.
   4. Controller Program shall become the property of the Owner.
D. The System shall be designed to allow for field and remote programming by Owner.
   1. Field programming at time of installation may include, at owners discretion.
      a. Start-up menu page.
      b. Set-up pages.
      c. Protected set-up pages.
      d. Functional pages.
      e. External buttons.
      f. RS-232 control of the video switcher.
      g. RS-232 control of the projector(s) for initial setup and alignment.
      h. IR control of the DVD/VCR player to include: Play, Stop, Pause, Fast Forward, Rewind, Search, Closed Captioning and Chapter Selection.
      i. Control of the projection screen.
      j. Volume control and muting.
      h. Other functions as specified in the sequence of operation.
   2. Program format shall be user-friendly using operation prompts with built-in programming error indications. It shall be impossible for the operator to damage or alter the software due to improper or accidental data entry.
E. All software and firmware shall utilize non-volatile memory
F. All equipment items shall be selected and installed to provide fully normal
operation in the anticipated ambient temperature range of 55° to 100°F.

1.07 SUBSTITUTIONS
A. Throughout these specifications various materials, equipment, apparatus, etc., are specified by manufacturer, brand name, and type or catalog number. Such designations are intended to establish standards of desired performance, quality, and construction as well as exact operating features required and shall be the basis of the bid. This specification is not intended to restrict competitive bidding.

B. Contractors wishing to bid on equipment other than that listed (‘substitute’ equipment) shall obtain prior approval. Approval of such items will be issued to all bidders by addendum. Requests for prior approval shall be submitted at least seven days prior to the bid date.

PART 2 - PRODUCTS

2.01 VIDEO PRESENTATION SYSTEM

A. General
1. All equipment items shall be selected and installed to provide fully normal operation in the anticipated ambient temperature range of 55° to 100°F.

B. Video Projectors
1. Video Projector - Shall be a high-resolution professional grade projection unit. Picture orientation shall be easily modified for proper display either on a ceiling mount (unit upside down) or a rack mount (unit right side up) in either a front or rear screen projection configuration.
   a. Light output 3000 or more lumens.
   b. LCD or DLP device.
   c. Display resolution 1280x720 or better.
   d. Inputs: RGBHV, VGA, DVI, S-Video and composite.
   e. Infrared Remote or Serial Communication Control.
   f. Projector shall be a Mitsubishi WD3300U or equivalent.

C. Video Projector Mounts
1. Ceiling mounted projectors shall be mounted to brackets provided and installed by the general contractor. Coordinate with the general contractor and the owner for proper size, mounting, security and orientation.

2. Upper mounting locations shall use Peerless model #ACC845 anti-vibration ceiling plate or equivalent. The upper mounting bracket shall be secured in place by either bolting it to the concrete decking above or by spanning ceiling trusses with lengths of Uni-Strut (per manufacturers instructions), but never suspended with lengths of all-thread as this creates a situation with too much movement in the mounting points and also gives the appearance of an unstable
installation that could pose a safety hazard.
3. A 1 ½” cast iron pipe, painted black, with 1 ½” NPT threads at each end will be used to connect the upper and lower mounting brackets (length to be determined by each location).
4. The lower mounting bracket shall be a BMS model #LCD Loc. II Med. or equivalent.

D. Control Switcher
1. Projection control switchers shall provide RGB video outputs with synchronization, S-video outputs, composite video outputs, and audio outputs, selectable from any of the inputs. The switchers shall accept the following input and output modes:
   a. Component RGB video with horizontal and vertical synchronization (RGBHV)
   b. Component RGB video with separate synchronization (RGBS)
   c. Composite NTSC (National Television Standards Committee) video
   d. Composite PAL (Phase Alternate Line) video
   e. S-Video (Y/C)
   f. DVI-D and DVI-I
   g. Audio
2. The switches shall be capable of the following types of control for input selection:
   a. Front panel buttons.
   b. Digital RS-232 control.
   c. Infrared control.
3. The switchers shall include the following features:
   a. VGA-WXGA via HD15 pin or BNC connectors.
   b. DVI-D single link female connector.
   a. Composite video via RCA female or BNC connectors.
   b. S-Video via 4-pin mini DIN or BNC connectors.
   c. Audio
   d. Communication via 9-pin female D-SUB connector and IR
   e. Rack mountable
4. The switcher shall be an Extron IN1508 seamless presentation switcher/scaler or equivalent. The matrix switcher shall be an Extron ISM 482 scaling matrix switcher or equivalent.

E. DVD/VCR
1. The player must be a single unit capable of playing DVDs and VHS tapes
2. Both DVD and VHS will playback through a common composite RCA connector.
3. Volatility of this market will dictate unit specification. Current model is a Sony SLV-D380P

F. Document Camera
1. Native output format: WXGA, capable of output down to XGA
2. Image pickup camera: 1-CCD 1/3”, 1.32 million pixels, progressive scan, and 30 frames per second
3. Connectors: Input – USB 2.0, RS-232 (9-pin D-Sub), VGA (15-pin D-Sub, desktop version only); Output – S-Video (4-Pin, desktop version only), Composite (RCA, desktop version only), RGB (15-pin D-Sub), and DVI
4. Image manipulation: Capable of 90, 180 and 270 degrees of rotation. Shall have automatic and manual focus, white balance and iris. Shall have optical zoom of at least 24X.
5. Serial and IR control: Capable of IR control using supplied remote. Capable of RS-232 control thru 9-Pin D-Sub connector
6. Document Camera shall be the Wolfvision VZ-8light3 for desktop unit or the Wolfvision EYE-12 for ceiling / wall mount unit or equivalent. Any substitution shall have written owner approval.

G. Interactive Whiteboard
1. Interactive touch-surface with pen tool(s) to control applications or annotate files.
2. USB connection for signal and power
5. Interactive Whiteboard shall be a SMART Board 600 series, at the largest possible size for the classroom.
6. Alternate installs in large lecture halls would be a SMART Sympodium interactive display in lieu of a front-projection SMART Board 600 series.

H. Wire and Cable
1. Cabinet wiring shall be #20 AWG (minimum) stranded copper with polymer alloy insulation and shall be compatible with disconnecting plugs.
2. Wire for circuits operating at 50 volts and less than 100 volts shall be #16 AWG (minimum) stranded copper with insulation rating of at least 60°C, unless otherwise indicated or required. Nominal insulation voltage shall be at least 300 volts.
3. Wire for circuits operating at less than 50 volts shall be #20 AWG stranded copper with insulation rating of at least 60°C, unless otherwise indicated. Nominal insulation voltage shall be at least 300 volts.
4. RGBHV cable shall be high-resolution bundled coaxial cable with five (5) bundled mini-coax cables in a single jacket, Extron mini cable of the appropriate length, as manufactured by Extron Electronics of Anaheim, California or equivalent. The part number for the specific cable shall be as follows:
   a. Cable to each Video Projector: 22-103-03 (various lengths) or equivalent.
5. S-Video shall be high-resolution cable with male-to-male
connectors, Extron #MHR-2 SV series cable or equivalent. The part number for each specific cable shall be as follows:
a. Custom Cable to each Switcher: 26-316-XX.

6. Composite video shall be 20/2 stranded copper, West Penn #WP25292B, or equivalent with RCA connectors or the cable provided with the DVD/VHS unit.

I. Spare Parts

10. Provide the Owner with a recommended spare parts list for each system complete with pricing.
2.02 VIDEOCONFERENCE SYSTEM

A. General
   1. All equipment items shall be selected and installed to provide fully normal operation in the anticipated ambient temperature range of 55° to 100°F.

B. Videoconference Codec
   1. The videoconferencing unit shall support IP communication.
   2. Unit will have a maximum data rate of up to 2Mbps
   3. Unit will be capable of simultaneously transmitting and receiving video of people and high-resolution content via direct computer connection (VGA).
   4. Minimum inputs include 2 S-video, 1 high-resolution computer input (VGA or DVI), 1 stereo audio input (RCA); Minimum outputs include 2 S-video, 1 high-resolution computer output (VGA or DVI), 1 stereo audio output.
   5. Includes RS-232 data port for integration with classroom control system (AMX or Extron) and communication port for transmission of serial data.
   6. Video conferencing codec will be Polycom VSX 8000 series or Polycom HDX 8000 series.

C. PTZ Cameras
   1. Pan/Tilt/Zoom capabilities
   2. RS-232 serial control.
   3. Minimum 10X optical zoom
   4. Video output: HDCI or Y/C (depending on the matching codec)
   5. PTZ cameras will be Polycom PowerCam or Polycom EagleEye (depending on the matching codec) using Polycom extension cables and wiring harnesses.

D. Local Displays
   1. Videoconference codec will interface with the classroom projector or the large format display and any secondary displays, depending on classroom configuration as specified by Owner.
   2. Any large format displays dedicated to videoconferencing will be professional grade 50” (or larger) LCD monitor with 1280x720 resolution (or better) and high-resolution signal capability. Minimum inputs include 1 DVI, 1 VGA, and RS-232.
   3. Any secondary display monitor will be 19” or larger LCD monitor with 1280x720 resolution (or better) and high-resolution signal capability. Minimum inputs include 1 DVI and 1 VGA.

E. Microphones
   1. Videoconference microphones will be either ceiling microphone arrays or tabletop microphone arrays, as specified by Owner.
   2. Microphone shall be Polycom microphone arrays, matched to the appropriate VSX 8000 series or HDX 8000 series codec, as specified by Owner.
2.03  SOUND REINFORCEMENT SYSTEMS

A.  General
1.  All equipment items shall be selected and installed to provide fully normal operation in the anticipated ambient temperature range of 55° to 100°F.
2.  Any balanced audio to unbalanced audio, or unbalanced audio to balanced audio interconnections shall use a proper impedance and audio level interface such as the “Matchbox” made by Henry Engineering or a RDL STD 600 divider/combiner, a RDL FP-BUC2 converter, or a RDL FP-UBC2 converter.

B.  Power Amplifier
1.  The power amplifier shall provide high and low impedance input signal capability. Amplifier shall provide a high-pass filter with a 125Hz cutoff for driver protection. Input power shall be 120VAC, 60Hz. Amplifier shall be rack mounted. The amplifier shall conform to the following specifications:
   a.  The power amplifier shall contain a pre-master unbalanced output, a post-master unbalanced output, a master output level control, and an output transformer providing a balanced 4 ohm, 25 volt, 70.7 volt and 100 volt output.
   b.  The amplifier shall be protected from short circuit loads, over temperature, and excessive load reactance. The loads shall be protected from turn-on/turn-off transients, subsonic signals, and DC. An output relay shall be provided to disconnect the load if any of these conditions occurs. The front panel shall have an LED indicator to show excessive output levels. The master level control may be mounted on the rear panel.
   c.  The amplifier shall conform to the following specifications:
      1)  Power Output: -35-500 watts as specified by owner)
      2)  Distortion: 20Hz - < -0.2 % 1kHz at rated power.
      3)  Frequency Response +/- -1.5dB, -50Hz-20kHz constant voltage
      4)  Input Impedance: 1-15dBu/SB-15kQ
      5)  Noise Level: –123 db below rated output
2.  The power amplifier shall be a Biamp MXA 35 or larger as specified by Owner.

C.  Automatic Microphone Mixer
1.  The mixer shall be a self-contained, 105V-135VAC, 60Hz, mixing amplifier with preamplifiers and controls to mix four independent low-impedance automatic microphone input signals, and be expandable to eight input channels in the future
2.  Each channel shall be capable of either manual or automatic level control with priority/mute circuitry for operation of each selected
channel. Switchable + 48V phantom power shall be provided for condenser type microphones. All channels shall be capable of selecting balanced microphone or high level sources.

3. Each microphone input channel in the mixer shall have its own rotary gain control and channel LED to indicate the microphone is gated on. The front panel shall also contain a rotary master gain control. Each microphone input channel shall also contain a Line Out (non-gated) phone jack. The rear panel shall also contain a Main 3-pin XLR output, a 5-pin male XLR Link Output, and a 5-pin female Link Input.

4. The mixer shall conform to the following specifications:
   a. Gain: 83dB
   b. Frequency Response from 20Hz to 20kHz
   c. THD: < 0.20% from 20Hz to 20kHz at +20dBm
   d. Equivalent Input Noise: -124dBm
   e. Maximum Output Level: +21dB
   f. Logic Output: 1.0VDC to 4.0 VDC

5. The mixer shall be enclosed in a metal housing designed for rack mounting. The mixer shall be a Voicematic VM-4043 or equivalent.

D. Equalizer

1. The equalizer shall contain 31 constant-Q active band-pass filters at the ISO preferred 1/3 octave center frequencies from 31.5Hz to 16kHz.

2. Each filter in the mixer shall provide up to 12dB of boost or cut at the center frequency and shall skirt with adjacent filters for minimum ripple. Boost and cut shall be controlled by linear slide controls mounted on the front panel.

3. The front panel shall contain 18dB/octave, rotary high-pass and low-pass filters with continuously variable cutoff frequency point adjustable from 20Hz to 160Hz for the high-pass filter and 5kHz to 20kHz for the low-pass filter.

4. Inputs and outputs shall be electronically balanced; the output shall be capable of driving load greater than 600 ohms. Barrier strips and XLR connectors shall be provided for input and output signal wiring.

5. The equalizer shall conform to the following specifications:
   a. Operating Gain: 0 dB
   b. Frequency Response: 20Hz to 20kHz, +0, -1dB referenced at 1kHz
   c. THD: < 0.03 % with 0 dB output at unity gain
   d. Noise: -85dBm, A-weighted at unity gain
   e. Input Impedance: 30kQ balanced, 15k52 unbalanced
   f. Max Input Level: +24dBv
   g. Output Impedance: 4452 balanced, 2252 unbalanced
   h. Max Output Level: +24dBm
6. The equalizer shall be enclosed in a metal housing designed for rack mounting. Provide security cover. The equalizer shall be a Yamaha GQ1031C or equivalent.

E. Ceiling Speakers and Wall Speakers
1. Both ceiling and wall speakers shall be equipped with four primary voltage taps from 3.7 to 30 watts. Ceiling Speaker includes grille, back can, support backing bracket and tile rails, size as required.
2. The speakers shall be JBL Control 24CT ceiling mount or JBL Control 25T, which includes wall mount bracket and hardware.

F. Wireless Microphone System
1. Wireless microphone systems shall be Shure ULXP-14/83. Receiver shall have one XLR balanced output and one phone jack unbalanced auxiliary output. Antennas shall be mounted to provide optimum coverage.
2. Provide standard 9V alkaline batteries for transmitter power.

G. Wire And Cable
1. Speaker wiring shall be West Penn #WP25225B or equivalent.
2. Audio and control wiring shall be West Penn #WP25292B or equivalent.

2.04 ASSISTED LISTENING SYSTEMS

A. General
1. All equipment items shall be selected and installed to provide fully normal operation in the anticipated ambient temperature range of 55° to 100°F.

B. RF Transmitters/Receivers
1. The master RF transmitter shall operate at 72 or 216 MHz.
2. The RF transmitter shall be Listen LT 800-72 or 216.
3. The RF receiver shall be a single channel portable receiver. The receiver shall be battery operated with an output of at least 10 hours. Provide two (2) receivers, 2 ear speakers (Listen LA 164) with rechargeable batteries and one (1) charging station for each.
4. Receiver shall be LR-500-72 or 216; rechargeable battery shall be Listen LA-362 charging station shall be a Listen LA-202.

C. Wire and Cable
1. Extension cable from the audio amplifier to the RF transmitter as required.
2. Extension cable between the RF transmitter and antennae as required.
3. Power distribution cable between power supply and transmitter as required.
2.05 CONTROL SYSTEMS

A. General
   1. The system shall be equal to AMX Netlink or Extron Media Link Control System.

B. Control Panels
   1. The control panels shall each consist of a tabletop console with a push button or touch panel display. The display panel shall tilt through an angle of approximately 60 degrees, permitting adjustment to optimize visibility and minimize glare.
   3. The control panels shall include the following features:
      a. Ability to upload and download panel programming,
      b. Software tools provide full-featured capabilities in Windows.
      c. Windows control panel programming.
      d. The control panels shall be, complete with local power supply, with cord and plug for 120 volt input.

C. Integrated Controller, AMX
   1. Integrated controllers shall mount in a standard 19” electronics rack. Provide cable mount brackets for cable control.
   2. Each controller shall be complete with Microprocessor, Master and Control Modules and shall accommodate additional external control modules.
   3. Controllers shall communicate with control panels and interface modules over the AXlink data/power bus.
   4. Controllers shall be equipped with at least the following:
      a. Non-volatile memory,
      b. Seven RS-232/422/485 data ports
      c. Two communication ports (one AXlink, one Ethernet).
      d. One RS-232 programming port.
      e. Eight relay-ports
      f. Eight IR/Serial ports.
      g. Eight I/O ports
      h. Included power supply for 120VAC input.
   5. Controllers shall be equipped with status indicators as follows:
      a. Bus status
      b. Data send/receive
      c. Relay closure
      d. IR/Serial send
      e. I/O send
   6. Controllers shall be from the AMX Netlink family of products.

D. Integrated Controller, Extron
   1. Integrated controllers shall be capable of wall, lectern, or tabletop mounting.
   2. Each controller shall have an integral high performance web server with at least 7mb of flash memory.
3. Integrated controllers shall communicate with display devices, switches or other types of media controllers via RS-232, media link or IR.
4. Integrated controller shall be equipped with at least the following:
   a. Bi-directional RS-232 port for universal control.
   b. IP link
   c. Three digital I/O. May be eliminated for secondary displays at owner’s discretion.
   d. Dedicated IR port. May be eliminated for secondary displays at Owner’s discretion.
   e. Support for optional IR control models
   f. IR learning capability.
   g. Discrete on/off display power controls.
   h. RS-232 port for media link switches. Support for primary display. May be eliminated for secondary display at Owners discretion.
   i. Inactivity timer for display shut-off.
   j. Front panel security lockout.
   k. User configurable buttons
   l. Macro capability.
   m. Tri-color, backlit buttons can be custom labeled.
   n. Removable button caps.
   o. Volume control knob with volume indication for display or switches. May be eliminated for secondary displays.
   p. Optional secondary control panel connection for primary display. May be eliminated for secondary display.
   q. Provided with an external universal power supply, 110 to 240 VAC, 50/60 Hz to 12VDC, 1A regulated.
   r. Front panel configuration port.

E. Spare Parts
   1. Provide the Owner with a recommended spare parts list for each system, complete with pricing.

F. Manuals
   1. Provide the Owner with two (2) complete sets of Operation and Maintenance manuals (O&M) complete with As-Built shop drawings per classroom.

PART 3 - EXECUTION

3.01 INSTALLATION

A. System equipment shall not be installed until the environment is free of dust. A dust-free environment shall be considered one in which all construction work has been completed and the air handling system for the area has been operated continuously for at least two weeks with a filter change after one week. During and following installation of the system
equipment, relay assemblies and equipment cabinets, the air handling system shall be kept operational continuously and shall be adjusted to maintain a positive pressure relative to building spaces outside the areas of installation. Openings into the installation spaces shall be kept closed, filters shall be changed at frequent intervals, equipment enclosures shall be kept closed, covers shall be installed and any other provisions for keeping the equipment, assemblies and cabinets clean and free of dust and deliver shall be employed.

B. Verify exact location and sizes of all existing conduit runs and back boxes prior to rough installation.

C. All switches, connectors, outlets, etc., shall be clearly, logically and permanently labeled during installation.

D. All items of equipment related to the video projection system shall be installed in the equipment cabinet and/or rack provided for the purpose.

E. All wiring terminations shall be trimmed to the required length for proper system operation and neatly dressed. Excess wire service loops shall remain in the final system where required for maintenance or access. Each system wire and cable shall be clearly marked at each end with the corresponding markings identified in the Operations and Maintenance manual.

F. All audio and video interconnections shall use the highest quality signal path available. Example: Use balanced audio and component video when available.

G. Any balanced audio to unbalanced audio, or unbalanced audio to balanced audio interconnections shall use proper impedance and audio level interface such as the “Matchbox” made by Henry Engineering or equivalent.

H. Any RF interconnections (VCR/TV modulator or antenna) shall require crimped screw on type “F” connectors and shall not use push on type “F” connectors.

3.02 WIRING

A. Wiring within equipment enclosures shall be neatly grouped and tied to lacing rods and/or run in plastic snap-cover wire way sections. Wiring shall run behind the panel in a manner that is not visible from the operator’s position. A termination loop shall be formed immediately adjacent to each terminal.

B. Terminal strips shall be fully insulated but allow insertion of test equipment probes. Each terminal segment shall be numbered to correspond with the drawings and conductor identification numbers.

C. All wire and cable shall extend to each outlet location with complete electrical continuity and without any shorts or grounds. Cables shall run uninterrupted and un-spliced to each remote device, with the exception of distributed speaker runs.

D. All wire and cable shall be in conduit, free air, or a combination of the two
at the Owners discretion. Conduits shall be grounded to the power system ground.

E. Cables shall be routed so as to maintain a separation of at least 2 feet from all heat sources and from ballasts, transformers, dimmers, and all other sources of electromagnetic interference.

F. Care shall be exercised during installation not to damage the cable insulation. Damaged cables shall be removed and replaced.

G. Each cable termination shall be tagged and labeled.

H. Wire color-coding shall be at the option of the Contractor, but each individual conductor shall be the same color throughout its entire length.

I. For test purposes, standard operating level for sound reinforcement systems shall include that portion of the rated power range of the amplifiers from 10% to 100%.

J. After testing is complete, audio levels on all systems shall be set to levels satisfactory to the owner.

PART 4 - SECURITY

4.01 Physical Security

A. Panel lockout- all controls not part of daily use will be blocked from user with a cover panel.

B. All equipment located in rack will be mounted with security screws.

C. Projector mount shall be a BMS LCD Loc2 Medium universal lockable mount or equivalent.

D. Lectern will be locked in order to keep people out of the wiring side of the equipment. Use standard EWU/IT classroom services lock and key.

4.02 Electronic Security

A. Control systems will be connected to EWU Global Configurator via Media Link or IP Link box to constantly monitor each room. See section 2.05 sub-section D.

B. Projectors will be fitted with Sonic Alarms that activate upon cutting the cable, disconnecting the cable, or tampering with the cable.

C. Room access doors - proximity card access see Spec. 16721.

END OF SECTION 16710