Ventura County Community College District
761 East Daily Drive, Camarillo, CA 93010
Purchasing Department

TO: All Bidders April 12, 2021
FROM: Janice Kisch, Purchasing Specialist
SUBJECT: Bid 597 Moorpark College Main Entry Sign

Bid 597 Moorpark College Main Entry Sign – Addendum 1

This addendum is hereby made a part of the contract documents to the same extent as though it was originally included therein and takes precedence over the original documents.
Note that the Bid Proposal Form requires acknowledgement of receipt of all addenda.

It is the responsibility of the Bidder to verify that their Bid Proposal and all addenda has been received and delivered to the VCCCD Purchasing Department prior to the bid opening date and time. Verification of receipt can be obtained through the listed Purchasing Specialist.

New Information:

1. Specification Sheets Section 27-41-16 – AUDIOVISUAL SYSTEMS.
   Pages 27 41 16-1 through 27 41 16-17 of Section 613-6960-04.

Jobwalk Notes: The following are notes taken from the job walk:

1. The Bid Number 597 MUST be used in all correspondence related to this Bid.
2. A DIR Inspector (PI), will be full time on this project
3. Question about LED display is answered in this Addendum with AV Specifications Section attached.
4. New retaining wall and work shown on plans is the responsibility of the Contractor, not District. Contractor shall contract with appropriately licensed subcontractors as needed.
5. Demolition, debris disposal and site preparation done by Contractor.

SECTION 27 41 16 – AUDIOVISUAL SYSTEMS

PART1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. This Specification document is Standard Practice, outlining design considerations and accepted procedures for accomplishing the task of integrating audiovisual systems into the design and construction of facilities in the built environment. This Specification outlines a comprehensive set of procedures for the design and installation of professional audiovisual systems and does not suggest a specific course of action. Qualified, experienced professionals are required to interpret, judge, and modify this guide to suit the project needs. Some of the tasks and deliverables described in this guide may not be applicable in *all* circumstances. The intent of this Specification is not to represent or replace the due diligence of qualified audiovisual professionals and cannot be applied without considering each project's individual parameters and circumstances.

1.2 SUMMARY

A. Section Includes, but is not limited to the following:

1. Complete and operational Audiovisual (AV) systems as described in the Contract Documents.
2. Provide all miscellaneous terminations, hardware and components required for proper system operation.
3. Digital Signage Installation.
4. Video/Display/Monitor Installation.
5. Testing equipment and tools.
6. Warranty Information
7. Documentation and Instructions

1.3 COORDINATION

A. Examine other Sections of the Specifications for the requirements that affect work of this Section whether such work is specifically mentioned in this Section.

B. Coordinate work with that or other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of work under the Contract.

1.4 ABBREVIATIONS

A. All abbreviations used in this Specification for various societies, Government bodies or organizations shall stand for the following:

AES	Audio Engineering Society
ANSI	American National Standards Institute
ASA	Acoustical Society of America
ASTM	American Society for Testing and Materials
EIA	Electronic Industries Association
NAB	National Association of Broadcasters
NEMA	National Electrical Manufacturers' Association
NTSC	National Television Standards Committee
RIAA	Record Industry Association of America
SMPTE	Society for Motion Picture and Television Engineers
UL	Underwriter's Laboratory

1.5 REFERENCES

A. AVIXA/InfoComm International; AV Installation Handbook – The Best Practices for Quality Audiovisual Systems.

B. Owner's AV Standards

C. American National Standards Institute (ANSI)

D. AVIXA/InfoComm International; AV Installation Handbook- The Best Practices for Quality AV Systems

1.6 ACTION SUBMITTALS

A. Product Data- For each type of product, provide:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for AV system and digital signage.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Nationally recognized testing laboratory listing data for plenum-mounted equipment.

B. Shop Drawings: For Audiovisual systems

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified [**Installers**] [**manufacturers**] [**and**] [**testing agency**].

B. Seismic Qualification Data: Certificates, for Audiovisual equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Factory Quality-Control Reports (FAT)

1. Test and System Calibration instrument list and instrument calibration documentation

D. Site Quality -Control Reports (SAT)

1. Test and System Calibration instrument list and instrument calibration documentation

1.8 QUALITY ASSURANCE

A. Installer Qualifications – Any contractors wishing to bid may do so by submitting a Statement of Qualifications, to include the following, as a part of the Bid Documents package:

1. A cover letter stating the project name and showing the Contractor's business address, telephone number, and website.
2. Job history showing a minimum of 5 years' experience in the design, installation and service of audiovisual systems.
3. Provide at least three (3) references from institutions of similar size and scope where comparable work was completed in the last two years.
4. Must possess licenses and/or permits required to perform installations in the specified jurisdiction.
5. Summary of staff members experience, training certifications and capabilities.

B. Contractor shall have a minimum of an AVIXA certified CTS-D on staff. A copy of the certification shall be included in the bid documents.

C. The Project shall be supervised by a minimum of an AVIXA certified CTS technician and a copy of certification shall be included in the bid documents.

D. Contractor is to be an approved reseller of equipment specified and provided as part of the complete system.

E. In the event names and contact information of reputable AV contractors are needed, a list can be provided by the consultant.

F. Unless specified otherwise elsewhere, Bid Package documentation is to be submitted to the Consultant and shall include the following:

1. Equipment- Price for all systems equipment as described in the Contract Documents. If an alternate is required, add additional line items with "ADD ALTERNATE" in the item description. Provide both overall system pricing and unit pricing for each device.
2. Engineering- Price for engineering, shop drawing preparation and the labor not directly related to the Systems installation for all systems as described in the Contract Documents.

3. Programming- Identify the party(s) who will be responsible for the system programming. If multiple personnel and/or subcontractors will be used, list all party(s) individually. Include name, contact information and certifications.
4. Installation- Price for all labor directly related to the installation of all systems as described in the Contract Documents. Include all miscellaneous hardware, consumables, etc. required for installation in this number.
5. Taxes- Price of all applicable taxes.
6. Warranty- Price for first year warranty.
7. Bond- Price for Bid Bond and Performance Bond as required by the Contract Documents.
8. Total - Total cost for the systems as described in the Contract Documents.
9. Provide separate pricing for the base systems and any Alternates described in the Contract Documents.

G. Material Quality Control

1. Materials incorporated into Project shall be new condition, except as otherwise indicated in the Contract Documents, of specified quality, and furnished in sufficient quantity to facilitate proper and speedy execution of the Work.
2. Contractor shall furnish evidence of the quality of materials incorporated into the Project as required by the Contract Documents or at request of Owner's Representative or Consultant.
3. Materials not meeting requirements of the Contract Documents shall be removed from the Project and replaced with materials meeting Contract Document requirements by Contractor with no additional expense to Owner.
4. No End of Life (EOL) equipment will be accepted, even in new condition.
5. Electrical Components: Listed and labeled per NFPA 70, Article 100 by a testing agency acceptable to authorities having jurisdiction.

H. Comply with UL 813.1.9 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace sound-masking loudspeaker control units and loudspeakers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to connect to the network and perform specified functions.
b. Failure to produce specified sound.

2. Warranty Period: One year from date of Substantial Completion.

1.10 RELATED WORK

A. A representative from the Manufacturer/Installer to attend construction meetings at the Project site. This representative shall have the authority to make commitments on behalf of the Manufacturer/Installer.

B. AV System Control and Design.

1. Design graphical user interface design for AV touch panels for the AV system as noted in Drawings and Specifications. Manufacturer/Installer to review these designs with Owner for approval.

2. Select and provide hardware and software; such as, server cards, boards, cabling and cabling, associated with core equipment specified to provide a complete and operable system.
3. Load software and configuration files into programmable AV and control system devices.
4. Set up and configure programmable AV and control system devices provided as part of a full and operable system.

1.11 SCOPE OF WORK

A. Performance Requirements:

1. Furnish and install audiovisual equipment, including any items not specified but required to provide a completed system. Verify the completeness of equipment listed in this Section and the correctness of type numbers.
2. Use equipment specified in the manner specified. Clarify any misunderstandings prior to bid submission and offer substitutions as appropriate.
3. Verify each component's conformance with its manufacturer's published Specifications and other requirements as stated in this Section.
4. Check in detail each item of equipment provided, each portion of the installation, and the complete installation to ensure that the intent of this Section is achieved.

B. The work includes; but is not limited to, the following:

1. Submission of shop drawings prior to fabrication.
2. Verification of dimensions and conditions at the job site.
3. Installation in accordance with these specifications, manufacturer's recommendations and applicable code requirements.
4. Setup and adjustment of signal processing, system tests and adjustments, written report, demonstration for approval, participation in acceptance tests and final adjustments as required.
5. Programming and documenting of software-controlled devices including initial setup of presets in devices.
6. Coordination with the Electrical Contractor.
7. Coordination with the Lighting Contractor.
8. Coordination with the Fire Alarm Contractor.
9. Coordination with the Tel/Data Contractor and other Low Voltage Contractors.
10. Coordination with the Owner's Audiovisual Personnel.
11. Coordination with the Owner's IT Department.
12. Performance standards, without claim for additional payment.
13. System documentation.
14. Instruction of Owner's operating personnel.
15. Maintenance services for one year.
16. Warranty.

1.12 BASE SYSTEM DESCRIPTION

A. Provide DVLED solution for three (1) digital signage display at the Moorpark College campus. The display will be housed within a fabricated enclosure. Selected contractor will be responsible for the provision of materials and installation at Moorpark College, 7075 Campus Rd, Moorpark, CA 93021

B. **Monument Sign #1**

1. System shall be capable of displaying a large high-resolution video or signage graphics
2. System shall be designed for outdoor use 24/7/365
3. Systems shall include media player with wireless connectivity to Moorpark's network.

1.13 SUBMITTALS

A. Submittal Format. Unless directed otherwise, provide submittal documents electronically in PDF format. Provide documents in full size and suitable for printing by the reviewer. Clearly identify each document within its file name. Clearly identify the item within the sheets provided based on use in the system.

B. Submit under provisions of Section 01 33 00 "Submittal Procedures."

C. Product Data: Submit applicable reference standards, current performance data, and application recommendations and product limitations.

D. Review of Electrical and Telecom Infrastructure. Within 30 days after execution of contract, provide a written statement indicating that empty conduits, junction boxes, pathways, telecom outlets, such as, phone, data and CATV coax, and 120V electrical power systems needed to support the work in of this Section have been reviewed and found to be acceptable. Identify any deficiencies.

E. Control Panels: Provide the following for each graphical user interface employed in the system. Provide in a timely manner so that reasonable review comments do not affect the Project schedule.

1. Preliminary color layouts of principle pages, generally outlining system functionality and the graphical standard to be employed and outlining navigation between pages.
2. Fully functional control panel emulated within programming environment or alternately, physical touch panel with supporting control systems hardware. Provide fully programmed panel for review of layout, legends, colors, status feedback, page flips and other factors by the Owner or Owner's authorized representative.

F. Shop Drawings: Submit assembly and installation layout drawings showing product components in assembly with adjacent materials and products; such as speakers, panels, microphones, and electronics rack.

G. Operation and Maintenance Data.

H. Warranty: Submit manufacturer's standard warranty statement.

1.14 SUBSTANTIAL COMPLETION SUBMITTALS

A. Upon completion of the Initial Tests and Adjustments and when the systems are substantially complete, but before Final Tests, submit two complete sets of submittals directly to the Consultant. These Submittals shall include the following:

1. Results of initial electrical and electronic tests.
2. Description of corrective procedures and adjustments.
3. Resulting performance of each system after adjustments.

4. Full-size Project Record Drawings –
   a. Modify accepted shop drawings to record the actual installation as of the completion of Initial Tests and Adjustments.
   b. Record serial numbers for permanently mounted electronic devices.
   c. Indicate actual locations of devices.

B. Written verification that the systems are substantially complete.

C. A list of any known outstanding work or equipment other than the Final Tests, Client Training and Final Cleaning as specified.

D. Substantial Completion for these systems shall not be dependent upon or limited by the Certificate of Substantial Completion for the project and shall be defined as:

1. Systems are functional as defined by the Contract Documents.
2. All permanently installed equipment is in place and properly installed.
3. All portable equipment required for operation is on site.
4. Initial Tests and Adjustments are complete.
5. The systems are ready for Final Tests.
6. The systems are ready for use by the Owner.
7. Comments from previous submittals, Addenda, and other contract correspondence have been addressed

E. Manufacturer/Installer to be fully responsible for making substitutions of specified products that may have had a model update or model change.

F. Products to be new and under warranty at the time of installation.

1.15 PROJECT CONDITIONS

A. Environmental Requirements: Do not install system until mortar, wet and dust producing trades have completed their work and finished floor is in place.

B. Determine rack location(s) with the Owner.

C. Where code permits, wiring may be run outside of conduit. Such wiring shall be coordinated either in a plenum space or by means of secondary enclosure that meets code requirements.

D. Coordinate with Owner to meet acoustic performance requirements. The noise level in the rehearsal space to be at or less than NC 30.

E. Field Measurements: Obtain required field measurements and indicating performance setups, ceiling construction, wall construction, ventilation features, electrical systems, networks and potential obstacles on shop drawings.

F. If asbestos is present, abatement shall be required by Owner prior to installation.

PART 2- PRODUCTS

2.1 SIGNAGE SYSTEM BASIS OF DESIGN

A. Monument Sign #1

1. DVLED: QTY 1

    a. To serve as main display in the new monument sign located at the main entrance of the college campus. 7000nit, 3840hz refresh rate, and 5.7mm pixel pitch. Must include screen controller/processor. Overall display dimensions are 14.69’ W x 6.29’ H
        1) DigiLED – DigiTILE MAX5710o or equivalent

2. Media Player: QTY 1

    a. Media player shall have wireless capabilities and be located in the fabricated enclosure:
        1) BrightSign – XD1033 or equivalent

C. Cable

1. Mic/Line Level Audio: Cable shall be plenum rated, shielded, twisted pair. Minimum of 22AWG, stranded conductor with a 24AWG drain wire contained in a single outer jacket.

    a. Acceptable: West Penn D25291 or approved equal from Belden

2. 70V/100V Speaker/Program Audio: Cable shall be Plenum rated, unshielded, twisted pair. 14AWG stranded conductor contained in a single outer jacket.

    a. Acceptable: West Penn D25225 or approved equal from Belden

3. 2/4/8 Ohm Speaker Audio: Cable shall be Plenum rated, unshielded, twisted pair. 12AWG stranded conductor contained in a single outer jacket.

    a. Acceptable: West Penn D25227 or approved equal from Belden

4. Control cable (Non-plenum rated):

    a. Contact Closures and Inputs: Cable shall be unshielded, 22AWG stranded-multiple conductor cable enclosed in a single overall jacket.
        1) Acceptable: West Penn 3241 or approved equal from Belden
    b. Serial Communication: Cable shall be plenum rated, shielded, twisted pair. Minimum of 22AWG, stranded conductor with a 24AWG drain wire contained in a single outer jacket.
        1) Acceptable: West Penn D25291 or approved equal from Belden
    c. Control Link (Ethernet): Cable shall be unshielded twisted 4 pair. 24AWG singe core, twisted 4-pair contained in a single outer jacket.
        1) Acceptable: CommScope, West Penn or Belden

5. Control cable (Plenum rated):

    a. Contact Closures and Inputs: Cable shall be unshielded, 22AWG stranded-multiple conductor cable enclosed in a single overall jacket.
        1) Acceptable: West Penn 253241 or approved equal from Belden
    b. Serial Communication: Cable shall be plenum rated, shielded, twisted pair. Minimum of 22AWG, stranded conductor with a 24AWG drain wire contained in a single outer jacket.
        1) Acceptable: West Penn D25291 or approved equal from Belden

c. Control Link (Ethernet): Cable shall be unshielded twisted 4 pair. 24AWG singe core, twisted 4-pair contained in a single outer jacket.
   1) Acceptable: CommScope, West Penn or Belden

6. Crestron DM/AMX DXLink Video Transmission Cable:

   a. Via Ethernet (Non-Plenum rated): Cable shall be shielded twisted 4 pair. 23AWG single core, with drain wire and twisted 4 pair all contained in a single outer jacket. To be terminated with Shielded connector specified for specific cable type and brand.
      1) Acceptable: CommScope, West Penn, or Belden
   b. Via Ethernet (Plenum rated): Cable shall be shielded twisted 4 pair. 23AWG single core, with drain wire and twisted 4 pair all contained in a single outer jacket. To be terminated with Shielded connector specified for specific cable type and brand.
      1) Acceptable: CommScope, West Penn, or Belden

2.5 SOURCE MUSIC:

A. Basis of Design: Subject to compliance with requirements, provide products by Mood/Muzak Media Source or comparable product from an available manufacturer.

B. Provide background music in building. Coordinate with Owner for source options.

2.6 OUTLET PLATES AND CABLING:

A. Provide associated plates for inputs and outputs as indicated. Locations may be in floor box, wall or ceiling locations.

B. Plates to be metallic for durability.

C. Plate connectors to be durable and suited for location and quantities required to provide required connectivity.

D. Cabling to be pre-manufactured wherever possible and sized for loss and distance limitations defined by system.

E. Cabling supporting AV systems to be installed and supported in accordance to NEC and TIA/EIA standards.

2.7 LABELING

A. General
   1. **Handwritten labels are not acceptable.**
   2. Do not indicate Manufacturer/Installer’s name on moveable, portable or loose equipment, touch panels, cables or wall plates.
   3. Label types to be approved by Designer prior to any final labeling has been installed.
   4. Labels to be legible.
   5. Label products and cables in a logical, legible and permanent manner in accordance to the AVIXA Best Practices Handbook and corresponding to the Audiovisual Drawings. Wording, format, style, color, and arrangement of text is subject to the approval of the Consultant.

6. Label the following with engraved, permanently attached Lamicoid™, with white 1/8-inch block letters on black background:

    a. Front and back of rack mounted equipment indicating device function.
    b. Barrier strips, terminals, stand-alone transformers, switches, relays, volume controls, and similar devices.

3. Engrave custom receptacles, plates and panels as shown on the drawings, using 1/8-inch lettering filled with contrasting paint.
4. **Permanently label installed wires on both ends with accepted permanent heat-shrink labels.**

a. Acceptable: BRADY BMP21(Plus) with 1.5" Self-laminating Labels or equal with approval.

5. The Contractor's name shall appear only once on each set of racks, preferably on the AC power control, or as coordinated with the Consultant. The Contractor's name shall not appear on wall plates or portable equipment.
6. Provide self-adhesive dots to normally user-adjustable front-panel controls to indicate their nominal settings. Mark controls on mainframe modules on the appropriate internal labels.

B. Provide permanent self-adhesive labels on the front and back panel of rack mounted equipment with designation and functionality.

C. Provide permanent label of plug end power cords identifying the equipment served.

2.8 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Wherever a product or class of material is specified exclusively by a single trade name, name of maker, or catalog reference, use only such specified product unless approval for a substitution has been secured in writing. Products and materials not specified in the Contract Documents and installed in the Work shall be removed and replaced by specified products and materials. The Contractor will be fully responsible, and no additional cost will be incurred by the Owner. Neither will there be any additional time added to Contract for the correction of unapproved equipment.

B. When multiple products are specified in the Contract Documents, by name, manufacturer and model number, or as a "Basis of Design" for one use, the Contractor may select any one of the alternates specified.

C. Where multiple acceptable manufacturers, series or product lines are specified in the Contract Documents by name for one use, Contractor may select any one of those listed that meets the specified performance and intent. The Contractor must still secure approval, there is no guarantee stated or implied by these specifications that products will be approved.

D. Wherever the words "or approved" are used in the Products section of the Specification, it shall mean that the manufacturer or manufacturers listed compete in the same product categories as the primary listed manufacturer and so can reasonably be expected to manufacture a product that provides equivalent functionality, performance and specifications as the primary listed products. The Contractor must still secure approval, there is no guarantee stated or implied by these specifications that products by manufacturers listed as comparable will be approved.

E. Where the Contractor proposes to substitute products not listed, the onus lies on the Contractor to submit information to verify that the proposed substitution meets or exceeds

the specified performance and intent. The Contractor may be required to provide cut sheets, samples, technical data or any other information requested to determine equivalence. No substitutions shall be permitted without prior written consent. All proposed substitutions shall be submitted in writing to the Consultant. Substitutions proposed during the bid process shall be submitted. There is no guarantee stated or implied by these specifications that proposed products will be approved.

F. Substitutions will only be considered under the following circumstances:

1. The proposed products offer superior performance without adding cost to the Contract.
2. The proposed products offer equivalent performance and reduce cost to the Contract.
3. The specified products are no longer available or are considered End of Life (EOL).
4. The proposed products avoid delays to the project that would be caused by the specified products.
5. The specified products will not operate as intended due to unexpected field conditions.

G. If proposed products have been approved for Substitution, the changes must be approved in writing by the Consultant and will be considered as a Substitution. Preference will be given to the alternate products listed in the Contract Documents for that use.

H. If a proposed Substitution is approved in writing, the Substituting product shall be substituted throughout the entire system design, so long as the usage is the same. Use the same products, for the same use, throughout the system design.

I. Use only products from a single manufacturer for similar use throughout the systems unless otherwise specified by the Consultant. Wherever words “Approved by”, “Satisfactory to”, “submitted to”, “inspected by,” or similar phrases are used in these specifications, they shall be understood to mean that the material or item referred to shall be approved by, be satisfactory to, submitted to, or inspected by the Consultant.

PART 3- EXECUTION

3.1 INSTALLATION

A. Equipment and enclosures to be installed plumb and square unless specifically detailed otherwise.

1. Install all equipment and devices according to the Manufacturers’ specifications – Properly match levels and impedance between components in accordance with specifications.
2. Do not install equipment in a manner different than what is indicated. The Contractor shall notify the Consultant, make recommendations, and proceed with the necessary changes upon receipt of written approval from the Consultant.
3.. Provide brackets, screws, adapters, springs, rack mounting kits, etc., recommended by manufacturer for correct assembly and installation of speaker assemblies and electronic components.
4. Finishes for exposed or custom fabricated components shall be approved by the Consultant prior to installation.
5. Enclose electrical and electronic equipment in metal raceways rigidly secured plumb and square to the building.

6. Locate overhead (distributed) loudspeakers as shown on the drawings, with minor changes not to exceed 6-inches in any direction without written receipt of approval from the Consultant.
7. Confirm polarity of speaker before installation and wire to maintain uniform polarity.
8. Mount transformers with screws securely to speaker brackets or enclosures. Adjust torsion springs as necessary to securely support speaker assembly.
9. Locate and aim speaker clusters as shown on the drawings, with minor changes not to exceed 3” or 0.5° in any direction for the entire cluster. Within any given cluster, the alignment of individual cabinets in relationship to one another is not to vary by more than 1/8” or 0.25° from the drawings. Additional adjustments may be required during any Final Testing and Measurements, Adjustment and Equalization by the Consultant (see paragraph 3.5)
10. Design and install supports, mounts, attachments, attachment points and hardware reinforcement requirements in accordance with Paragraph 1.2 and industry standards. Verify capacity of mounting methods used in the work.
11. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems.
12. Do not fabricate or install supports that would overload the building structure. Do not drill or cut concrete beams, joists or structural steel, and do not weld to structural steel, except as specifically authorized in writing by the Owner, Consultant, General Contractor or designated representative.
13. Use attachment and support hardware with a minimum safety factor of 5: 1 for static loads, and 8: 1 for dynamic loads.
14. For any equipment that is to be suspended, the equipment and all associated attachment and support hardware is to be certified by the manufacturer(s) for overhead suspension.
15. At the Contractor’s expense, a registered structural engineer shall approve and stamp drawings for supports and mounts for any equipment to be suspended in any manner not approved by the Manufacturers.

B. Equipment, except that designated as moveable, portable or loose equipment, to be secured and permanently attached to racks or structure in a manner which will require the use of a tool for removal.

C. Supports to meet or exceed the load requirements of the intended application with a minimum safety factor of 5.

D. Equipment racks are to be properly bonded to the AV grounding system and systems internal to enclosure bonded to the internal rack grounding system

1. Verify depth of cabinet before assembly, to ensure mounted equipment will fit completely inside with the doors closed.
2. Fill unused equipment mounting spaces with blank panels or vent panels where additional ventilation is required.
3. Assure enough ventilation space between equipment for adequate cooling.
4. Unless shown otherwise on the drawings, mount amplifiers at the bottom of the equipment rack. Follow amplifier manufacturer’s recommendations regarding ventilation space between amplifiers.
5. Any “knock-outs” or “punch-outs” that are needed to allow for cable to be run out of the rack must have rubber or plastic grommets installed to keep unwanted wire stripping from occurring.
6. Equipment racks and enclosures are to be installed plumb and square unless specified otherwise.
7. All equipment, except that designated as moveable, portable or loose equipment, is to be secured and permanently attached in the equipment racks or structure in a manner which will require the use of a tool for removal.

8. Provide a minimum of one spare AC receptacle, for each four in use, per branch circuit.
9. Do not share power amplifier branch circuits with any line level devices.
10. Clearly label receptacles in the rack for panel and circuit breaker number.
11. Provide switched receptacles or power sequencers as required to meet the power sequencing shown in the drawings and specified elsewhere.
12. Use EMT or flexible conduits (per NEC) and PVC fittings to provide insulated connections of the electrical raceway systems to equipment racks.
13. Provide continuous raceways with no more than 40% fill, between wire troughs and equipment rack for all non-plenum-rated cables.
14. Plenum rated cable may be routed into the equipment racks via EMT stubs into the above-ceiling area.
15. Provide ample service loop for each cable that breaks out from a harness. Provide ample service loops at plates and panels. Service loops may be created in the rack space; however, it should not be visible or looped from the lacing bars or other wire management.
16. Employ permanent strain relief for any cable whose outside diameter is one inch or greater.
17. Separate wiring of differing classifications by at least four inches where possible when entering the rack. Where lines of differing classifications come closer together than four inches, cross them perpendicular to each other. The different classifications of cables should be bundled and wrapped in expandable “snake-skin” style sleeving. Neatly comb and harness wires within consoles by the following classifications of power levels or signal types –

    a. Balanced Microphone Level Audio less than -20 dBm.
    b. Balanced Line Level Audio from -20 dBm to +30 dBm.
    c. DC Control or Power less than 48VDC, Intercom with low voltage DC power, Speaker Level Audio, AC Power.
    d. Video.

18. Once the cables are securely inside the equipment rack, all bundles shall be distributed to the appropriate side of the rack in accordance to InfoComm wiring standards and classification type.
19. Do not splice wires inside the equipment rack under any circumstance.
20. Connect line level wiring only to accepted terminal barrier strips. Solder terminal blocks (x-mas trees) or standard telco 66-type punch blocks are not acceptable. Connect speaker level wiring only to accepted terminal barrier strips. Do not parallel or branch cables and lines at other points.
21. Mount terminal strips on ¾ inch plywood or 1/8-inch-thick aluminum plates/blank panels; mounting on the bottom of the rack will not be acceptable. Provide 15% spare terminals at each location.
22. Plywood used inside of any IDF or MDF must be painted with fire-retardant paint. If the use of plywood is specified in the design, the Electrical Contractor (EC) should provide and install all materials.
23. Use only balanced audio circuits unless noted otherwise. Use accepted transformers or interface devices to convert unbalanced circuits to balanced. Certain output signals may be unbalanced if inputs of subsequent devices are within adjacent racks; these are noted on the drawings on an individual basis.

E. Use separate pathways for microphone-level circuits, video and line-level audio circuits, loudspeaker circuits, control and power circuits. Provide conduit spacing from power circuits as defined by AVIXA/InfoComm guidelines.

F. Components are manufactured units, pre-wired where appropriate.

G. Heat Shrink and Cable Preparations for Termination

1. In general, cover the end of the overall jacket with 1-inch length (min.) black heat-shrink tubing. Heat shrink tape or “wrap-around” shrink is *not* acceptable. Cut off unused insulated conductors 2 inches (minimum) past heat-shrink, folding the ends back over the jacket, and securing in place with tie-wrap.
2. Cover shield/drain wire with properly sized green sleeving. If the shield/drain wire is to be unused cover with green sleeving and serve as noted above. Extend sleeving ¼ inch past the end of unused shield/drain wire.
3. For connectors containing more than 4 solder connections, cover each bare wire and solder connection with properly sized, green heat- shrink sleeving.
4. Cables terminated by cable-type connectors are not required to have the 1-inch heat-shrink tubing on the end of the overall jacket but shall meet the wire identification requirements as noted and shall have any shields/drain wires insulated with sleeving.
5. Heat-shrink sleeving shall not be heated via lighter or any other open flame. Any heat-shrink showing charring or melting of any kind, will be re-terminated at no additional cost to the Consultant or Owner.
6. Do *not* cut the shield/drain wire of any exposed shielded cable at the end of the overall jacket.

H. Connections

1. Contractor to ensure connections using rosin-core solder or accepted mechanical connectors.
2. Use crimping tools that are specifically designed for the application. The presence of non-accepted crimping tools in the Contractor’s shop or on the job-site shall constitute prima-facie evidence of improper crimp-type connections, and may result in all crimp-type connections being redone.
3. Use insulated spade lugs on screw terminals. Do not exceed two lugs per terminal. Do not cut strands from conductors to fit lugs.
4. Make connections to loudspeaker transformers with properly sized, closed-end connectors crimped with factory-approved ratchet type tool. Wire nut, electrical tape or “Scotch lock” connectors are not acceptable. Attach loudspeaker transformers to loudspeakers with permanent fasteners inside the loudspeaker enclosure unless specifically noted otherwise.

I. Programming

1. Programming requirements for all DSP based audio and video routing and processing devices will be based on information provided by the Contract Documents unless otherwise noted. The Contractor shall provide complete electronic copies of all manufacturers’ application files and any preliminary source code (Uncompiled) and data files on CD-ROM or USB Flash Drive; to the Consultant. Contractor will make modifications to the programming as required. This review does not relieve the Contractor of any responsibility for the proper functioning of DSP Systems and their associated programming upon Substantial Completion and after any modification during the warranty period.
2. All software, firmware and hardware shall be the latest available versions and all software shall meet manufacturers’ standards.
3. Document all passwords for software and devices when applicable.
4. A copy of all uncompiled source code, data files, IP configurations and passwords shall be provided to the consultant on a USB Flash Drive or CD, as a part of Final Contract Close-out Submittals.

J. Calibrate system for proper operation.

1. Measure and record impedance curves for each type of outboard balancing transformer used and for each type of loudspeaker (with 70V transformer if applicable) is used
2. All microphone preamplifiers shall have 50dB of gain. Line-level devices shall be at unity gain and have equalizers set flat. Power amplifiers shall be set at 75 percent of the maximum gain.
3. Start with a -50dBu signal at microphone inputs and a +4dBu signal at line inputs. Increase the signal until the input or output clips. Record input and output levels.
4. Measure frequency response

    a. Use continuous 20Hz to 20kHz sweep oscillator and multimeter (or plotter). This can be software based.
    b. Frequency response shall not exceed manufacturers' published ratings more than ±1dBu.

5. Measure and record impedance curves of all loudspeaker lines (3 frequencies minimum; continuous 20hz to 20kHz sweep preferred) at amplifier rack terminal barrier strips. Minimum impedance should not be less than 70% of the calculated load over the nominal bandwidth of the system.

K. Audio System Adjustment and Equalization

1. All crossover filters and networks for all loudspeakers should be adjusted according to the loudspeaker manufacturer's recommendations before any other adjustment or equalization is performed.

2. Gain structure specifications using a -67dBu pink noise source for microphone level inputs, and a +4dBu pink noise source for line level inputs (Adjust each channel for the signal that is normalled to it):

    a. For each balanced microphone input on all manual and automatic mixers, adjust input gain control such that the channel level meter shall maintain (-15dBfs for meters on digital devices) with the channel gain set to unity.
    b. After adjusting all microphone inputs, verify that all input gain controls are set to the same position. If any are not, calibrate the meters on those channels as necessary per the manufacturer's recommendations, and repeat the gain adjustment process.
    c. For stand-alone microphone pre-amps, adjust gain such that balanced line level output shall be measured to be +4dBu.
    d. For each balanced line input on all manual and automatic mixers, adjust input gain such that any channel level meter shall maintain (-15dBfs) with the channel gain set to unity.
    e. After adjusting all line inputs, verify that all input gain controls are set to the same position. If any are not, calibrate the meters on those channels as necessary per the manufacturer's recommendations, and repeat the gain adjustment process.
    f. On all manual and automatic mixers, all auxiliary, mix, matrix and master output busses; pass the signal at unity level. Verify that input channel meters, internal mix bus meters, and all output bus meters maintain identical levels for a given input. Verify that the measured output of any bus is equal to the measured input of the channel or bus assigned to that bus.
    g. All line level signal processing equipment and distribution amplifiers shall pass the signal at unity level.
    h. Adjust amplifier gain to meet the output levels specified below.

3. Equalization and output level specifications with the gain structure set as specified above and a pink noise source maintaining (-15dBfs) on all level meters. All dB measurements are assumed to be dB SPL:

    a. Left and Right speaker channels shall *each* generate 85dB (±2dB) C-weighted throughout the entire direct coverage area of the channel. Record the level at a minimum of 3 points distributed throughout the coverage area. Frequency response for each channel in the same coverage area shall be flat (±3dB) from 80Hz to 8kHz. Below 60Hz, roll-off shall occur at -6dB per octave, with roll-off being achieved using a high-pass filter *only.* Above 8kHz, roll-off shall occur at -3dB per octave for the first octave, and at -6dB per octave thereafter.
    b. Center speaker channel shall generate 85dB (± 2dB) C-weighted throughout the entire direct coverage area of the channel. Record the level at a minimum of six points distributed throughout the coverage area. Frequency response for the channel in the same coverage area shall be flat (+/- 3dB) from100Hz to 6kHz. Below 100Hz, roll-off shall occur at- 6dB per octave, with roll-off being achieved using a high- pass filter *only.* Above 6kHz, roll-off shall occur at -6dB per octave.
    c. Each surround speaker channel shall generate 83dB (± 2dB) C-weighted throughout the entire direct coverage area of the channel. Record the level at a minimum of four points distributed throughout the coverage area. Frequency response for the channel in the same coverage area shall be flat (± 3dB) from80Hz to 8kHz. Below 80Hz, roll- off shall occur at -6dB per octave, with roll-off being achieved using a high-pass filter *only*. Above 8kHz, roll-off shall occur at -6dB per octave.
    d. Distributed ceiling speaker system shall generate 85dB (± 2dB) C-weighted throughout the entire audience area of the room. Record the level at a minimum of six points distributed throughout the audience area. Frequency response for the distributed system shall be flat (+/- 3dB) from120Hz to 6kHz. Below 120Hz, roll-off shall occur at -6dB per octave, with roll-off being achieved using a high-pass filter *only*. Above 6kHz, roll-off shall occur at -6dB per octave.
    e. Minimum feedback stability margin (using the same microphone that will be used by the owner) shall be 6dB with the system equalized.
    f. Record and submit all equalization and output levels before scheduling any Final Tests. Submit measurement data directly to the Consultant.

L. Final Acceptance Testing to be performed during a period designated and agreed upon by all parties. The minimum time required for Acceptance Testing is five working days of dedicated quiet.

1. The Contractor shall work with the Consultant to schedule a time for the Consultant to perform the Final Tests site visit. Notify the Owner and Consultant at least fourteen days in advance.
2. Furnish a technician who is familiar with the system to assist the Consultant during the Final Testing and Measurement.
3. Under the direction of the Consultant, adjust the systems as required to achieve the final specified or desired performance. Additionally, any test from the Initial Tests and Adjustments may also be performed by the Consultant if deemed necessary.
4. If the Consultant is unable to perform any of the Final Tests and Measurements due to errors, omissions, problems or inaccuracies by the Contractor, the Contractor shall be responsible for costs incurred by The Consultant for additional review.
5. The Owner may elect to verify test data and system performance as part of the acceptance procedure. Provide personnel and equipment, at the convenience of the

Owner, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Owner. These tests and demonstrations are in addition to any Consultant testing, or the instructional requirements.

6. Record final settings on all Systems and incorporate into the Final Contract Close-out Submittals.

3.2 DEMONSTRATION

A. Train Owner's personnel to operate and maintain AV System as applicable. Comply with requirements specified in Section “Demonstration and Training.”

B. Turn over operation and instructions to Owner.

3.3 FINAL ACCEPTANCE

A. Final acceptance of the installation shall be the sole responsibility of the Owner and Project Manager and will be based upon the report of the Consultant following the Final Tests and Measurement, and upon receipt of acceptable Final Contract Close-out Submittals and Instruction documentation.

B. The failure of a representative of the Owner, Project Manager or the Consultant to condemn any defective work or material shall not release the Contractor from the obligation to promptly remove and replace the same at any time before Final Acceptance upon discovery of defective work or material without claim for additional payment.

END OF SECTION 27 41 16

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