DOCUMENT 00 90 00
ADDENDUM

ADDENDUM NO. [1] **Date: October 21, 2020**

RE: **SOUTHWEST WISCONSIN TECHNICAL COLLEGE**
BUILDING 400 LECTURE HALL
1800 BRONSON BLVD
FENNIMORE, WI
BID NUMBER: 2021-02

FROM: HSR Associates, Inc
100 Milwaukee Street
La Crosse, WI 54603
(608) 784-1830

To: Prospective Bidders

This addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated October 2020. Acknowledge receipt of this Addendum in the space provided on the bid form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of [2] pages, Pre-bid attendance, [2] specification sections, and [2] 30 x 42 drawings.

CHANGES TO BIDDING REQUIREMENTS AND CONDITIONS OF THE CONTRACT:

1. Pre-bid Attendance: Attached hereto.
2. Pre-bid site tours: Tours of no more than 2 people may be scheduled with the Owner. Contact Josh Bedward 608-822-2754 or
   Dan Imhoff 608-822-2401
3. Photos of existing conditions are available at the following link:
   https://hsrassociates.sharefile.com/d-sedcca9e98c44939a

GENERAL REQUIREMENTS:

4. Section 01 50 00 TEMPORARY FACILITIES AND CONTROLS
   a. 1.05: Delete Paragraph A. The existing system may be used for heat following paragraph C.

CHANGES TO SPECIFICATIONS:

5. Section 27 10 05 STRUCTURAL CABLING FOR VOICE AND DATA
   b. Add the following Cabling for all AV equipment data wiring requirements.
   c. **Cat. 6A,** 23 AWG solid copper STP (shielded twisted pair), 10 Gigabit, 500 Mhz with overall shield and jacket. Manufacturers: Belden 10GX53F or West Penn 254246AF.
6. Section 26 24 00 PANELBOARDS
   d. Section attached hereto as part of Contract Documents.
7. Section 27 41 00 AUDIO VISUAL SYSTEMS
   a. Revised section attached hereto replacing original section.

8. Section 28 31 00 FIRE ALARM AND DETECTION
    e. 2.01 Manufacturers, A: Delete “Simplex” and revise to “EST”. This matches a campus standard.

CHANGES TO DRAWINGS

9. Sheet A100 REMODEL PLANS 30 x 42 attached hereto
    a. Revisions clouded on Drawing.
    b. Removable seat locations revised.

10. Sheet E200 POWER PLAN (No Drawing Reissued)
    f. Detail 3: Change “Flexible conduit provided by Irwin” to “Flexible conduit provided by theater chair provider”.

11. Sheet E600 LIGHTING, MOTOR AND PANELBOARD SCHEDULES (No Drawing Reissued)
    g. One Line Diagram 2E600; Provide 30KVA transformer with K13 rating.
    h. Panelboard A: Provide 25 amp, 2 pole circuit breaker for CU-1 and AC-1 in lieu of 30 amp.
    i. Equipment Schedule: Add note #1 to remarks column for AC-1.

12. Sheet AV001 GENERAL AUDIOVISUAL INFORMATION 30 x 42 attached hereto.
    a. Revisions clouded on Drawing.

13. AV Drawing Clarification:
    j. Clarification: All references to Cat.6A or Cat. 5E cabling shall be furnished and installed by the electrical contractor. HDMI, USB cables and Control wiring shall be furnished and installed by the AV contractor. Refer to sheet AV001 - Scope of work demarcation table.
    k. Electrical contractor to provide all conduit, raceways and power connections.
    l. Owners AV Equipment Supplier contact:
    Jay Shearer
    Regional Sales Manager
    EPA Audio Visual, Inc.
    Office: 763.477.6931
    Cell: 612.655.5462

END OF DOCUMENT 00 90 00

SWTC Bldg. 400 Lecture Hall Remodel – HSR project # 20006
Pre- Bid Attendance Friday 10/16/2020

Attendees

Dan Imhoff – SWTC
Josh Bedward - SWTC
Art
Alan Harper
Brenda Egli
J. Vaske – Sullivan Design/Build
Jake B. – HSR
Michelle M. – HSR
Doug R. – HSR
Ron K. – HSR
Ryan Rands
Todd Allison
Travis Wellington – Hooper
Jayden Herring – Westphal
Eric Lehman – Fowler & Hammer
Charlie Cook – Air Temperature
Shawn – Global Comm.
Jesse Armstrong
Nick Schuch
Dalton Lunde – M&J

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SECTION 26 24 16

PANELBOARDS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Branch circuit panelboards.

1.02 RELATED WORK

A. Section 26 05 29 – Hangers and Supports for Electrical Systems

B. Section 26 05 53 – Identification of Electrical Systems

C. Section 26 05 26 – Grounding and Bonding of Electrical Systems

1.03 REFERENCES

A. NECA (National Electrical Contractors Association) "Standard of Installation."

B. NEMA AB 1 - Molded Case Circuit Breakers.

C. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

D. NEMA KS 1 - Enclosed Switches.

E. NEMA PB 1 - Panelboards.

F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

G. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

B. Maintain one copy of each document on site.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2: PRODUCTS

2.01 MANUFACTURERS

A. Square D.

B. Substitutions: None. Maintain campus standard.

2.02 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1, circuit breaker type.

B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

C. Minimum integrated short circuit rating: 22,000 amperes rms symmetrical for 240 volt panelboards; 18,000 amperes rms symmetrical for 480 volt panelboards [or as indicated].

D. 120/208V branch circuit panelboards shall have UL Listed 200% rated neutrals for non-linear loads where indicated in the Panelboard Schedule.

E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.

F. Enclosure: NEMA PB 1, Type 1.

G. Cabinet box: 6 inches deep; width: 20 inches. All multi-section panelboards shall be the same physical size for all sections.

H. Cabinet Front: Flush or surface cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

PART 3: EXECUTION

3.01 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb. Install recessed panelboards flush with wall finishes. Provide supports in accordance with Section 26 05 29.

C. Height: 6 ft (2 M) to top of panelboard; install panelboards taller than 6 ft (2 M) with bottom no more than 4 inches (10 cm) above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

F. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Minimum spare conduits: 5 empty 3/4 inch. Identify each as SPARE.

G. Circuit numbers indicated on drawings are for reference. Contractor to arrange branch circuits as required for wiring and load balancing. Indicate actual panelboard circuit numbers on record/as-built drawings.

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION

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SECTION 27 41 00
AUDIO-VISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 specification sections apply to the work of this section.

B. Applicable Division 26 and Division 27 sections including:

1. 26 05 26 Grounding and Bonding for Electrical Systems
2. 26 05 33 Raceway and Boxes for Electrical Systems
3. 27 05 53 Identification for Communication Systems

4. 27 10 00 Structured Cable

1.2 DEFINITIONS

A. Unless otherwise noted, the following definitions shall govern the specifications herein.

1. "Owner" and "Campus" refers to both owner of the project and the owner's authorized representative from Southwest Wisconsin Technical College.
2. "Construction Manager" refers to the primary contact and shall have complete responsibility and final authority for this project.
3. "Control System Programmer" refers to the Crestron and DSP programmer.
4. "Architect" refers to the project architect.
5. "AV Consultant" refers to Professional Audio Designs, Inc.
6. “Bidder” refers to the entity generating the bid response.
7. "Electrical Contractor" refers to contractor responsible for all Division 26 work.
8. “Telecom System Installer” or “Telecommunications System Installer” refers to the contractor responsible for Division 27 work that does NOT include the AV systems as described in this 27 41 00 specification.
9. "AV System Installer" refers to the contractor responsible for implementation of 27 41 00 specifications, AV series drawings, and co-ordination of related infrastructure by other disciplines.
10. "Shall" is defined as a mandatory requirement of the project.
11. "Will" is defined as a future requirement.
12. "Should" or "May" are defined as strongly encouraged, non-mandatory provisions.
13. “OFE” refers to owner furnished equipment.
14. “OFCI” refers to owner furnished contractor installed.
15. "OFOI" refers to owner furnished owner installed.
16. “CFCI” refers to contractor furnished contractor installed. Contractor may include AV System Installer, Electrical Contractor, or Telecommunications System Installer and shall be detailed in drawings, descriptions, or equipment list.

1.3 SCOPE OF WORK

A. This section covers general requirements associated with the installation of audiovisual systems within:

1. Building 400 Lecture Hall

B. Refer to sections listed below for more specific system requirements. Multiple spaces with multiple systems are covered under this section.

C. Provide all materials, labor, and drawings, for a complete and professionally installed systems in working order. Provide any and all connectors, hardware, transformers, power supplies, rack panels, interfaces, fasteners, wire harnessing materials, bushings and any other incidentals required for complete and proper functioning of this system whether specifically listed or not.

D. Specifically, the work includes, but is not limited to:

1. Coordination
   a. Communicate and coordinate with the AV Consultant, Owner, Architect and other trades complying with all requirements as defined under this Scope of Work and elsewhere, to fulfill the requirements of this specification.
   b. Coordinate schedule installation activities with other trades.

c. Coordinate installation of equipment to provide accessibility for future maintenance.
d. Verify required cable lengths with installed cable pathways for all multi-pair and/or preterminated cables before ordering.
e. If provided, master quote numbers are provided as a convenience for bidding purposes. Verify the accuracy of quotation numbers prior to ordering. A quotation list may include every element of a fully functioning system.

2. Documentation
   a. Develop and submit Shop Drawings as specified for approval.
   b. Develop and submit As-Built Drawings detailing the installed systems as specified for approval.

3. Installation
   a. Furnish and install cable labels as specified.
   b. Ensure that all cabling, equipment, and terminations are installed in accordance with accepted industry standards, approved Shop Drawings, manufacturer's recommendations and as specified.
   c. Furnish and install cable management hardware as required including areas internal to rack cabinets, areas between pieces of equipment not housed in rack cabinets, and area that extend cabling from rack cabinets and equipment to the greater facility cabling infrastructure.
   d. Furnish and install custom cover plates, wall plates, I/O connection plates, floor box insert plates as required. Coordinate with the Architect and/or Owner on the final selection of finishes.
   e. Coordinate with the Architect and Owner on final color selection, and/or the painting of any exposed loudspeakers and any/all exposed system components to match the room's aesthetics and finishes.
   f. Furnish all lifts, ladders, scaffolding or other resources as needed for safe installation. Coordinating with other trades as needed.
   g. Furnish and install all equipment as specified.
   h. Ensure that all equipment, with the exception of portable equipment, is firmly fastened or attached in place. A safety factor of at least five shall be utilized for all brackets, fasteners and attachments.
   i. Furnish and install all projector mounts, including support assemblies back to structural members. AV System Installer must pay close attention to obstructions which vary from room to room.
   j. Field verify all projector locations and resolve any obstruction conflicts for optimal performance. AV System Installer reference the drawings for screen sizes and field verify measurements to confirm throw distances to determine the appropriate lens required. Furnish all projector lenses as required.
   k. Mount and align the projectors so that digital keystone correction is not required. Optical lens shift may be used, only if necessary, to align the image with the image area. If possible, mount projectors perpendicular to the screen surface.
   l. Provide safety retention cables for overhead equipment such as loudspeakers, projectors, etc.
   m. Ensure that all equipment mounting styles and locations comply with the 2010 ADA Standards for Accessible Design.
   n. Install Owner furnished equipment as specified.
   o. Furnish and install cables for connection of AV equipment to the Building/Facility LAN where required (including OFCI equipment).
   p. Provide patching, caulking, fire stopping, and painting required to restore damaged finishes during installation.

q. Ensure that all equipment mounting styles and locations comply with the 2010 ADA Standards for Accessible Design.
r. Select final channels for all wireless devices and resolve conflicts where they may occur.
s. Upon completion, turn over to the Owner all accessories included with the manufacturer's equipment but not used for the physical installation of the device. This includes but is not limited to, all user manuals, remote controls, batteries, tools, installation hardware, cases, covers, software, etc.

4. Coordination with Owner's Network
   a. Where AV equipment is connected to Owner's network, acquire the following from the Owner for each AV device on the Owner's network (not limited to):
      1) IP address (DHCP or static)
      2) Subnet information
      3) VLAN setup and authorization.
   b. Do not connect any device to the Owner's network without written permission from the Owner.

5. Programming
   a. Provide Control System design submittals as specified.
   b. Develop, install, and debug all custom control programming code as required and/or as specified.
   c. Provide low voltage control system interfaces to facility lighting and/or shades where specified.
   d. Provide the uncompiled programming control code as specified.

6. Testing, Commissioning, Training and Warranty
   a. Verify that all individual components as well as the system as whole function as intended by the AV documents and specifications.
   b. Test and adjust systems and components for optimal performance.
   c. Provide initial test and measurement verification reports to the AV Consultant as specified.
   d. Coordinate and participate in a Commissioning with the AV Consultant and Owner.
   e. Coordinate and conduct an acceptance walk-through and sign-off session with the Owner and/or AV Consultant.
   f. Provide "sign-off" documents for each space and/or space type as defined herein.
   g. Conduct training in systems operation with the Owner's designated representative(s).
   h. Provide a warranty as specified.

7. Work Excluded: Work not included under this contract shall be:
   a. Provide conduit, power receptacles, junction boxes, cable raceways, electrical back-boxes, and floor boxes – with the exception of those boxes noted as "specialty" on the drawings.
   b. Provide blocking as required to support wall-mounted AV components.
   c. Provide millwork except where otherwise specified.
   d. Provide lighting fixtures, lighting dimming systems, and lighting controllers.
   e. Provide window shades, drapes or controllers.
   f. Provide telecommunications structured cabling systems, including horizontal and backbone cabling and termination, voice and data face plates, associated racks and cabinets, raceway, and cable management required for facility telecommunications systems separate from Audio-Video networks.

E. Information concerning the design intent is contained both within this document and on AV system drawings. Where conflicts exist between drawings and specifications, the Bidder must bring the discrepancies to the project's Construction Manager and AV Consultant's attention BEFORE the bid due date. If the Bidder fails to bring any particular discrepancy to the attention of the AV Consultant before bids are due then refer to general conditions of the general prime contractor contract, article 4 - conflicting conditions.

F. Any schedule of major equipment included as part of this spec is provided as a courtesy and as a basis of design to illustrate the required performance. It is the responsibility of the AV System Installer to verify the completeness of all drawings, specifications and schedules and the suitability of devices to meet the intent of the specifications.

G. Purchase date(s) shall be within 2-3 months of the time the AV System Installer intends to install the equipment in the building. The Owner reserves the right to negotiate these dates with the AV System Installer. After these dates are agreed upon, AV System Installer shall not purchase any equipment prior to these dates without written permission from the Owner. The Owner recognizes the AV equipment specified is rapidly changing. The intent of this requirement is to allow the Owner the option of upgrading the equipment to models that are more current at the time of installation. Any changes made to the equipment specifications after bidding that result in increased cost will be considered changes to the contract and will be processed accordingly. Manufacturer’s warranties are to be in full effect for a minimum of one year from substantial completion of AV phase.

H. If this project includes owner furnished equipment (OFE), it will be indicated in the Systems Descriptions Summary section and in Part 2 of this document and within drawings. Owner shall have owner furnished equipment delivered to AV System Installers shop or to jobsite. AV System Installer coordinate with Owner for receipt of equipment. Record the serial numbers of each item, manufacturer, and model onto a spreadsheet. A form with all the information of the equipment being turned over is required for the AV System Installer to sign. AV System Installer shall not accept equipment without this form. Upon receipt of Owner furnished equipment, the AV System Installer will take possession and responsibility of equipment. AV System Installer will be fully responsible for Owner furnished equipment until substantial completion of AV phase or first beneficial use of system by Owner or whichever comes first. Therefore, unless AV System Installer has signed the Owner's form agreeing to take control of equipment, the AV System Installer shall not be held responsible for damage or loss of owner furnished equipment.

I. AV System Installer is responsible for compliance with the current published edition of the National Electrical Code and with all of the legal regulations that may apply to this installation, including OSHA safety regulations, regulations of municipal, city, local, and other government agencies. Obtain all necessary permits for the work. AV System Installer is responsible for any violations of the law within the scope of work.

1.4 SYSTEMS DESCRIPTIONS SUMMARY

A. The following systems' descriptions are a summary of system types throughout project.

1. The Lecture Hall serves as a multi-use facility, mainly accommodating extracurricular events and presentations; lecturers, comedians, hypnotists, awards ceremonies, small band performances, winter graduations and outside rentals. Large scale video conferences and streaming will originate from this space as well. Instructional use of the room is anticipated to be a very small percentage of the overall use of the space. The space also serves as a stop on campus tours. The ability to easily operate the AV system and show college videos and promotional information is included.

2. Operation of the room is controlled via touch screens. Audio mixing and video production consoles are not included.
3. Specific Audio-visual elements of the system include:
    a. Audio Sources:
        1) Four (4) channels of wireless microphones are included for use by presenters and audience members. Transmitters use rechargeable batteries and charging stations are included.
            a) Two (2) handheld transmitters
            b) Two (2) bodypack transmitters with headworn microphones
        2) One (1) wired gooseneck microphone is installed at the lectern on the stage.
        3) An upstage wall panel has multiple audio input.
            a) Four (4) wired microphone inputs connect directly to the audio digital signal processor for “easy mode” operation. Audio levels are controlled via the touch screens.
            b) Eight (8) wired microphone inputs are dry audio lines routed to a plate in the control room for use with a portable mixing console (console not included in contract).
            c) Four (4) wired line level returns can be used to send audio from the control room back to the stage.
    b. Loudspeakers
        1) Three (3) main and three (3) delay performance loudspeakers are suspended from the ceiling for higher output, higher fidelity audio requirements such as live performances and movie events. A subwoofer, for low frequency extension, is installed at the floor (in a pocket built into the stage platform).
        2) Seven (7) flush-mounted ceiling speakers are mounted in the ceiling reflectors at the rear of the room to supplement the delay loudspeakers. (refer to Alternate #1 below for additional ceiling speakers).
        3) Wall-mounted powered monitors are mounted within the control room to monitor audio from the main room if the operable control room window is closed. These loudspeakers are level matched and time aligned to the loudspeakers in the hall.
    c. Assistive Listening System:
        1) An FM Assistive Listening System is included.
            a) A number of receivers based on the quantity of seating in the space are provided along with inductive neckloops for individuals with T-coil hearing aids. The receivers have rechargeable batteries. A charging case that keeps the receivers charged while stored is also included. Signage is installed at the entry to the space per ADA requirements.
    d. Video Sources:
        1) Lectern: Four (4) total computer inputs – two (2) for an Owner Furnished fixed PC and two (2) for connection of a portable Owner Furnished laptop (or any other devices with HDMI outputs). These inputs connect via a floor pocket at downstage left.
        2) Control Room: Four (4) total computer inputs – two (2) for an Owner Furnished fixed PC and two (2) for connection of a portable Owner Furnished laptop (or any other devices with HDMI outputs).
        3) A Blu-ray player is located in the lectern and a second Blu-ray player is located in the Control Room equipment rack.
        4) One (1) digital media player is provided for playback of video content during campus tours.
        5) Three (3) cameras are provided. One is located in the ceiling near the center projector and confidence monitors to capture the presenter. Two are located near the front of the room to capture audience members in the

seating area for large conference calls and other events. Infrastructure is provided for a fourth camera at the rear of the room to provide future switching between a wide and narrow shot of the stage during events.

e. Video Displays:
   1) One (1) 220" (diagonal) projection screen and associated 13,000 lumen full HD projector are located house center.
   2) Two (2) 188" (diagonal) projection screens and associated 10,000 lumen full HD projectors are located house left & right.
   3) Two (2) 75" flat panel displays are ceiling mounted at gaps in the ceiling reflectors and are oriented toward the stage for confidence monitors. These confidence monitors can display:
      a) The same content as the main projection screens,
      b) Presenter notes from any laptop or fixed PC,
      c) Far-end video during video conferencing to allow the presenter to engage with remote participants
   4) Local PC monitors at the lectern and control room are Owner furnished and are used for the fixed PC's.
   5) One (1) 43" flat panel display is wall mounted on an arm in the Control Room. This display acts as a "multiviewer" previewing the video content from multiple sources. Sources include:
      a) PTZ Camera #1 (House Left – Front Wall)
      b) PTZ Camera #2 (House Center – Ceiling)
      c) PTZ Camera #3 (House Right – Side Wall)
      d) Future PTZ Camera #4 (House Center – Rear Wall)
      e) Recording / Streaming Content Feed
      f) Recording / Streaming Composite Output)
      g) Web Conference Far End Video
      h) Web Conference Content

f. Streaming & Web conferencing
   1) An owner furnished, contractor installed small form factor PC is installed in the main equipment rack to be used for web conferencing. This PC will have two video outputs for display of the far end as well as shared content.
   2) A recording/streaming device is installed in the main equipment rack. This allows events to be both recorded as well as live streamed via H.264. The feed (sources selected from the touch screens) can be:
      a) Full screen video of one of the local sources – most likely one of the cameras or the presentation content (excludes the Blu-ray players),
      b) A picture-in-picture of two sources – most likely the presentation content full screen with one of the cameras as the picture-in picture (excludes the Blu-ray players)
      c) Side-by-side video of two sources – most likely one of the cameras and the presentation content (excludes the Blu-ray players)

g. System Control
   1) Three (3) touch screens provide system control
      a) A 22" touch monitor with a control system interface is located on the counter in the control room. This display provides full system control (refer to the control system requirements in Part 3 of this spec for additional details).
      b) A 10" touch screen is installed at the lectern with provides system control from the presentation position.
      c) A 10" wall mounted panel at the stage provides control when the lectern is disconnected and there is no operator in the control room.

h. Equipment Racks

1) The head end for the entire system is located in a full-size rack located in a room adjacent to the Control Room.
2) A small rack is located below the counter in the Control room. This rack houses a Blu-ray player and a Bluetooth audio interface. It also houses video encoders and decoders for the Control Room video sources and displays.
3) The presentation lectern has equipment rack space as well. Similar to the Control Room rack, the lectern also houses a Blu-ray player as well as video encoders for the lectern video sources.

4. ALTERNATE #1: Mix-Minus Ceiling Loudspeakers
   a. A series of twelve (12) ceiling-recessed loudspeakers provide audio reinforcement and playback for audience members, primarily during guest lectures, web conferences, or instructional use. If audience microphones are installed (refer to Alternate #2), these loudspeakers are zoned for “mix-minus” operation.
5. ALTERNATE #2: Ceiling Microphone Arrays
   a. A series of ceiling-mounted beam-forming microphones provide reinforcement of audience members during web conferences and Q&A sessions. Audio from these microphones is fed to both the webconferencing system for the benefit of far-end participants and to the loudspeakers in the room to reinforce audience questions for the benefit of presenters and others in the space. A “mix-minus” system is utilized in this case to prevent feedback from the ceiling loudspeaker system.

1.5 BIDDER QUALIFICATIONS

A. A single AV System Installer shall perform the entire work of the 27 41 00 specification, unless otherwise noted. Bidder must meet the following qualifications:

1. Bidder is capable of providing all systems within full and strict compliance to the provisions included in this specification.
2. Bidder has, at minimum, five (5) active years engaged in installing similar systems included under specification section 27 41 00.
3. Bidder has access to all necessary equipment and has the organizational capacity and technical competency to perform work properly and expeditiously.
4. Bidder maintains a manufacturer certified programmer on staff for the control systems included in this bid.
5. Bidder shall include with their Bid Response, proof of their qualifications as listed above and shall include a list of staff who will be actively involved in this project including their specific roles.
6. Bidder employs competent personnel capable of generating necessary drawings outlined under the Submittals section, in a timely fashion and according to project standards.
7. Bidder employs an adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts. They are also familiar with the specified requirements and methods standard for proper performance of work in this section.
8. Bidder shall provide a designated supervisor on the project site during all phases of installation and testing of the system. This designated supervisor is the primary contact during all phases. Provide secondary contact information in instances that the designated supervisor is unreachable.
9. Bidder shows satisfactory evidence, upon request, that it maintains a fully equipped local service organization capable of furnishing adequate inspection and service to systems, including replacement parts. The service organization is capable of a minimum 24 hour on site response time. Bidder is prepared to offer a service contract for the maintenance of the systems after the guarantee period.
10. Bidder is a factory-authorized dealer for all major components specified including, but not limited to, mixing consoles, digital signal processors, audio amplifiers, loudspeakers,

video switching and signal transport, video projectors, flat panel displays, and control systems.

11. The Owner may request a Bidder to provide additional information as desired for review by the Owner, Architect and AV Consultant to determine the Bidder's acceptability.

B. Bidder is responsible for equipment testing and therefore should meet the following qualifications:

1. The Bidder shall furnish a list of equipment for servicing, calibration, and alignment of AV systems upon request of the AV Consultant.
2. Bidder's test equipment must:

a. Test all cable types installed over the frequency ranges used.
b. Generate test signals and/or patterns for all signal types and/or resolutions used.
c. Analyze all signals produced by or displayed by the AV system.

C. The AV Consultant reserves the right to request and have furnished to them any additional information required to determine the Bidder's ability to complete the work outlined in this section. Supply additional information with no additional cost incurred by the Owner.

D. The AV systems for this project will be provided by the following AV contractor under a negotiated contract:

EPA Audio Visual, Inc.
Rockford, MN
Contact: Jay Shearer
Phone: (763) 477-6931

1.6 SITE CONDITIONS

A. Prior to submitting a bid response, examine the site of the proposed work and verify the conditions associated with the Scope of Work as defined by this specification section. Include reasonable allowances for site visits and site conditions in the submitted bid response. Clearly note any impacts on cost and/or schedule in the bid response.

B. Investigate any potential conflicts with site-related or union-related issues regarding use of personnel, scheduling, access to the site, storage of tools and equipment on site, and other areas of potential conflict. Clearly note any impacts on cost and/or schedule in the bid response.

C. Architectural drawings provided to the Bidder for bidding purposes may not reflect actual construction site as-built conditions. Field-verify all site conditions relevant to the work.

D. Identify any condition where the recommended electrical or environmental operating parameters for specified equipment cannot be assured. If any such conditions are identified notify the Architect and AV Consultant.

1.7 QUALITY ASSURANCE

A. All equipment installed shall be new and in proper operating condition, less than one year from date of manufacture. The equipment shall be the manufacturer's latest standard designs current at the time of delivery, modified only to the extent necessary to comply with the requirements of these specifications. Where two or more units of the same class of equipment are required, such units shall be the standard product of a single manufacturer, but individual classes of compatible equipment may be the products of different manufacturers. Manufacturers shall be

established in the industry so that prompt and continued service and delivery of spare parts may be assured

B. If a product is discontinued after submittals and prior to installation, the AV System Installer shall submit a substitution request. Refer to Substitutions sections for requirements.

C. If any equipment, brackets, or mounts require custom fabrication by the AV System Installer, fabricate components with the quality of workmanship comparable to professional equipment produced by specialized manufacturers of the trade involved.

D. Furnish all required equipment whether or not specifically mentioned in these specifications or on the drawings. Such devices include but not be limited to hardware, fasteners, rack screws, rack brackets, power supplies, fan guards, grill covers, floor box covers, impedance matching devices, transformers, line pads, line amplifiers, EDID emulators, twisted pair repeaters, DVI/HDMI cable equalizers, DVI/HDMI repeaters, relay and LED power supplies, and other devices as necessary to interface, control, or balance the AV systems.

1.8 SUBMITTALS

A. Create Submittals and Shop Drawings based on the requirements this Specification. The AV Consultant's review and approval of the AV System Installer's Submittal does not constitute a certification of accuracy or completeness in regards any work which is the responsibility of the AV System Installer (such as quantities, equipment, installation techniques, software programming, equipment interoperability, safety factors, etc.).

B. Required Submittals – Pre-Construction:

1. AV-Submittal-01 – Schedule

   a. Obtain from the Owner, Architect, or Construction Manager a project timeline schedule showing projected dates when the relevant areas will be available to the AV Contractor for the on-site installation.
   b. Provide a schedule of major project milestones to the Owner, Architect, and AV Consultant. The schedule shall show the following milestones, but may include others as required for overall site-work coordination:
      1) Shop Drawings and Submittals
      2) Order and receipt of equipment and supplementary materials
      3) Shop testing of components
      4) Delivery of materials to the work site for installation
      5) Development and submittal of control system GUI and audio DSP submittals
      6) 100% completion of work by area
      7) Testing and debugging on-site
      8) System Commissioning
      9) Final punch list
      10) Submittal of Final Documentation
      11) Training
   c. If, at any time throughout construction, the AV Contractor feels that they will have any problems with meeting the scheduled deadlines, they must inform the Owner, Architect, Construction Manager, and AV Consultant at the earliest possible opportunity

2. AV-Submittal-02 – Shop Drawings

a. Provide completed shop drawings in electronic form (PDF) for the Owner and AV Consultant's approval. Files submitted in PDF format shall be files saved as or printed to PDF format, NOT scanned, so that they are searchable. DO NOT PROCURE EQUIPMENT OR BEGIN WORK ON THIS PROJECT UNTIL SHOP DRAWINGS HAVE BEEN SUBMITTED AND APPROVED.

b. Reproductions of Consultant's drawings are NOT acceptable. Confirm that AV systems are fully understood by providing original shop drawings. Providing original drawings demonstrates that the AV System Installer has reviewed AV equipment locations and connections.

c. Provide Shop Drawing Submittals within thirty (30) days of award of contract, or sooner if necessary to comply with construction schedule. AV System Installer is solely responsible for all costs resulting from delay in providing shop drawings in a timely manner.

d. If reviewed shop drawings require resubmission, include revision dates that indicate when changes from previous reviews were performed for resubmitted Shop Drawing Submittals. Cloud all revisions made to submittal documents and all clouds must be identified by the corresponding line item number on the review roster. Include a list of changes to re-submittal documents.

e. Shop Drawing submittals that are not submitted complete and in full will be returned without review.

f. The Shop Drawing Submittals shall be submitted as a single package and shall be made on 30" x 42" reproducible media or match the project drawing size if larger than 30" x 42". Shop Drawing Submittals shall include the following items:

    1) **Floor Plan Drawings:** Provide drawings with locations of all required raceway, AV power, AV data, equipment racks, and TV displays. Indicate locations of pull-boxes, wall boxes, and floor boxes. The AV Consultant reserves the right to adjust pull-box locations to accommodate access for maintenance.
    2) **Reflected Ceiling Plans**: Provide drawings with ceiling coordinated device locations such as ceiling boxes, ceiling microphones, projectors, projector screens, and loudspeakers.
    3) **Room Sections & Wall Elevations Drawings:** Provide drawings with room sections and wall elevations showing coordinated device locations such as input/output boxes, display backboxes, displays, projection screens, surface mounted loudspeakers, touch screens, etc.
    4) **Equipment List:** Provide a complete list of all components used for the project in an electronic spreadsheet or a searchable PDF. The spreadsheet shall include installation location, quantity, manufacturer, and model number.
    5) **Cable Run Schedule:** Provide a complete list of all cable runs used for the project in an electronic spreadsheet or searchable PDF. The spreadsheet shall include termination locations and identification nomenclature.
    6) **Schematic Drawings:** Provide wiring diagrams showing terminal connections between equipment with consistent terminal numbering, circuit designations, and equipment designations on all drawings. Terminal connections in the equipment shall be numbered to correspond to the diagrams for use in making connections. Coordinate wiring diagrams so that terminal numbering, circuit designation, and equipment or device

designations are the same on all drawings. All drawings must be submitted and approved by the AV Consultant before fabrication starts, but such approval will not waive any specification requirements unless so specifically stated. Final approval will be made after checking the equipment when operated in the field.

7) **Panel/Plate and Rack Elevation Drawings:** Provide elevation drawings of all custom panels and plates as well as equipment racks showing locations of AV equipment being mounted in these racks. Include cable layouts, locations for terminal blocks, transformers, relays, power supplies, etc.
8) **Mounting Details:** Provide drawings of mounting details for all speakers, TV displays, projector screens, and projectors. Provide structural calculations, drawings and details for the anchorage of loudspeaker rigging hardware, projector and/or projection screen rigging, and all other mounts that attach to structure. Submit design for review and approval by a registered Structural Engineer that is licensed for the project jurisdiction.
9) **Custom Millwork Details:** If technical furniture or millwork is specified to be provided by the AV System Installer, provide scaled drawings of all technical furniture indicating dimensions, material, finishes, equipment locations and orientation, cable management, and all other details needed to show the functional and physical aspects of the technical furniture.
10) **Summary of Coordination Efforts:** Write a description of plan to coordinate with other trades. Include name(s) of person(s) responsible for control programming, lighting control, etc.
11) **Listing of Purchase Dates:** As part of the contract for this work, submit a listing of the date or dates for purchasing the audiovisual equipment. Date(s) submitted shall be coordinated with the project schedule presented by the Construction Manager.
12) Update the shop drawing package throughout the duration of the project to document and changes, whether Owner-requested, changes due to field conditions, approved change orders, etc.

C. Required Submittals – During Construction:

1. AV-Submittal-03 – Equipment Rack Digital Photos

a. Submit digital photographs of completed equipment racks for approval prior to delivering the racks to the project site.

b. All photographs shall clearly show the front and rear of each equipment rack. The front photos must show all visible components. The rear photos must clearly show any components mounted in the rear, AC Power distribution, internal rack cabling, terminations, and cable management. Photos shall be properly focused. Use multiple images to show taller racks if necessary.

c. Label image files appropriately to convey the rack or location they are associated with.

d. Submit all digital images in JPEG or PNG file format.

2. AV-Submittal-04 – Software Submittals

a. Submit Software Submittals no later than 30 days prior to deployment of control and DSP programs.

1) Follow the procedures outlined in Part 3, AV Control Systems and Audio Digital Signal Processor (DSP) System to develop the programming prior to submission.
2) Base programming on system types to minimize the number of control programs.

b. The Control System Programming Submittal shall include:

1) Un-compiled control source code, and programming files. All control source code shall become the property of the Owner upon completion of the project.
2) Screen Layouts and Flowcharts: Provide full size drawings demonstrating touch panel through screen shots as a flow chart

c. Audio Digital Signal Processing (DSP) Programming Submittal shall include:

1) Audio DSP configuration file to demonstrate the AV System Installer's basis of design for the internal workings & routing audio through the DSP.

3. AV-Submittal-05 – Verification Test Report Submittal

a. Generate and submit a test report documenting and certifying compliance with any and all provisions of this specification. Test report shall be made available to AV Consultant a minimum of seven (7) days prior to commissioning.

b. Refer to Part 3, AV System Installer's Preliminary Tests & Measurements section for details regarding the requirements of the test report.

c. Submit an electronic PDF of a written report detailing the results of Initial Adjustments and Verification tests including all relevant drawings, charts, test instrument data, and photographs.

d. Submit a written letter of certification along with a written report stating that the installation conforms to the requirements stated herein, is complete in all respects and ready for inspection.

D. Required Submittals – Post Construction Final Documentation

1. AV-Submittal-06 – As-Built Construction Drawings

a. Modify drawings to denote as-built conditions, and include updated drawings as part of the as-built documentation. As-built documentation shall include a complete list of all cable runs including termination locations, numbers/identification, and test data as required under the section on preliminary tests and measurements.

b. The drawings shall include:

1) Plans/RCP/Sections/Elevations with cable routes.
2) Rack elevations and panel details. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided.
3) Final schematics with wire numbers.

c. Modify the documents accordingly to denote as-built information as defined above and submit to the AV Consultant for acceptance. Supply this information no later than four (4) weeks prior to the scheduled occupancy of the affected spaces.

d. Annotate the base drawings and return to the Owner and AV Consultant in hard copy (same plot size as originals) and electronic (AutoCAD or Revit) form.

e. Identify each drawing submitted as part of the Project Documentation as an "As-built" drawing and include the following information: (1) The AV System Installer name and/or logo and (2) the date of the drawing.

f. Maintain all fonts, color, layer, Model Space/Paper Space conventions established in the base drawings in preparation of the As-built drawings.

g. Prior to generation of the drawings, provide a sample file and test plot to the AV Consultant for review and approval.

h. All documentation, including hard copy and electronic forms shall become the property of the Owner.

i. Provide electronic images of each equipment rack for reference to the AV Consultant. Electronic images shall be 10 megapixel or higher, well lit, and clear, full images of the front and back of the equipment rack with doors open.

2. AV-Submittal-07 – Maintenance and Operating Manuals

a. Provide four (4) complete sets, in hard cover binders as well as electronic .PDF, of maintenance and operating instructions for this system. These manuals shall include the following:

1) A table of contents.
2) Owner's manuals for all provided equipment.
3) Simplified operational procedures with diagrams depicting the actual equipment front panels showing the nominal level settings for the controls.
4) FAQ: Question and answer type trouble-shooting guides.
5) IP and MAC address schedule of Ethernet enabled AV devices.
6) Materials list with Manufacturer, Model number and Serial number.
7) CD or USB memory stick with all software furnished for the project.
8) As-Built Drawings One copy of as built drawings.
9) Warranty Schedule: list of dates within four (4) month increments for return visit in compliance with warranty specifications. See section Warranty.

b. Prior to submitting the four (4) hard copies, the AV System Installer shall submit an electronic version to the AV Consultant for review to prevent any reprints due to errors.

c. The AV System Installer shall maintain, in their office, a record of all original manual information to be able to issue as a replacement copy, at the Owner's expense, during the time the equipment is in actual service.

PART 2 - PRODUCTS

2.1 EQUIPMENT STANDARDS

A. Complete AV systems consisting of all the individual system components and peripherals as shown or listed shall be provided to fulfill design intent. Equivalent manufacturers and products shall be in strict accordance with this specification.

B. It is the responsibility of the AV System Installer to verify the completeness of the drawings, specifications, and schedules and the suitability of devices to meet the design intent of the specifications. The AV System Installer shall provide any additional equipment, accessories, or incidentals required, whether or not specifically mentioned herein, without claim for additional payment, it being understood that a complete operational system is required.

C. All equipment quantities listed in audiovisual specification sections are for reference only and may vary depending on the type of manufacturer equipment provided. Refer to schematic drawings to provide AV Consultant-approved quantities to meet design intent.

D. All components that comprise the various systems shall be UL listed where a UL listing exists for that component.

2.2 SUBSTITUTIONS

A. Substitutions are strictly prohibited without prior approval from the AV Consultant. The AV contractor's shall obtain approval on all substitutions prior to bidding from the AV Consultant. FAILURE TO OBTAIN APPROVAL FOR SUBSTITUTIONS SHALL BIND THE CONTRACTOR TO PROVIDE THE SPECIFIED EQUIPMENT WITHOUT REQUEST FOR ADDITIONAL PAYMENT.

B. The AV contractors request for approval of a substitution shall include the reason for requesting the substitution along with any relevant product data. Engineering data must be submitted along with request showing that the substitution will work and perform to the design intent of the system.

C. Request to substitute loudspeakers shall include a complete room model of the space in EASE 4.2 or higher demonstrating equivalent coverage to the consultant’s satisfaction, the suitability of the proposed loudspeaker in addition to documentation described above.

D. Requests for substitutions must be submitted at least 10 days prior to bid due date. Bidders will be notified of approved substitutions via addendum.

E. If a substitution replaces multiple pieces of gear, all components to be replaced shall be identified in the substitution request. If a component listed herein is no longer necessary for proper system functioning due to an equipment substitution, it must be removed from the equipment list and properly credited back to the Owner.

2.3 BACKBOXES FOR AV SYSTEMS

A. All boxes for AV systems as listed on the STANDARD BOX SCHEDULE WITH DESCRIPTIONS on sheet AV900 shall be furnished and installed by the Electrical Contractor.

Type	Manufacturer	Model	Description
FL600	FSR Inc	FL-600P-8-B with Pour Pan and FL-600P-BK-C cover	13.5x12x8 on grade floor box, one 5-gang side and one 6-gang side. Black

			flat cover (no flange) with hinged door
WB-2	Raco	696	2-gang masonry box, 3.5" deep, welded construction
WB-4A	Hoffman	ASE Series	4x4x4 Type 1 box with screw on cover
WB-6A	Hoffman	ASE Series	6x6x4 Type 1 box with screw on cover
WB-12A	Hoffman	ASE Series	12x12x4 Type 1 box with screw on cover
WB-61	Garvin	6350-### with 61AMR-158	6x6x3.5 junction box with 1-gang mud ring matching wall finish depth
WB-62	Garvin	6350-### with 62AMR-2	6x6x3.5 junction box with 2-gang mud ring matching wall finish depth
WB-63	Garvin	6350-### with 63AMR-3	6x6x3.5 junction box with 3-gang mud ring matching wall finish depth
WB-366	Hoffman	A6636T1T	6x6x36 Type 1 box with screw on cover (or larger if neces-sary)
WB-525	Legrand/Chief	PAC525FC(W)	9x14.25x3.5 wall box with trim flange and cover (coordi-nate color with Ar-chitect)

B. All boxes for AV systems listed on the SPECIALTY BOX SCHEDULE WITH DESCRIPTIONS on sheet AV900 shall be furnished by the AV System Installer.

1. No SPECIALTY boxes are included in this project.

2.4 EQUIPMENT SPECIFICATIONS

A. Audio Digital Signal Processors

Manufacturer	Model	Description
Biamp	TesiraFORTE DAN CI	12x8 Open Architecture DSP with Dante network audio and Echo Canceling

B. Audio Amplifiers

Manufacturer	Model	Description
Extron	NetPA U 1004-70V	Four channel power amplifier with Dante and DSP, 100W per channel, 70V

Crown	DCi4-600DA	Four channel power amplifier with Dante/AES67, 600W per channel, 70V
Crown	DCi4-1250DA	Four channel power amplifier with Dante/AES67, 1250W per channel, 70V

C. Audio Sources

Manufacturer	Model	Description
RDL	DD-BTN44	Wall-mounted bi-directional line level and Bluetooth audio interface with Dante/AES67 out. 2-gang Decora.
Shure	MX418C	18" Cardioid Gooseneck Microphone

D. Loudspeakers

Manufacturer	Model	Description
Danley	TH212	Dual 12" Subwoofer (color: black)
JBL	AC299 with MTU-266-99 (include custom painting)	Compact 12" two-way loudspeaker, 90x90 coverage, U-bracket or yoke mount (color: coordinate with Architect)
JBL	Control 26CT (include custom painting)	6.5" Ceiling Loudspeaker (color: coordinate with Architect)
JBL	308P MkII	Powered 8" two-way studio monitor
B-TECH	BT77	Side-clamping speaker wall mount (pr)

E. Wireless Microphone Systems

Manufacturer	Model	Description
Countryman	E6iOW6__SL	Headworn Microphone, Coordinate colors with Owner
Shure	SB900A	Rechargeable Battery Pack for Wireless Transmitters
Shure	SBC200-US	Charger with Power Supply
Shure	SBC200	Charger without Power Supply
Shure	UA864US	Active Antenna
Shure	ULXD1	Digital bodypack wireless transmitter
Shure	ULXD2/SM58	Digital handheld microphone wireless transmitter
Shure	ULXD4Q	Quad-channel digital wireless receiver with Dante audio output

F. Assistive Listening System

Manufacturer	Model	Description
Williams AV	ANT 024	72 MHz Antenna
Williams AV	BAT 026-2	Rechargeable Battery for ALS Receiver
Williams AV	CHG 3512 PRO	ALS Receiver Charger Bay / Case
Williams AV	FM T55	72 MHz FM ALS Transmitter

Williams AV	IDP 008	ALS ADA Wall Signage
Williams AV	NKL 001	18" Mono Inductive Neckloop
Williams AV	PPA R37 HD	17-Channel 72 MHz ALS Receiver

G. Video Sources & Recorders

Manufacturer	Model	Description
Brightsign	HD224	Signage/Video Player, 4K and full HD output
Denon Pro	DN-500BD MkII	Blu-ray, DVD and CD/SD/USB Player
Extron	SMP 351	H.264 Streaming Media Processor - Standard version with 80 GB SSD
Vaddio	RoboSHOT 30E HDBT OneLINK Bridge System (include mounting system as needed such as 535-2000-2006 ceiling mount	Pan-Tilt-Zoom Camera with HDBaseT Receiver. Video, control, and power for camera via single Cat6 cable

H. Video Processing, Switching & Extension

Manufacturer	Model	Description
Crestron	DMF-CI-8	DM NVX Card Frame Chassis, holds up to eight encoder/decoder cards
Crestron	DM-NVX-350	IP Video Encoder/Decoder, can be configured as an input or an output.
Crestron	DM-NVX-350C	IP Video Encoder/Decoder Card, can be configured as an input or an output.
Crestron	DM-NVX-E30C	IP Video Encoder Only Card
Crestron	DM-TXRX-100-STR	H.264 Media Processor
Crestron	HD-RX-101-C-E	DM Lite Receiver (HDMI Extender)
Crestron	HD-TX-101-C-E	DM Lite Transmitter (HDMI Extender)
Decimator	MD-HX	HDMI / SDI Cross Converter
Decimator	DMON-12S	12-Input SDI Multiviewer Processor
Vaddio	AV Bridge Mini	Audio & Video to USB3 Interface

I. Video Displays & Mounts

Manufacturer	Model	Description
Chief	TS325TU	Medium Display Arm Mount
Chief	VCMU	Heavy Duty Universal Projector Mount, 250 lb capacity
Chief	XCM1U	Extra Large Display Ceiling Mount
Da-Lite	21870L with custom black drop	Tensioned Cosmopolitan Electrol, 16:9, 92"x164", HD Progressive 1.1 screen fabric, 6" Custom Black Drop, Low Voltage Control

Da-Lite	21872L with custom black drop	Tensioned Cosmopolitan Electrol, 16:9, 108"x192", HD Progressive 1.1 screen fabric, 6" Custom Black Drop, Low Voltage Control
Planar	PCT2235	22" Touch Monitor
Samsung	QB43R	43" Display, 3840x2160, 350nit, 16/7 Operation, 22 lbs.
Samsung	QB75R	75" Display, 3840x2160, 350nit, 16/7 Operation, 84.5 lbs.
Sony	VPL-FHZ101L	10,000 Lumen Laser Projector, 1920x1200 (full HD capable)
Sony	VPL-FHZ131L	13,000 Lumen Laser Projector, 1920x1200 (full HD capable)
Sony	VPLL-Z4015	1.85-2.44:1 Zoom Lens
Sony	VPLL-Z4019	2.41-3.07:1 Zoom Lens

J. AV Network Switches

Manufacturer	**Model**	**Description**
Luxul	AMS-4424P	24-Port (PoE+) Gigabit Managed Network Switch
Luxul	XMS-5248P	52-Port (PoE+) Gigabit Managed Network Switch (Layer 2/3)

K. AV Control Systems and Control Interfaces

Manufacturer	**Model**	**Description**
Crestron	CP3N	Control System Series 3 Processor
Crestron	DGE-100	Digital Graphics Engine for touch monitors
Crestron	TSW-1060-B-S	10" Touch Screen
Crestron	TSW-1060-TTK-B-S	Tabletop mounting kit for 10" touch screen

L. Equipment Racks

Manufacturer	**Model**	**Description**
Middle Atlantic Products	BRK12-22	Countertop Rack, 22"D x 22.63"H, 12 RU
Middle Atlantic Products	D3LK	Locking Rack Drawer – 3RU
Middle Atlantic Products	LF-ISO	Leveling and Isolating Feet for Racks
Middle Atlantic Products	MW-10FT-FC	Thermostat Controlled Fan Kit for Racks
Middle Atlantic Products	SPN-44-312	Side Panels for 44 RU, 31"-32" Deep Racks
Middle Atlantic Products	LVFD-44	Vented Front Door for 44 RU Racks
Middle Atlantic Products	WRK-44-32	44-RU Equipment Rack

Spectrum Industries	Director Series Lectern	Reference Quote Q000223727-1

M. AV Power Distribution

Manufacturer	Model	Description
Middle Atlantic Products	M-20IG	MPR Power Module, 20A, Duplex, Isolated Ground
Middle Atlantic Products	M-2X20IGA	MPR Power Module, 20A, Double Duplex, Isolated Ground
Middle Atlantic Products	MPR-8A (provide tails, jumpers and blanks as needed for complete raceway solution)	Modular Raceway Power Distribution frame, accepts up to 8 modules
Middle Atlantic Products	PD-915R	Horizontal Power Distro with 2-Stage Surge Suppression
Middle Atlantic Products	UPS-2200R	UPS Backup Power Supply, Pure Sine Wave, 2150VA
Whirlwind	ROK-1	Remote Outlet Controller, switches a 20A circuit via contact closure

N. AV Connection Panels

Manufacturer	Model	Description
Custom	FB/DL	Floor Pocket Connection Plates per drawings
Custom	AV/UL	Upstage Left Connection Plate per drawings
Custom	AV/CR-1	Control Room Connection Plate per drawings
Custom	AV/CR-2	Control Room Connection Plate per drawings
Custom	SPK/CR-x	Control Room Loudspeaker Plate per drawings
Custom	ANT/ALS	Assisted Listening Antenna Plate per drawings
Custom	SUB/C	Subwoofer Plate per drawings
Custom	RP/BT	Bluetooth Rack Panel per drawings
Custom	ID Panel	Consultant and Contractor Identification Rack Panel per drawings

O. Cable

Type	Manufacturer	Model	Description
ANT (50' or less)	West Penn	812	RG-58, 20 AWG 50-Ohm Coax
ANT (greater than 50')	West Penn	810	RG-8 or RG-213, 11-13 AWG 50-Ohm Coax
CAT6A	West Penn	4246AF	23 AWG Solid Copper Twisted Pair, overall foil shield and jacket (Cat6A)
CTRL	West Penn	454	22/2 Stranded Tinned Copper Conductors, shielded with overall jacket
HDMI	Crestron	CBL-HD-length	High Speed HDMI Cable
LINE	West Penn	454	22/2 Stranded Tinned Copper Conductors, shielded with overall jacket
MIC	West Penn	454	22/2 Stranded Tinned Copper Conductors, shielded with overall jacket
RS232	West Penn	D2404	24 AWG stranded, 8 conductors, overall shield
SDI	West Penn	6350	RG-6 18 AWG 75 Ohm Coax
SPK10	West Penn	HA210	10 AWG Stranded Twisted Pair
SPK12	West Penn	227	12 AWG Stranded Twisted Pair
SPK16	West Penn	225	16 AWG Stranded Twisted Pair
USB	C2G	#54173 / #54174	USB3.0 USB-B to USB-A Cable

P. **Alternate #1**

Manufacturer	Model	Description
JBL	Control 26CT (include custom painting)	6.5" Ceiling Loudspeaker (color: coordinate with Architect)

Q. **Alternate #2**

Manufacturer	Model	Description
Shure	MXA910W-US (include custom painting)	Ceiling Mic Array, US version for 24" ceilings (color: coordinate with Architect)

PART 3 - EXECUTION

3.1 GENERAL

A. Verify all dimensions and conditions at the project site. Submit any conflicts in a timely manner for resolution and coordinate their efforts with Construction Manager to ensure timely completion of work and to avoid conflicts over scheduling, access, and locations of their work.

B. Materials to be furnished by the AV System Installer may include all back boxes noted as "Specialty" on Sheet AV900 and all low voltage wire and cable. The Construction Manager shall be responsible for ensuring all floor boxes and back boxes noted as Standard, if applicable, are furnished for the project. The demarcation table on Sheet AV001 is a suggested scope of work.

C. Division 26 Contractor ensure all power connections are installed as noted on the drawings. AV System Installer is responsible for providing a schedule of completion of each system or space to the Division 26 Contractor to ensure timely completion of AV installation.

D. Furnish all mounting brackets, raceways, sleeves, rack rails, termination plugs, jacks, faceplate mounting hardware, and other unique components as necessary to securely mount equipment and panels.

E. Facilitate the integration of other room systems including lighting control systems, motorized shades, motorized projection lifts, motorized projection screens, etc, where noted on drawings.

F. Furnish painting and finishing as may be required to match components, cabinetry, and room décor. Coordinate the color and finish of any visible element of the system with Construction Manager approval.

G. Do not mount any projector, camera, or other AV device to any structure that is not sufficiently supportive and free of vibration or shake. If there is vibration or shake in the building structure that causes any degradation of the video image, Modify the mounting method so the projector, camera, or other AV device is isolated from this vibration or shake.

H. Provide a full list of MAC addresses and serial numbers to Owner, AV Consultant, and Control System Programmer sixty (60) days prior to scheduled completion of installation.

I. Update all the firmware for devices within one (1) week prior to the commissioning.

3.2 SITE CONDITIONS

A. Coordination:

1. Coordinate all work with other trades.

B. Equipment Delivery & Storage:

1. Make appropriate arrangements and coordinate with job site personnel for the proper receiving, handling, and secure storage of equipment delivered.

C. Site Clean-up:

1. Keep the site free of all debris generated by the AV System Installer’s work, to the satisfaction of the Owner or Construction Manager. Remove waste and debris related to the specified work from the site daily and shall leave the relevant areas and equipment

clean and in an operational state. Repair any damage caused to the premises by the AV System Installer's installation activities, at no cost to the Owner.

2. At the completion of work, remove all remaining waste materials, tools belonging to the AV System Installer, construction equipment, machinery and surplus materials.
3. If the AV System Installer fails to clean up as provided in the contract documents, the Owner may do so and the cost of clean up shall be charged to the AV System Installer.

D. Use of Site:

1. Adhere to the Construction Manager's or Owner's instructions regarding non-smoking, noise, signs, advertisements and fires.
2. Confine operations at the site to the areas permitted in the Contract Documents and do not unreasonably encumber the site with materials or equipment.

E. Access to Work:

1. Provide the Owner and the AV Consultant access to the Work in preparation and progress wherever located.

3.3 WIRING & TERMINATIONS

A. Follow all applicable provisions of NEC and local codes.

B. Employ true 75-ohm or 50-ohm connectors based on component manufacturer specifications on all BNC type connections.

C. All cabling shall be in accordance with manufacturer's recommendations. If the manufacturer's recommended cabling for equipment proposed cannot be accommodated in the conduit indicated in the contract documents without exceeding normal fill or code requirements, the Contractor shall furnish and install the additional required conduit without cost to the Owner.

D. Do not exceed manufacturer's recommendations for cable pulling tension Where cable-pulling lubricant is used, the lubricant must not damage the conduit and cable sleeve materials and must not harden over time to prevent future pulls.

E. Install a nylon pull string in every conduit. If additional cables are pulled in after the initial cable pull, pull a nylon pull string with the added cable. Coordinate installation of pull strings with the Electrical Contractor.

F. Color-code all systems wiring with labeling and coding as submitted and approved by shop drawing. Cabling shall be continuous and shall not be spliced between equipment. Maintain color coding and tagging throughout the system at all accessible locations to the cabling.

G. Communication cables passing through any plenum space and not encased in steel conduits, must be plenum rated for their entire length.

H. Provide or maintain through penetration fire stop systems to prevent the spread of fire through openings made in fire-rated walls or floors to accommodate conduits, cables or other pathways.

I. Fire stops shall restore floor and wall to the original fire rated integrity and shall be waterproof. The fire stop systems and products shall be UL tested and material shall be UL classified as materials for use in through-penetration fire stops.

J. The fire stop system shall comply with the latest editions of NEC and with NFPA 101-Life Safety Code and shall be made available for inspection by the local Authority Having Jurisdiction. AV System Installer is responsible for verifying the fire rating of all walls and floors affected by their work.

K. AV system cabling is divided into classes that may not be intermixed within a conduit or raceway. In certain cases, AV system cabling of different classes may pass through or terminate in a common enclosure provided that proper separation is maintained within the enclosure. Do not intermix AV system cabling with AC wiring within a conduit, raceway, or enclosure. Additionally do not intermix AV system cabling with wiring related to any other trades or discipline including but not limited to; fire protection, HVAC, CATV, alarm, intercom, master clock, access control or other similar systems within a conduit, raceway or enclosure. Wiring classifications, type and minimum separations are listed on Sheet AV910.

L. Use crimp-on terminal lugs for all screw on terminals.

M. Cover wire ends and shield drain wires with shrink tubing.

N. Attach all mechanical solder-on connectors to cable ends using rosin core solder. Check all solder connections for cold solder joints. Resolder any cold solder joints.

O. Install any floor-mounted connectors so that release buttons (for both receptacles and cable connectors) are easily accessible when cable connectors are installed.

P. Harness/dress all cables in racks and custom panels with suitable nylon tie wraps or Velcro straps in a vertical and horizontal configuration. Provide an adequate amount of slack for cables that break out from harnesses. Provide a service loop for access to equipment for servicing and adjustment. Provide cable support.

Q. Use balanced lines for all audio signal wiring. Provide balancing kit or install suitable transformers for all unbalanced equipment.

3.4 LABELING

A. Clearly label all racks, rack-mounted equipment, switches, controls, and panels unless noted otherwise.

1. Equipment Racks & Rack-mounted Equipment:

   a. Label rack-mounted equipment with engraved and filled plastic laminate. Other methods of labeling rack-mounted equipment may be accepted pending prior approval by the AV Consultant and/or Owner.
   b. Label all equipment racks on both the front and the rear.
   c. Use labels of contrasting color for rack-mounted equipment.
   d. Label the plug end of each AC power cable for all rack mounted devices. Label shall clearly identify the equipment associated with the plug.

2. Panels & Plates:

   a. Panels and plates shall be a minimum of 1/8” thick anodized aluminum etched and epoxy filled unless noted otherwise.
   b. Room numbering on drawings may not match the final facility room numbering. Match all labels for input/output plates, touch panels, and other panels to the final room numbering for the facility.

B. Coordinate with the Electrical Contractor to make sure that all AC power receptacles within each rack and at remote equipment locations are labeled and match to the appropriate panel and circuit breaker.

C. Logically, legibly and permanently label all cables and wiring for easy identification. Permanently mark each wire with a number at each end. This applies to wire within a rack assembly as well as wire running in conduit. Use adhesive strip type covered labels with clear heat-shrink tubing. Factory stamped heat shrink tubing may be used in lieu of the adhesive strip style label. Labels must be printed. Do not use adhesive wire labels from wire from books. Hand-written labels are not be acceptable.

D. Designate wiring with an alphanumeric code that is unique for each cable. Locate the cable designation at the start and end of each cable run and within 1-3 inches of the point of termination or connection. Print label in three lines so that the designator is visible from all angles. For cable runs that have intermediate splice points, use the same designation throughout with and additional suffix to indicate each segment of the run. AV System Installer determine and designate cable assignments. Use a uniform system of wire designators throughout the entire project from sub-system to sub-system. Designator shall include information on the device name where it is from, the signal type, and the device name where it is going. Add cable designation codes to system schematic drawings included with project As-built Drawings.

E. Label each terminal strip with a unique identification code in addition to a numerical label for each terminal. Show terminal strip codes on system schematic drawings included with project As-built Drawings.

F. Provide adhesive labels on the rear of equipment where cables attach to indicate the designation of the cable connected at that point.

G. Install identification panel with 1/8”-high engraved characters on front of bank of equipment racks serving each space. Clearly identify the AV System Installer and AV Consultant in the following format:

AV CONSULTANT:	Professional Audio Designs 11629 W. Dearbourn Ave. Wauwatosa, WI 53226 www.proaudiodesigns.com
AV SYSTEM INSTALLER:	AV System Installer Name AV System Installer Address City, State, Zip Code AV System Installer Phone Number

H. Final design of identification panel shall be approved by AV Consultant and Owner before manufacturing.

3.5 RACEWAYS AND PATHWAYS

A. Conduit requirements for AV systems cabling may differ from those of other trades. Coordinate requirements with Division 26 Contractor.

B. All AV systems cabling shall be enclosed within metallic conduit or raceway for floor boxes and Standard back boxes. All AV systems conduit, raceway and standard enclosures shall be

furnished and installed by Division 26 Contractor according to drawings provided and in accordance with applicable provisions of Division 26 Contractor.

C. Conduits for different AV cabling classifications must maintain minimum separations from each other and from other services. Conduits sizes and quantities shown on bid documents are minimums. Separate conduit runs specified in bid documents may not be combined for any purpose unless noted.

D. Assume all AV cabling to be in conduit for the purposes of this bid. Communication cables with a CM and CMR rating can be used in plenum spaces if they are encased in steel conduits. If changes are made to the pathway design, refer to Owner Data, Voice, Coaxial, and Fiber cabling policy for requirements.

E. Enclose exposed cables with surface raceway.

F. Electrically isolate conduit runs entering or exiting equipment racks from the equipment rack. Use non-metallic bushings, a short run of non-metallic raceway, or other suitable means.

G. All raceway shown on the AV drawings is for AV cable, and is in addition to any conduit shown on any other drawings. (Example: conduits for facility LAN or AC power)

H. Routing of conduit shown on AV drawings is for design intent only. Coordinate exact route based on field conditions.

I. The minimum size for all AV conduits shall be 0.75” diameter unless otherwise noted. All exposed conduit shall be routed parallel or perpendicular to structure above.

J. All conduits shall be (EMT) Electrical Metal Tubing unless project standards specify something different or is required by code.

K. All Back box locations and connection for design intent only.

L. Follow good practice related to conduit installation. This includes allowable bend angle, pull distances, number of 90-degree bends, and assurance that the pathways are clear of debris and do not have sharp edges.

3.6 EQUIPMENT RACKS

A. Equipment racks shall be assembled, wired, and tested in the AV System Installer’s shop. No rack assembly will be allowed on site without being completely wired except for terminations of field wiring to the rack. The consultant reserves the right to review the racks at the AV System Installer’s shop.

B. All equipment racks are to be grounded to the isolated ground bus and shall be isolated from all other building and conduit grounds.

C. AV System Installer ensure that all equipment is installed with proper cooling and ventilation.

D. Do not deliver assembled racks to the construction site until necessary. Protect racks from dust, construction debris and other job site hazards during the entire duration of the installation.

E. Thoroughly clean all racks and equipment contained therein upon completion of the project and just prior to turn over.

F. Security covers designed to limit tampering of preset levels shall conceal all rack-mounted equipment not requiring frequent adjustment. Install blank and or vented panels as needed to fill unused spaces in racks.

3.7 RIGGING

A. AV System Installer is responsible for the installation and mounting of all equipment specified herein.

B. AV System Installer is responsible for assuring all structure is suitable for mounting.

C. Coordinate with all applicable trades and with the project's structural engineer

D. Identify all components and their load ratings on detail drawings.

E. Provide a minimum safety factor for all mounting and rigging of 5:1

F. Provide drawings detailing mounting methods as well as attachment points to building structure. If required by AV Consultant, a structural engineer should stamp the drawings.

G. AV devices shall not share or utilize supporting structures intended for other systems.

H. Where devices are mounting overhead, hardware rated for overhead lifting must be used.

I. Provide safety wire of sufficient strength to anything suspended over audience areas excepting those that have three or more suspension points.

3.8 AV CONTROL SYSTEM

A. Fire Alarm Note: AV System Installer consultant with Fire Alarm Contractor on standards for project concerning audio system control during emergencies.

B. General: The description of the control system programming given here serves as a basis for the control system programming. Touch screen layouts and function shall not be limited to the operations outlined in this description.

1. The AV Consultant and Owner or Owner's Representative shall approve the touch screen layouts and programming flow before programming of the system begins. AV System Installer may want to schedule a conference call between AV Consultant and Owner to discuss touch screen operation prior to developing page layouts. Submit the touch screen page layouts and page relationship diagram, with a written button-by-button description of the function of each button, for review by the AV Consultant and Owner or Owner's Representative. It is expected that this approval meeting could take up to a minimum of one day. AV System Installer coordinate this meeting.
2. AV System Installer provide a real-time demonstration to the AV Consultant and Owner or Owner's Representative, with the touch screens specified in this project or equivalent approved by the AV Consultant. This demonstration may occur during the initial approval meeting or can be scheduled, by the AV System Installer, for a later date. Within one week of the approval meeting, the customer may deem that additional operations, whether manual or automated, may be necessary for the proper functioning of the system as outlined in the system description and/or for the ease of the operation by a novice user. These additional operations and changes are to be programmed without additional charge to the customer.

3. Software revision after 3 months of initial use (post -owner acceptance) to include 20 hours of programming by manufacturer certified programmer(s) as well as on site integration and training. These programming hours to be held in escrow for a period of 12 months after final acceptance if not utilized at the 3 month mark. It is the responsibility of the AV System Installer to pursue delivery of these software revisions including initiation of related discussions with Owner designees. At the follow up meeting, the customer may make changes to color schemes, button locations, and the existing programmed operations, whether manual or automated, that may be necessary for the proper functioning of the system as outlined in the system description and/or for the ease of the operation by a novice user. These additional operations and changes within the 90-day period are to be programmed without additional charge to the customer.
4. The control system introduction page shall be designed in a "system operation wizard" format. The page shall ask user intended use of room to set room to preconfigured settings (e.g. "Will you be making a phone call" resulting in turning on the audio system and landing at phone dialing page.). These various operational modes shall be determined by the user in collaboration with system programmer at initial meeting.
5. The control system shall automate power and power sequencing. Pressing button "system on" shall power up devices in sequence. Pressing button "system off" shall be followed by a confirmation page to confirm system to turn off in sequence.
6. The control system shall route video and audio sources to video and audio outputs. Owner representative shall determine which sources and outputs shall be available on touch screen.
7. Control presets such as program volume, individual audio source volumes, etc. Microphone volumes shall be independently controlled on a sub page.
8. The control panels should be intuitive and allow control of any source device available with a minimum of button presses. Provide visible feedback of the current operation of sources controlled on the touch panel. The panel should indicate audio levels for program.
9. Provide small discrete button on introduction page (splash page) of touch screen for project information. When pressed, display popup page that contains the following information.

PROJECT:	Owner’s Name Address Room Name Original Installation Date Current Version of Control Program Owner’s Technical Support Telephone
SYSTEM DESIGNER:	Professional Audio Designs 11629 W. Dearbourn Ave. Wauwatosa, WI 53226 414-476-1011
GENERAL CONTRACTOR:	GC Name GC Address City, State, Zip Code GC Phone Number
AV SYSTEM INSTALLER:	Company Name Address Telephone
PROJECT ARCHITECT:	Company Name

Address
Telephone

10. Final layout of project information page must be approved by Owner.
11. Only Owner graphics and Owner information are allowed on welcome page (splash page).
12. AV System Installer provide memory expansion for control processors as required to support system operation.
13. AV System Installer determine with the Owner and AV Consultant any control pages and/or functions that require passwords.

C. Video Preview Functionality

1. Where specified, a video preview function shall be provided on the touch screen.
2. The video preview function shall be capable of using H.264 video streams.
3. The video preview function shall allow any video source selected for output also routed to video preview window on the touch screen.
4. Touching the video preview window on the touch screen shall toggle the video display between a predetermined sized video window and full screen display on the touch screen.
5. Control buttons for the selected video source shall always be present below the video preview window and/or transparently overlaid onto the full screen display.
6. Preview function shall be accessible during event operation without interrupting main displays and audio reinforcement system.
7. Pressing the video source button followed by pressing the video display button shall route source to the respective displays.

D. Audio Control

1. A volume control icon or physical button shall be available to any user at any time there is an audio enabled system (i.e. powered speakers, ceiling speakers, display speakers, etc).
2. A clearly visible mute button with positive feedback to an on/off indicated on the touch screen shall also be included.
3. The control system shall automatically reset the audio levels to an indexed preset level each time the system is shut down or restarted (unless the Owner requests that the system holds the last state used at shutdown).
4. Video source's audio shall be routed to the audio reinforcement system upon routing video source to room display(s)

E. Lighting Control

1. Where specified and components permit, touch screens shall recall lighting presets. A minimum of four (4) lighting presets. For lighting zones where a dimming system is employed, the touch screen shall include "Plus" or "Minus" buttons allowing the User to increase or decrease the level of lighting for any given preset.
2. If so requested by the Owner, an auto-lighting control feature may also be provided for all or select spaces. The auto-lighting feature shall recall a specific lighting preset when projection or video conferencing is called for.

F. Controlled Devices

1. Wherever possible, the Control System shall provide positive feedback of individual component control-state conditions to the touch screen.

2. Where specified, the AV System Installer shall provide a Control System interface to mechanical or electronic devices such as screens, window shades, or room lighting. Wherever such operation is available at the mechanical device, a stop or halt button shall always be provided on touch screen. Where interfacing with systems installed by other trades, coordinate exact interface location with the appropriate contractor.
3. Remote power relays, wherever possible, shall be used to switch AV power to those devices whose power on/off function is otherwise not controllable. Where audio amplifiers are installed, the AV System Installer shall program system control to power amplifier on last during power up, and the first device to turn off during power down. Using a device's "stand-by" mode is an acceptable form of power down.
4. System components, which are infrared control based, shall include an external sensor as part of the infrared control system; the sensor shall provide positive feedback to the control system to indicate whether the device is in a power on or power off state.
5. Owner furnished computers shall be connected to constant power source and never part of the power down process.
6. Wherever devices that require keypad-style dialing, such as audio or video conferencing, mimic a telephone keypad display to allow dialing from the touch screen. Provide a display above the keypad to display the number being dialed. The AV System Installer shall provide a backspace key to modify dialed numbers.

G. Video Conferencing Codecs and Cameras

1. Control videoconferencing units via RS-232 interface or LAN interface from the control system touch screen in each room. In addition to dialing control, a touch screen layout similar in look to the manufacturer handheld remote shall be provided. Minimum features shall include local camera control, far end camera control, phone-add, and privacy function. The privacy function shall mute the near end audio and the control system shall provide a large icon to indicate that privacy is enabled.
2. AV System Installer assign four (4) to six (6) camera location presets for each camera and design a simple scheme whereby the user may easily recall these presets. Determine camera presets in consultation with the Owner.
3. Pan-Tilt-Zoom camera controls include zoom, pan, and tilt. Controls shall also include focus and iris, if available.
4. AV System Installer provide additional IR and LAN Control as required.

3.9 AUDIO DIGITAL SIGNAL PROCESSOR (DSP) SYSTEM

A. Audio Input Channels

1. Include the following processing blocks for Microphone input channels: high-pass filter, parametric equalizer, compressor, and gain/volume control. If processor permits, each microphone channel shall also include a feedback eliminator.
2. Line input channels for program audio (i.e. audio player, Blu-ray player, computer audio, etc) do not require processing blocks prior to mixers.
3. Include a meter on all input channels. If input channel blocks do not already have one, a meter block shall be added.

B. Audio Mixers

1. Include labels on matrix mixer block inputs and outputs.
2. Automatic mixer blocks should use gain sharing, if DSP permits, where numerous duplicate microphones will be used, such as ceiling microphones or table top microphones. Audio or video conference audio typically requires this kind of configuration post-acoustic echo cancellation blocks. See section Acoustic Echo Cancellation.

C. Audio Outputs

1. Include the following processing blocks for speaker outputs: high-pass filter, parametric equalizer, and peak limiter.
2. Outputs to phone lines/sip phones/VOIP shall include the following blocks; parametric equalizer, compressor, and gain/volume control.
3. All output channels shall have a meter. If output channel blocks do not already have one, a meter block shall be added.

D. Audio Component Blocks

1. Parametric Equalizer: use at minimum, three bands of parametric equalizer.
2. High-Pass Filter: never set lower than 40Hz or higher than 250Hz.
3. Acoustic Echo Cancellation (AEC)
   a. Use AEC when an analog phone line/Session Initiation Protocol (SIP)/VOIP/Web conferencing PC is connected to DSP.
   b. Include audio that will be played through room sound reinforcement system in the reference input for the AEC.

3.10 AV NETWORK SWITCHES

A. General

1. AV System Installer coordinate with Owner on Owner network standards prior to purchasing switches. Owner may require managed switches even though unmanaged switches allow portions of the AV systems to function. Owner may also have campus standards of manufacturer and model.
2. AV System Installer is responsible for providing AV network switches that comply with protocol standards of the devices the switches are intended to support. Not all AV protocols are detailed here and it is the AV System Installer's responsibility to ensure switch selection meets manufacturer's specifications for specified or substituted equipment (e.g. AVB or Cobranet).

B. Switches for Digital Video Systems and Control Systems

1. Provide managed switches with gigabit (1Gbps) Base-T Ethernet ports and non-blocking layer-2 functionality. Ports must provide a maximum of 34.2 Watts PoE.
2. Where specified, switches requiring PoE shall support Type 1 PoE, Class 0-3 power sourcing on Ethernet ports and Type 2 PoE+, Class 4 power sourcing on Ethernet ports. AV System Installer refer to the schematics for the number of ports that require PoE and shall be responsible for verifying switch will be capable of power sourcing the number of ports simultaneously.
3. AV System Installer provide a brush grommet panel above or below switch, if Ethernet ports connected on the front face of network switch when mounted in an equipment rack.

C. Dante Network Switch

1. Dante Network Switches, where specified, shall have Ethernet Ports with gigabit (1Gbps) and 1.488Mpps packet forwarding rate at minimum. Dante Switches shall be non-blocking layer-2 managed switches supporting DiffServe (DSCP) Quality of Service (QoS) with strict priority and four (4) queues per port.

2. AV System Installer is responsible for confirming that all ports are capable of simultaneous gigabit transfer and capable of switching off Energy Efficient Ethernet (EEE) and other power-saving features.
3. AV System Installer configure DiffServe (DSCP) QoS to give top priority to the Dante clock synchronization and audio data the next highest priority.
4. VLAN's shall be used to separate virtual networks for audio and non-Dante data over same network. Multicast transmissions may be required for audio sent to multiple Dante devices. To minimize unnecessary duplication of audio streams in multicast, Internet Group Management Protocol (IGMP) shall be enabled in the Dante Controller software.
5. Where specified, for switches located over long distances, a switch shall be capable of supporting optical modules.
6. Refer to Audinate support documents for full setup details.

3.11 EQUIPMENT GROUNDING

A. Maintain an isolated, insulated grounding scheme throughout the entire system. Isolate equipment racks from raceway or building steel by use of non-metallic bushings or other suitable means. Do not connect metallic raceway of any type to equipment racks. This includes but is not limited to AC power and AV conduits. Ground equipment racks using #6 stranded copper wire connected only to isolated technical ground buss and bonded to equipment rack ground buss.

B. Isolate equipment racks from floor by use plywood sheeting. Paint all six surfaces of the plywood with fire retardant paint. Isolate equipment rack AC receptacles from equipment rack by use of isolated ground receptacles. Connect receptacle-isolated grounds only to isolated technical ground buss.

3.12 AV SYSTEMS CLEAN POWER

A. Maintain isolated ground, clean power scheme. Do not use installation methods, practices that may compromise AV systems isolated ground, clean power scheme. Complete description and specifications for AV systems isolated ground clean power system listed in section 26 05 26.

3.13 WORK IN OTHER SECTIONS

A. In coordinating the AV work with the Electrical contractor, the AV System Installer shall bear in mind that the wiring and conduit requirements called for in the construction documents are based on the requirements of a single manufacturer and may or may not be adequate for the equipment actually being furnished. The conduit and wiring indicated on the drawings or in the specifications shall be considered minimum requirements. If the AV System Installer proposes to bid acceptable alternate equipment that requires a conduit topology different from what is shown on the bid documents, they shall factor this change in conduit required in their bid.

3.14 SPECIFIC TECHNICAL REQUIREMENTS

A. Amplifiers

1. Install manufacturer-provided security covers over all amplifier gain knobs.
2. Label each amplifier with which speaker zones each amp channel is driving.
3. Set gain levels for appropriate gain structure and maximum range of system volume.
4. Sequence power so amplifier is last device to turn on and first device to turn off.

B. Assistive Listening System

1. Provide receivers with Ear Speakers, and Rechargeable Batteries for required percentage of seating per ADA 2010.
2. Provide Neck loops for required percentage of receivers per ADA 2010.
3. Provide charging case/tray.

C. Blu-ray Player

1. RS-232 or LAN Control.
2. Provide rack mount.

    a. Touch screen Control.
        1) Control all transport functions.
        2) Direct track access keypad.

D. Ceiling Speakers, Pendant Speakers, Wall-Mounted Speakers, and Suspended Speakers

1. Include custom painting in bid.
2. Coordinate color with Architect prior to installation of speaker grills.
3. Coordinate color with Architect prior to purchase and installation of suspended speakers, wall mounted speakers, and pendant speakers.
4. Provide all required rigging hardware.
5. Provide all required mounting hardware including safety cabling.
6. Provide free air cable support.
7. Carefully coordinate speaker placement with other trades.

E. Digital Video System

1. Provide Digital Video Test reports for each system.
2. Adjust Digital Video encoders and decoders for proper EDID tables and resolutions confirmed with owner devices.
3. Digital Video decoders shall be set to maintain aspect ratio.
4. Provide Owner with complete list of all IP address.
5. Coordinate V-LAN'S and IP schemes with owner.

F. Equipment Racks

1. Provide isolated ground conduit insulation as required to maintain isolated ground. Work closely with Division 26 Contractor to maintain isolated ground.
2. Provide mounting hardware as required.
3. Provide power distribution for all equipment located within rack.
4. Provide rack screws as required.
5. AV System Installer is responsible for coordinating all equipment to be mounted in equipment racks.
6. Provide appropriate ventilation to ensure internal temperature stays below 85 degrees Fahrenheit (assuming 70 degrees ambient temperature) during system operation. Provide rack fans if required.
7. Provide blank panels for all unused rack spaces.
8. Provide locking front door if bend radius can be maintain for any cables connected at the front of the rack.
9. Provide locking rear doors.

G. Fire Alarm

1. System is connected to building fire alarm system and all audio shall be muted when fire alarm is activated.
2. AV System Installer pull cable to fire alarm relay.
3. AV System Installer make connection to relay input on control system master.

H. Flat-Panel Video Display Monitors

1. Division 26 Contractor provide and install outlets for AV back. Telecommunications System Installer provide and install Building Data connections and CCTV. AV System Installer provide and install AV Network Connections and Digital Video connections.
2. Supply appropriate wall mount bracket.
3. Install, terminate, and test the Flat-Panel Video Monitors.
4. Monitor installation shall meet ADA guidelines.
5. Confirm final mounting height and mounting locations with Owner prior to installing displays.
6. Touch screen control

    a. Provide individual control of each display
        1) Volume.
        2) On/Off.
        3) Input select.

I. Floor Box

1. Include floor-box cover with bid.
2. Include all insert panels and mounting brackets.
3. Verify fit of all panels to be installed in floor boxes prior to installation.
4. Screw all plates into floor pocket.
5. Provide blank plates for any unused gangs.
6. Coordinator color with Architect prior to purchase and installation of input plates, blank plates, and cover plate for floor boxes or poke-thru.
7. Provide connect cables for all inputs.
8. Provide "on-grade" version if floorbox is to be installed on-grade.

J. HDMI Extenders

1. All extenders must be HDMI 2.0 and HDCP 2.2 compliant.

K. Input/Output Panels

1. Mount at standard outlet height unless otherwise indicated in plans.
2. Coordinate color with Architect prior to purchase or installation of input/output panels.
3. Confirm nomenclature of engraved labels with AV Consultant and Owner prior to ordering by submitting panel layouts with submittal package. See section on Submittals in Part I.
4. Confirm number sequence of inputs and outputs with AV Consultant and Owner prior to ordering.

L. Interconnect Cables

1. Provide input interconnect cables for all inputs AV inputs into system.

M. Loudspeakers

1. Provide all required mounting hardware including safety cabling.

2. Carefully coordinate speaker placement with other trades (HVAC, lighting, fire protection, etc.).
3. Coordinate Color with Owner / Architect Approval.
4. Provide additional speaker cable support as required.

N. Projectors

1. Projector locations on drawings are general locations. Coordinate projector mounting positions with site conditions, image sizes, aspect ratios, and projector throw ratios prior to purchasing projectors.
2. Provide vibration isolation and additional support as required to stabilize image.
3. Provide the appropriate lens for all projectors. Field coordinate projector locations with other ceiling elements.
4. Projector mounting height shall be placed for optical alignment with projection screen so that keystone shall not be engaged.

O. Projection Screens

1. Electric projection screens provided and installed by AV System Installer.
2. All electric projection screens assumed to have 6" black drop unless otherwise noted.
3. Confirm mounting locations of screens.
4. Electrical Contractor install low voltage controller and wire high voltage side of low voltage controller to screen.
5. Low Voltage controller provided by AV System Installer.
6. AV System Installer adjust final trim of screens.
7. Tab-tensioned screens shall have no more than 4 inches of screen fabric on screen roller when screen is at presentation trim.

P. Screen Controls

1. Install low voltage screen control.

Q. Teaching Stations / Lecterns

1. Provide complete integrated solution with built in power and provisions for cooling and cabling.
2. Provide a finishing kit with approval of color / finish from owner / architect.
3. Field verify internal clearances for all AV equipment in the lectern.
4. Touch screens are to be mounted with table top kits to meet ADA side reach accessibility guidelines.

R. Touch Screens

1. Must meet ADA guidelines.
2. Coordinate color with Owner / Architect approval.
3. Locate to avoid and conflicts with monitor.
4. Assign buttons to control.
5. Touch Screen Control

    a. Provide welcome page.
    b. Provide owner representative approved graphic for welcome page.
    c. All touch screen pages and popup pages must be approved by Owner representative and AV Consultant before control code is written.

d. Provide Help button on touch screen that displays help pages and Owner contact information for help calls.
e. Develop help pages that provide a button by button graphic representation of panel functionality.
f. Provide PDF printout of all help file pages.
g. Touch screen at equipment rack shall control system power.
h. Touch screen at equipment rack shall function as mater panel and shall control all system functions.
i. Touch screen layout and graphics shall be user friendly, intuitive, and consist of high quality graphics and buttons that reflect a high-end technology system.

S. Wireless Microphone Systems

1. Wireless Microphone systems must be in bands below 560 MHz.
2. Connect Wireless Microphone Receivers directly to the inputs of the DSP for use in "quickmix" or “easy mode”.
3. Mount antennas at 90 degrees relative to one another if using half-wave antennas.
4. Provide frequency coordination with all other wireless systems in project and local TV stations.
5. Include Lithium-ion rechargeable battery with each transmitter
6. Include dual docking Battery charger.

3.15 MAINTENANCE AND OTHER MANUALS

A. AV System Installer maintain a file specific to this project that shall include all AV maintenance manuals, approved shop drawings and other pertinent information. This file shall be maintained for a period of time consistent with the length of time the equipment provided is in actual service. Documents shall be of such a nature, preferably electronically stored, that they may be reproduced to replace similar documents in possession of the Owner at Owner’s expense.

3.16 AV SYSTEM INSTALLER’S PRELIMINARY TESTS & MEASUREMENTS

A. AV System Installer certify, a minimum five (5) days prior to commissioning, that the installation is complete as outlined in bid, and is in compliance with the specification in its entirety. Include, as a part of the Certification, a *test report* as described in the next paragraph. Submit items listed in the *test report* prior to commissioning as it may delay the process. Any delays due to missing information or incorrect test reports are the responsibility of the AV System Installer.

B. Include the following items in the Test Report:

1. Wire List: Confirm that each individual wire and cable run (whether in a rack or in conduit) is identified with a unique number. These numbers are affixed at both ends and are clearly visible. Provide a complete list of these numbers including their termination location, their signal classification, and relevant test data. Wire list shall be considered part of as built documents and must be provided to consultant prior to system commissioning.

a. For all mic lines, tie lines, return lines and speaker lines confirm and document the following relevant test data:

1) Proper circuit appearing at each termination location.
2) Continuity of all conductors.
3) Proper polarity is maintained.
4) Absence of shorts between conductors.

5) Absence of shorts between conductors and raceway and ground.

b. For all video lines confirm and document the following relevant test data:

1) Continuity of all conductors.
2) Absence of shorts between conductors.
3) Absence of shorts between conductors and conduit and ground.
4) HDCP passes on digital video connections, including HDMI cables.
5) HDMI cables pass signal at all resolutions used on the project.

c. For all digital audio and video lines, including data or fiber optic cable, document the following relevant test data:

1) Continuity of all conductors for each line.
2) Absence of cable faults or breaks.
3) Adequate bandwidth for signal, per manufacturer source signal.

d. Documentation shall include a spread sheet with applicable data.

2. Digital Video Report: For all digital video or IP video systems deployed in this project, the AV System Installer shall provide a full System Report for each AV System.

3. Loudspeaker Impedance:

a. Prior to the termination of audio amplifiers to speakers, the AV System Installer shall test for short circuits to ground by measuring the resistance of the speaker line with reference to ground.
b. With the loudspeakers connected and the amplifiers disconnected, the AV System Installer shall measure and record the impedance of each speaker line using a 1kHz signal applied to the line.
c. With the loudspeakers connected and the amplifiers disconnected, the AV System Installer shall measure and record the impedance sweep of the speaker and speaker line from 20Hz to 20kHz.

4. Verification Checklist: Provide a verification checklist for each space or system:

a. Provide notification to consultant prior to punch-out of any equipment that is malfunctioning.
b. Verify that all AV system cables are identified by a unique ID as defined in the project documentation. Verify that this unique ID is displayed permanently at both ends of the cable, is legible, and is positioned where it can be seen without undue disturbance.
c. Verify that loudspeaker zones are wired as defined in the project documentation.
d. Verify that all loudspeakers and mountings are free of buzzes and rattles when swept with sine wave tones throughout its rated bandwidth at normal levels. Listen to all audio systems to verify that they are free of any obvious hum, buzz, feedback, interference, spurious oscillations, digital artifacts, or extraneous noises of any kind.
e. Verify that all audio routes are tested from endpoint to endpoint via the appropriate midpoint (s) for operation and routing as defined in the project documentation.
f. Verify that correct wiring polarity is maintained throughout the entire signal path.
g. Verify that all loudspeakers in the same acoustic space are wired to produce consistent polarity with a mono input signal. They shall be polarized such that a

positive acoustic pressure on a microphone results in a positive acoustic pressure at all loudspeakers.

h. Verify that phantom power is provided at correct voltage and correct locations as defined in the project documentation.

i. Verify the loudspeaker transformer tap setting in constant voltage systems is as defined in the project documentation.

j. Verify uniformity of sound coverage throughout intended coverage area. Sound level readings and frequency response shall be taken and plotted on a plan view of the room. Frequency response +/- 2dB averaged throughout the entire listening area at seated ear height on one-third octave centers within pass band of speakers.

k. Verify with the AV Consultant measurement locations, conditions, and measurement criteria.

l. Perform system rough equalization, cross-over and delay settings. The AV Consultant reserves the right to make final adjustments if necessary. Perform all video system set up and calibration.

m. Verify EDID settings reflect the native resolution for each projector, display, video codec, or other sinks. Record the EDID table for each source and sink for Owner's record.

n. Verify that the combined installation of projector and screen provides a displayed image that is correctly aligned to the active projection screen surface without misalignment.

o. Verify that all displayed images are correctly focused, have the correct image geometry and are free from distortion.

p. Verify brightness and correct color balance of each newly installed projected image and display image using a display analyzer system. Record settings of each device adjusted for Owner's records.

q. Verify that the system(s) accurately display all resolutions required by project documentation on all displays within the system (i.e. no pixel shift, no geometric distortion, no artifacts from scaling, letter-boxing, pillar-boxing, or window-boxing).

r. Verify that the system conforms to a minimum contrast ratio of at 15:1. The testing methodology in ANSI/INFOCOMM 3M-2011 shall per used. The projected image contrast ratio shall be measured and recorded for all projected images within the system.

s. Verify that all video routes are tested from endpoint to endpoint via the appropriate midpoint (s) for operation and routing required by the project documentation.

t. Verify that cameras, lenses, and pan/tilt systems operate as defined in the project documentation. Inspect the camera image through the full lens operation.

u. Verify that all audio and video signals are being routed to the recording device(s) and that the recording device(s) is operating correctly.

v. Verify that cables are not bent beyond their minimum bend radius as specified on sheet AV001.

w. Verify that all AV connector plate inputs and outputs are labeled as defined in the project documentation.

x. Verify that all AV connectors are correctly keyed, seated, and latched to respective connection points as defined in the project documentation.

y. Verify that all AV cable terminations are made securely and meet the recommendations of the connector and cable manufacturer(s), published standards, and requirements defined in the project documentation.

z. Verify that all AV equipment power cables are managed as defined in the project documentation. Verify that cables are managed in a uniform and acceptable manner so as not to compromise safety / OEM warranty, AV signal quality, and/or future field service.

aa. Verify that all AV equipment is powered from the designated power circuit and outlet as defined in the project documentation. No additional (non-AV equipment should be connected unless permitted in the project documentation.

bb. Verify proper operation of all controls. Verify operation of control system and reliable communication with each device controlled. Each touch screen control should do what it is supposed to do and function as it is indicated on touch screen submittal. Verifications include (but are not limited to) the following:

1) Confirm proper screen function from touch screen controls
2) Confirm volume buttons on the touch screen raise and lower the volume appropriately without skipping, jumping, or ramping out of control
3) Conform the proper switching of inputs. Verify that when a particular input is selected the appropriate input is routed.
4) Confirm the proper operation of lighting controls. Verify that the preset selection buttons trigger the appropriate preset and that all independent lighting controls raise and lower the lighting levels appropriately without skipping, jumping, or ramping out of control.

cc. For each installed data network cable, HDBaseT cable, 8G+ cable, DTP cable, or fiber optic cable terminated by the AV System Installer, verify conformity to TIA/EIA performance standards.

dd. Verify and document that all network-connected equipment has the correct IP address, subnet mask, hostname, gateway, and VLAN configuration as defined in the project documentation.

ee. Verify that PoE devices are supplied with correct power required from normal device operation. Verify under normal operations that the switch providing PoE has the capacity to power all of the devices that are connected to it.

ff. For each controllable device, verify discrete on/off commands and device feedback (where available).

3.17 COMMISSIONING

A. AV System Installer is responsible for conducting tests to determine systems conformance to requirements of the specifications. TESTS SHALL BE CONDUCTED PRIOR TO THE ARRIVAL OF THE CONSULTANT FOR COMMISSIONING. AV System Installer shall pay the AV Consultant at consultant's normal rate plus expenses for any additional time required due to the AV System Installer's failure to demonstrate compliance with any part of the specification.

B. AV System Installer provide at least one qualified technician, familiar with all aspects of the project, for a minimum of eight (8) work hours, or as long as may be needed to verify compliance with all provisions of the specification on the day of commissioning. AV SYSTEM INSTALLER IS RESPONSIBILE FOR ARRANGING A DATE MUTUALLY ACCEPTABLE TO AV CONSULTANT AND OWNER FOR COMMISSIONING. Arrangements include access to all necessary areas, parking within reasonable walking distance, and a minimum of eight (8) hours of un-interrupted quiet time. Make arrangements for testing with the Owner and AV Consultant at least two (2) weeks before the proposed testing date. The AV Consultant may at their sole discretion, suspend commissioning at any time the project has been determined that it is not made ready for commissioning, until such time as compliance can be demonstrated.

C. AV System Installer be prepared to make adjustments to system components at AV Consultant's direction during commissioning, without additional charge.

3.18 FUNCTION PERFORMANCE VERIFICATION

A. AV System Installer provide Owner and AV Consultant with verification checklist confirming that everything on the test plan has been completed. AV System Installer demonstrate functional performance verification during training (see section Training), where complete, to verify compliance. This includes everything listed in articles Systems Descriptions, AV Control Systems, Digital Signal Processor Systems, and Specific Technical Requirements and all other content in Parts 2 and 3.

3.19 TRAINING

A. The AV System Installer and Control System Programmer shall conduct group and/or individual training sessions for the proper operation and maintenance of the complete system. The AV System Installer should, to their benefit, coordinate training sessions with Control System Programmer.

B. Provide all labor and materials required for on-site training as defined in the previous section. Training shall be conducted at the project site using the project equipment for each unique system.

C. Training must cover, at minimum, the following items:

1. User Manual: AV System Installer go over the manual outlined in Part 1, Maintenance and Operating Manuals, detailing the system functions. Control Systems Programmer review control system operations for each AV system.
2. Technical User: Control System Programmer provide configuration training on equipment and software to Owner's Technical Users.
3. Maintenance User: AV System Installer provide training on all physical maintenance of systems, including cleaning of displays, bulb changes, filter cleaning, and filter changing.

D. Minimum on-site training times shall be:

1. User Manual: Four (4) hours
2. Technical User: Three (3) hours
3. Maintenance User: One (1) hours

3.20 EVENT SUPPORT

A. In addition to the training listed above, AV System Installer provide a total of up to eight (8) hours of on-site technical assistance for an Owner requested event. Control System Programmer shall be on hand for any assistance required that may result from software design. The event is expected to occur within the first sixty (60) days after system has been commissioned.

3.21 WARRANTY

A. AV System Installer provide on-the-premises service, parts and labor during normal working hours at no cost to the Owner, for a period of 12 months from the date of final acceptance. This shall not supersede any manufacturer's equipment warranties still in effect after 1 year. Warranty period shall commence at substantial completion as declared by Construction Manager.

B.

1. During the warranty period:

a. Furnish on site diagnostic and repair service to installed AV systems free of charge to Owner.

b. Respond to service requests within 24 hours.
c. Provide onsite diagnostic and repair service within two (2) business days of trouble report.
d. Make available after hours or weekend service at a premium rate not to exceed 1.5 times normal hourly rates minus normal hourly rates.
e. Provide technical support via telephone at no charge during the warranty period.
f. Maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the systems.
g. Provide for three (3) non-emergency service and maintenance calls by technically qualified personnel without additional charge. Calls shall be at least two hours at the site and shall be prearranged at least two weeks prior with the Owner.

    1) These service and maintenance calls shall be in addition to any warranty required service calls and shall commence every four (4) months after the date of final acceptance by the Owner. See sub-section Maintenance and Operating Manuals under section Submittals.

C. Make all tests, adjustments, or replacements in the presence of Owner's technician, or other person designated by the Owner's Representative. Upon completion of each call provide a report to clearly indicate any replacements or adjustments and any evidence of tampering.

D. All service calls pertaining to control system (e.g. alteration of buttons, non-responsive commands, etc) shall fall under the purview of the Control System Programmer.

END OF SECTION

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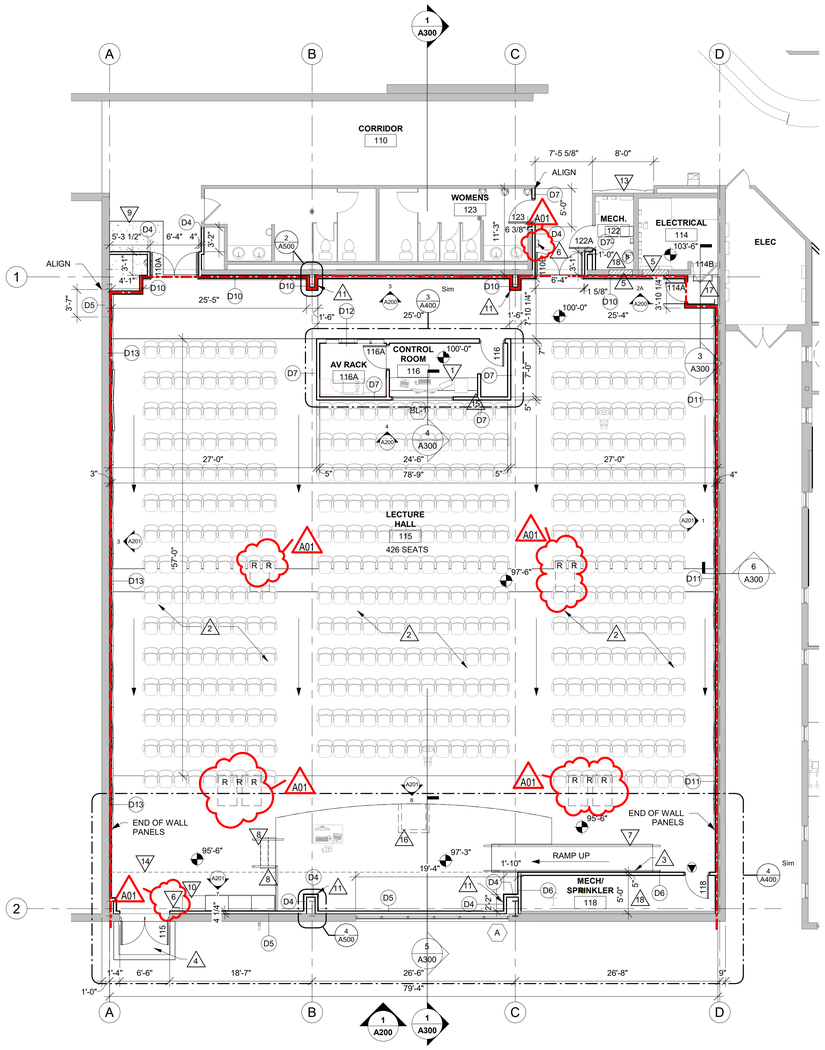
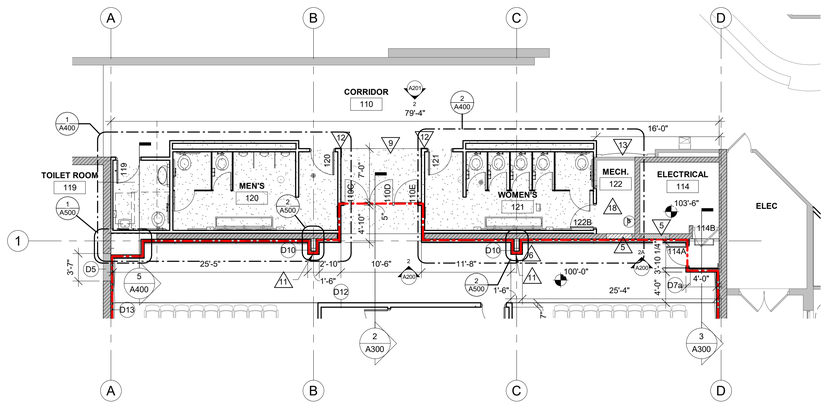


1 FIRST FLOOR REMODEL PLAN

1/8" = 1'-0"



2 FIRST FLOOR REMODEL PLAN - ALTERNATE

1/8" = 1'-0"

GENERAL NOTES:

A	SEE ID SHEETS FOR FLOOR AND WALL FINISH LAYOUTS.
B	LOOSE FURNISHINGS EXCEPT AS NOTED SHALL BE PROVIDED AND INSTALLED BY THE OWNER.
C	REFER TO OVERALL PLANS FOR AND ACCESSIBILITY ROUTES.
D	EXTEND ALL WALLS TO DECK UNLESS NOTED OTHERWISE.

LEGEND:

(A)	SYMBOL INDICATES WALL TYPE - SEE SHEET A600 FOR WALL TYPE DETAILS.
A	SYMBOL INDICATES WINDOW TYPE. SEE SHEET A600 FOR WINDOW FRAME ELEVATIONS.
	SYMBOL INDICATES CONSTRUCTION NOTE THIS SHEET
	1 HR FIRE BARRIER (45MIN DOORS)

KEY NOTES PLAN

A01

1	PLAM COUNTERTOP WITH SUPPORT BRACKETS SPACED AS REQUIRED.
2	AUDITORIUM SEATING. SEATS DESIGNATED WITH "R" TO BE REMOVABLE TO PROVIDE ACCESSIBLE SEATING SPACES
3	STAINLESS STEEL RAIL HANDRAIL WITH WALL BRACKETS SPACED @ 2'-0" MAX. EXTEND 12" BEYOND EACH END OF RAMP
4	NEW CONCRETE STOOP- SEE STRUCTURAL.
5	CMU INFILL AT REMOVED DOORS BELOW NEW SLAB.
6	SEMI RECESSED FIRE EXTINGUISHER CABINET
7	CABLE RAILING SYSTEM W/ STAINLESS STEEL TOP RAIL - EXTEND TOP RAIL 12" BEYOND TOP & BOTTOM OF RAMP. EMBED POSTS IN TOP OF RAMP
8	CABLE RAILING SYSTEM W/ STAINLESS STEEL TOP RAIL - EXTEND TOP RAIL 12" BEYOND TOP & BOTTOM OF STAIR
9	NEW FLOOR INFILL BOUNDARY
10	PLAM CASEWORK - SEE ELEVATION ON A201
11	COLUMN BUMP OUTS WRAPPED WITH PLAM PANELS - SEE DETAIL ON A500
12	PLAM PANELS AT CORNER - SEE DETAIL 13A500
13	DONOR WALL TO BE PROTECTED AND MAINTAINED IN PLACE. VERIFY W/ OWNER IF IT NEEDS TO BE MODIFIED
14	SOFFIT ABOVE - SEE REFLECTED CEILING PLAN
15	INSTALL BLOCKING IN WALL FOR WALL MOUNTED MONITOR - SEE AV SHEETS
16	RECESSED SPACE FOR AV EQUIPMENT. SEE DETAILS ON A500 AND VERIFY FINAL SIZE OF EQUIPMENT WITH AV CONTRACTOR
17	STEEL LADDER TO REACH ELECTRICAL ROOM - SEE SECTIONS
18	SEALED CONCRETE FLOOR FINISH

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Project Title: **SOUTHWEST WISCONSIN TECHNICAL COLLEGE**
BLDG 400 LECTURE HALL

Project Location: **1800 BRONSON BLVD**
FENNIMORE, WI 53809

Sheet Title: **REMODEL PLANS**

Southwest Wisconsin Technical College Bid Number: **2021-02**

HSR Project Number: **20006**

Project Date: **OCTOBER 2020**

Drawn By: **M.MALAND**

Key Plan:

Revisions:

No.	Description	Date
A01	ADDENDUM #1	11/26/19

Graphic Scale: **VARIES**

Last Update: **10/21/2020 8:33:30 AM**

A100

SCOPE OF WORK DEMARCATION TABLE

SCOPE OF WORK	GENERAL PRIME CONTRACTOR			DIVISION 26 INSTALLER			AV INSTALLER			OWNER		
	FURNISHES	INSTALLS	WIRES	FURNISHES	INSTALLS	WIRES	FURNISHES	INSTALLS	WIRES	FURNISHES	INSTALLS	WIRES
POWER DISTRIBUTION SYSTEMS												
MAIN POWER SERVICE, CIRCUIT BREAKERS				X	X	X						
STANDARD PANELBOARDS, CIRCUIT BREAKERS				X	X	X						
STANDARD LOAD CENTERS, CIRCUIT BREAKERS				X	X	X						
COMPANY SWITCH, CIRCUIT BREAKERS				X	X	X						
CUSTOM SEQUENCING PANELBOARD, BREAKERS					X†	X	X					
ISOLATION TRANSFORMERS				X	X	X						
AC ELECTRICAL WIRING INFRASTRUCTURE												
WIRING				X	X	X						
CONDUIT				X	X	X						
TERMINATIONS					X	X						
TERMINATIONS OF AC ELECTRICAL TO WHIPS FOR EQUIPMENT RACKS					X†	X						
AC ELECTRICAL DISTRIBUTION WITHIN EQUIPMENT RACKS							X	X	X			
WALL RECEPTACLES				X	X	X						
AUDIO-VIDEO SYSTEMS WIRING INFRASTRUCTURE												
WIRING							X	X	X			
CONDUIT				X	X							
CONDUIT RISER DRAWING							X					
PULL LINES IN ALL EMPTY CONDUITS				X	X							
TERMINATIONS								X	X			
WALL PLATES							X	X	X			
PULL BOXES				X	X†							
BUILDING DATA												
WIRING FROM BUILDING DATA TO CONNECTION IN PROXIMITY TO AUDIO-VIDEO EQUIPMENT				X†Δ		X						
TERMINATION OF BUILDING DATA CONNECTION AT AUDIO-VIDEO EQUIPMENT					X†Δ	X						
BUILDING FIRE ALARM												
WIRING FROM BUILDING FIRE ALARM TO AUDIO-VIDEO EQUIPMENT				X†								
TERMINATION OF BUILDING FIRE ALARM CONNECTION TO AUDIO-VIDEO EQUIPMENT								X				
AUDIO-VIDEO SYSTEMS EQUIPMENT, DEVICES												
AUDIO-VIDEO EQUIPMENT							X	X	X			
EQUIPMENT RACKS							X	X	X			
STANDARD ELECTRICAL BACK BOXES				X	X	X						
SPECIALTY FLOOR, WALL, CEILING BOXES					X		X		X			
OWNER FURNISHED, CONTRACTOR INSTALLED EQUIPMENT								X	X	X		
OWNER FURNISHED, OWNER INSTALLED EQUIPMENT										X	X	X

† INSTALLATION PER DIRECTION OF AUDIO-VIDEO CONTRACTOR.
‡ UNLESS SPECIFICALLY STATED OTHERWISE.
Δ OR BY RELEVANT CONTRACTOR.

AV CABLING SCHEDULE

TYPE	DESCRIPTION	MFR	PART #	PLENUM CROSS REFERENCE	O.D. (in.)	MIN BEND RADIUS (in.)	SIGNAL GROUPING	NOTES
8G	23 AWG SOLID COPPER STP WITH OVERALL FOIL SHIELD AND JACKET (CAT6A)	BELDEN / WEST PENN	10GX52F / 4246AF	10GX53F / 254246AF	0.244	2.75	D / E	CABLE LENGTH SHALL NOT EXCEED 295'
ANT	RG-58, 20 AWG 50-OHM COAX	BELDEN / WEST PENN	8240 / 812	82240 / 25812	0.193	2	R	ANTENNA RUNS 50' OR LESS
ANT-50	RG-8/RG-213, 11-13 AWG 50-OHM COAX	BELDEN / WEST PENN	8214 / 810	7733A / 25810	0.403	4	R	ANTENNA RUNS 50' OR MORE
ANT-TV	RG-6 18 AWG 75 OHM COAX, FOR TV/SATELLITE DISTRIBUTION	BELDEN / WEST PENN	7915R / 6300	7916AP / 256300	0.2795	2.75	R	
CAT5E	24 AWG SOLID COPPER UTP WITH OVERALL JACKET (CAT5e)	BELDEN	DFLEX4	DFLEX4	0.185	1.9	D / E	
CAT6A	23 AWG SOLID COPPER STP WITH OVERALL FOIL SHIELD AND JACKET (CAT6A)	BELDEN / WEST PENN	10GX52F / 4246AF	10GX53F / 254246AF	0.244	2.75	D / E	CABLE LENGTH SHALL NOT EXCEED 295'
CTRL	22/2 STRANDED TINNED COPPER CONDUCTORS, SHIELDED WITH AN OVERALL JACKET	BELDEN / WEST PENN	9451 / 454	9451P / D25454	0.138	1.5	D / E	
CTRL-6	22/6 STRANDED TINNED COPPER CONDUCTORS, UNSHIELDED WITH AN OVERALL JACKET	BELDEN / WEST PENN	5504UE / 270	6504UE / 25270B	0.163	1.5	D/E	
DAP	DATAPORT CABLE	QSC	DPC-X	-	-	-	-	CABLE ONLY USED WITHIN EQUIPMENT RACKS
DPORT	DISPLAYPORT CABLE	C2G	54402	-	0.236	2.8	E	ORDER CABLE BY LENGTH AS NEEDED
DTP	(4) INDIVIDUALY SHIELDED 24 AWG TWISTED PAIRS W/ OVERALL SHIELD	EXTRON	XTP DTP 24	XTP DTP 24P	0.276	2.5	D / E	
HDMI	HIGH SPEED HDMI CABLE	CRESTRON	CBL-HD	-	0.39	4.1	D / E	HDMI 20' OR UNDER. 1-1/4" MINIMUM CONDUIT SIZE TO PASS HDMI CONNECTOR (4K60 4:4:4 CAPABLE)
HDMI-RB	HIGH SPEED HDMI CABLE - ACTIVE EXTENSION	FSR	DR-H2.0	DR-H2.0	0.2	0.5	D / E	REQUIRES 1" OR LARGER CONDUIT FOR CONNECTORS TO PASS THROUGH
HLOOP	INDUCTION LOOP ALS CABLE						G	
ICOM	18/2 STRANDED TINNED COPPER CONDUCTORS, SHIELDED WITH AN OVERALL JACKET	BELDEN / WEST PENN	9460 / 77293	-	0.23	2.5	B	COLOR CODE MULTIPLE INTERCOM CHANNELS WITH DIFFERENT COLOR CABLE JACKETS
IR	22/2 STRANDED TINNED COPPER CONDUCTORS, SHIELDED WITH AN OVERALL JACKET	BELDEN	9451 / 454	9451P / D25454	0.138	1.5	D / E	
LINE	22/2 STRANDED TINNED COPPER CONDUCTORS, SHIELDED WITH AN OVERALL JACKET	BELDEN / WEST PENN	9451 / 454	9451P / D25454	0.138	1.5	B	
LINE-AES	24/2 STRANDED TINNED COPPER CONDUCTORS, SHIELDED WITH AN OVERALL JACKET	BELDEN / WEST PENN	1800B / DA2401	1801B / DA252401	0.185	2	B / D	
MIC	22/2 STRANDED TINNED COPPER CONDUCTORS, SHIELDED WITH AN OVERALL JACKET	BELDEN / WEST PENN	9451 / 454	9451P / D25454	0.138	1.5	A	
NET	(1) PAIR 18 AWG AND (1) TWISTED PAIR 22 AWG W/ SHIELD	CRESTRON	CRESNET-NP	CRESNET-P	0.25	2.5	D / E	
RS232	24 AWG STRANDED, 8 CONDUCTOR, OVERALL SHIELD	BELDEN	9538	82504	0.224	2.25	D / E	
SDI	RG-6 18 AWG 75 OHM COAX	BELDEN / WEST PENN	1694A / 6350	1695A / 256350	0.275	2.75	D / E	
SPK10	10 AWG TWISTED PAIR	BELDEN / WEST PENN	1313A / HA210	6T00UP / 25210	0.428	4.5	C	
SPK12	12 AWG TWISTED PAIR	BELDEN / WEST PENN	1311A / 227	6000UE / 25227B	0.352	3.5	C	
SPK14	14 AWG TWISTED PAIR	BELDEN / WEST PENN	1309A / 226	6100UE / 25226B	0.264	2.7	C	
SPK16	16 AWG TWISTED PAIR	BELDEN / WEST PENN	1307A / 225	6200UE / 25225B	0.21	2.1	C	
SPK16 (2PR)	16 AWG TWISTED PAIR, TWO PAIRS WITH AN OVERALL JACKET	WEST PENN	245	25245B	0.217	1.953	C	
USB	USB 3.0 CABLE	C2G	USB 3.0 SERIES	-			D	
VGA	MALE-MALE VGA CABLE WITH AUDIO AND MOLDED CONNECTORS	EXTRON	MVGA-A M-M/xx	-			E	VGA 100' OR UNDER. 1-1/2" MINIMUM CONDUIT SIZE TO PASS MOLDED VGA CONNECTOR
	PART NUMBERS LISTED IN THIS TABLE ARE FOR REFERENCE. REQUIRING EQUALS FOR CABLING DOES NOT REQUIRE SOLE SOURCE. AV CONTRACTOR TO CONFIRM WIRE DIMENSIONS WITH EC FOR FINAL CONDUIT SIZING AND PROVIDE CONDUIT RISER. WHERE PROJECT REQUIRES, PROVIDE PLENUM VERSION OF CABLING.							

FOR REFERENCE ONLY

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BLDG 400 LECTURE HALL

Project Location: 1800 BRONSON BLVD
FENNMORE, WI 53809

Sheet Title: GENERAL AUDIOVISUAL INFORMATION

Southwest Wisconsin Technical College Bid Number: 2021-02

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Drawn By: CK / AT

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AV001