SECTION 16810 – AUDIO VIDEO SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes Audio-Video Systems.

B. The term “provide” used throughout this specification and drawings means “furnish, install, test, and certify”.

C. Within two weeks after award of contract, the AV Contractor shall arrange a “CA kickoff” meeting and/or conference call with the General Contractor, Construction Manager, Architect, Consultant, and Owner (when applicable) to discuss general project expectations.

D. Coordinate project schedule, installation schedule, phasing and any other requirements deemed necessary with Construction Manager and all necessary trades to ensure successful completion of work.

E. Phasing, temporary distribution/equipment, cutover and implementation where applicable, shall be coordinated with the Construction Manager.

F. Extent of Audio-Video Systems infrastructure work is indicated by Division 16 “Electrical” sections, drawings and schedules and is hereby defined to include, but not by way of limitation, the provisions of:

1. Raceway systems including but not limited to conduits, cable trays, sleeves, surface raceways, pull-boxes, junction boxes, back-boxes, etc.

2. Power distribution within equipment racks including programable power sequencing of AC circuits.

3. All AV system related infrastructure shall be provided as part of the Base Building Project including but not limited to raceway, cable, cable terminals, and AV equipment rack room fit-out where applicable.

G. Extent of Audio Video Systems Infrastructure as indicated by Division 16 “Communications” and those associated specification sections that address Ethernet and IT requirements shall include but not be limited to:

1. Patch cords, jumper cables, and cross-connect cables to interconnect wiring terminals as well as electronic equipment.

2. Network connectivity: a channel is defined as the connection from one active device to another, including any patch cords and equipment cords and shall not exceed 100 meters total length.

3. Testing of all category type cable infrastructure and grounding systems as noted by specification, drawings, and applicable industry standards.

H. General requirements also include but are not limited to:

1. Grounding and bonding of all metallic hardware components back to the nearest grounding bus including, but not limited to equipment racks, cabinets, cable trays, ladder rack, metallic cable sheaths, wall mounted wiring terminals, conduits, sleeves, metallic ductwork, and frames.

2. All physical cable management hardware including, but not limited to: “J-hooks” in accessible ceiling areas where conduit has not been provided for, “D-rings” on backboards, vertical and horizontal managers on racks and cabinets, vertical and horizontal ladder-type or wire basket cable tray within AV head-end equipment rooms.

3. The use of Velcro type cable ties are required; the use of plastic zip ties shall not be permitted. No exceptions.

4. Fire stopping as required. Contractor shall provide fire stopping for all low-voltage openings (including empty low voltage raceway) once cable installation is complete. Confirm specific fire stopping scope requirements with Construction Manager.

5. Seismic bracing of all equipment racks, ladder-type or wire basket cable trays, ceiling recessed equipment such as loudspeakers, plenum boxes et cetera as required by code and by local governing jurisdiction.

6. Preparation and submission of product data, shop drawings, testing reports, as-built drawings, and cabling documentation as required in this specification.

7. Construction and Installation warranties.

8. Manufacturer components, channel and solutions warranties.

9. Installation and testing of all system and components shall be documented.

10. Onsite administrative and user training.

1.02 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. Division 16 Electrical Sections pertaining to basic materials and installation methods, raceways, boxes, supports, grounding and bonding, and wiring.

C. Division 16 Telecommunication Sections pertaining to structured UTP/STP cabling, fiber optic cabling, low voltage coaxial signal distribution and installation methods.

D. Section 16813 “Audio Video Control Systems”.

E. Section 16819 “Audio Video Systems Performance Verification”.

F. Audio-Video Systems (AV) Construction Drawings for equipment locations, system layouts, one-line diagrams, and details.

1.03 REFERENCES

A. Audiovisual and Integrated Experience Association (AVIXA):

1. ANSI / INFOCOMM 2M – Standard Guide for Audiovisual Design and Coordination Processes
2. ANSI / INFOCOMM 10 – Audiovisual Systems Performance Verification
3. ANSI / INFOCOMM A102.01 – Audio Coverage Uniformity in Listener Areas
4. AVIXA F502.01 – Rack Building for Audiovisual Systems
5. AVIXA F502.02 – Rack Design for Audiovisual Systems
6. INFOCOMM F501.01 – Cable Labeling for Audiovisual Systems

B. Building Industry Consulting Service International (BICSI):

1. ANSI / BICSI 001 – Information and Communication Technology Systems Design and Implementation Best Practices for Educational Institutions and Facilities
2. ANSI / BICSI N1 – Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure
3. ANSI / BICSI N3 – Planning and Installation Methods for the Bonding and Grounding of Telecommunication and ICT Systems and Infrastructure

C. Code of Federal Regulations (CFR):

1. 29 CFR 1910.268 – Occupation Safety and Health Standards (OSHA) – Telecommunications
2. 36 CFR 1191 – Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

D. Electronic Components Industry Association (ECIA):

1. ECIA EIA/ECA 310-E – Cabinets, Racks, Panels, and Associated Equipment

E. National Fire Protection Association (NFPA):

1. NFPA 70 – National Electrical Code
2. NFPA 72 – National Fire Alarm and Signaling Code
3. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems

F. Telecommunications Industry Association (TIA):

1. TIA-568.0 – Generic Telecommunications Cabling for Customer Premises

2. TIA-568.1 – Commercial Building Telecommunications Infrastructure Standard
3. TIA-568.2 – Balanced Twisted-Pair Telecommunications Cabling and Components Standards
4. TIA-568.3 – Optical Fiber Cabling Components Standard
5. TIA-568.4 – Broadband Coaxial Cabling and Components Standard
6. TIA-569 – Telecommunications Pathways and Spaces
7. TIA-606 – Administration Standard for Telecommunications Infrastructure
8. TIA-607 – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
9. TIA-862 – Structured Cabling Infrastructure Standard for Intelligent Building Systems
10. TIA-1152 – Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling

G. Underwriters Laboratories (UL):

1. UL 263 – Fire Tests of Building Construction and Materials
2. UL 1480 – Speakers for Fire Alarm and Signaling Systems, Including Accessories
3. UL 2043 – Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handing Spaces
4. UL 62368-1 – Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements

1.04 DEFINITIONS

A. The term “Owner” shall refer to the facility’s owner or primary operator.

B. The term “Architect” shall refer to the Architect of Record (AOR).

C. The terms “Consultant”, “Designer of Record”, and “DOR” shall refer to CENSEO AV+Acoustics LLC, being responsible for the design and specification of the audio-video systems.

D. The terms “AV Contractor”, “AVC”, and “Contractor” shall refer to the Audio-Video Systems Contractor who has been awarded the contract for this scope and who has responsibility for the performance of the work specified in this specification.

E. The term “EC” shall refer to the electrical contractor.

F. The term “GC” shall refer to the general contractor.

G. The term “SCC” shall refer to the structured cabling contractor.

H. The terms “not in contract” and “NIC” shall refer to work or equipment that is not in the contract covered in this specification.

I. The terms “owner furnished equipment” and “OFE” shall refer to equipment which shall be furnished by the Owner or user to the Contractor. The Contractor shall be responsible for installing the equipment at the project site in good functional order as detailed herein. Where the equipment is existing or is used, the AV Contractor shall verify the operation and functionality of these devices prior to installation. Any deficiencies shall be brought to the Owner and Consultant’s attention immediately via written documentation.

~~J. The term “owner-furnished, contractor-installed” and “OFCI”…shall refer to xxx~~

~~K. The term “owner-furnished, owner-installed” and “OFOI” shall refer to xxx~~

~~L. The term “turn-key” shall refer to xxx~~

M. The term “procure” shall indicate the responsibility to acquire materials, equipment, or services needed to complete the project scope.

N. The term “furnish” shall indicate the responsibility to ship or deliver the item to the job site for receipt, staging and installation by others.

O. The term “install” or “installation” shall indicate the responsibility of receiving the item at the job site, providing adequate storage, unpacking or uncrating the item, physically securing the item or otherwise making ready the item for its intended use by following the instruction and approved methods of the manufacturer and those contained herein.

P. The term “provide” shall refer to the responsibility to both procure, furnish, install, test and certify equipment.

Q. The term “shall” is mandatory; the term “will” is informative; the term “should” is advisory.

1.05 SCOPE OF WORK

A. The completion of the work described within this specification section shall be the sole responsibility of one (1) firm, hereafter referred to as the AV Contractor or AVC. The AVC shall be responsible for providing all equipment, cabling, programming, testing, training and commissioning as described in this specification section.

B. The AV Contractor shall provide all equipment, cabling, programming and materials, whether specifically mentioned herein or not, to ensure a turn-key and fully operational system.

C. The specifications and drawings shall be read and used together. System features which are mentioned in the one are not necessarily shown in the other. In case of conflict between the drawings and specifications, request clarification via the pre-bid RFI proves. These pre-bid RFIs are due one (1) week before the bids are due. All pre-bid RFI responses shall be distributed to each Bidder.

1.06 System descriptions and functions

A. Lobby

1. A local digital signage display for wayfinding or announcements with a digital signage player mounted behind the display.

B. CR Observation, Day Room, and Large Therapy

1. A local display protected by an anti-ligature shroud. The display will have the ability to show digital signage, and wireless screen sharing.

2. Devices include a digital signage player, wireless presentation, and network equipment to send audio to ceiling PoE+ speakers. Devices must be mounted in the recessed display backbox.

3. Each display will be connected to two (2) ceiling recessed PoE+ speakers for improved audio quality.

4. Displays are controlled by a local passkey protected control panel to change display sources, volume, and power.

C. Visit/Tele

1. A local display protected by an anti-ligature shroud. The display will have the ability to show digital signage, wireless screen sharing and wireless conferencing.

2. Devices include a digital signage player, wireless presentation, and VTC equipment to. Devices must be mounted in the recessed display backbox.

3. Display will be connected to a VTC bar rigidly connected to the protective shroud.

4. Displays are controlled by a local passkey protected control panel to change display sources, volume, and power

D. Conference

1. The display will have the ability to show digital signage, wireless screen sharing, wireless conferencing, and local HDMI plate.

2. Devices include a digital signage player, wireless presentation, and VTC equipment to. Devices must be mounted in the recessed display backbox.

3. Display will be connected to a VTC bar rigidly connected to the protective shroud.

4. Displays are controlled by a local passkey protected control panel to change display sources, volume, and power

1.07 RELATED WORK BY OTHER TRADE CONTRACTORS

A. General Contractor: It is the responsibility of the GC to furnish and install all steel not shown on the Structural drawings but required for the Audio-Video equipment rigging and support. Additionally, the GC shall provide plywood backing to support video flat panel monitors, video walls, etc.

B. Electrical: It is the responsibility of the EC to furnish and install the work described in the Electrical documentation. All high-voltage work shall be done by the EC only.

1. It is anticipated that the AV equipment rack grounding bar shall be provided and installed by the EC / Tele-Data Contractors. See drawing detail sheets for additional information.

C. Tele-data: It is the responsibility of the Tele-Data / IT Contractor to furnish and install network data drops (including those designated as Dante signal types) and wireless LAN access point equipment that shall be utilized by the AV Systems and one-line diagrams. AVC shall closely coordinate their requirements with the Tele-Data Contractor.

1.08 MILESTONES

A. CA Kick-Off Meeting: Upon the contract award, and within twenty (20) working days, the AV Contractor shall initiate / set-up a meeting to discuss the project scope of the work, general project expectations and, but not limited to the following agenda items:

1. AV System Functionality
   a. Audio DSP programming, presets and operations
   b. Control system functionality / preliminary discussions

2. Shop Documentation and Submittal Schedule

3. Installation Schedule / Timetable
   a. Equipment delivery issues / lead times (if any)
   b. Substantial Completion
   c. Final Acceptance Testing

4. As-built Documentation

5. Owner Training

B. Electrical Infrastructure Site Survey: The AVC shall coordinate an electrical infrastructure & box site survey (box walk) with the GC & EC prior to the installation of drywall and ceiling and /or hard lid ceilings. AVC shall issue a report as to their findings to the OAC team so that identified issues can be resolved in a timely manner prior to the installation of the drywall or wall finishes.

1.09 BID SUBMITTALS

A. AV Contractor's Qualifications: Bidders shall submit a qualification package demonstrating compliance with all the requirements specified herein. Refer to 1.11 QUALITY ASSURANCE. At a minimum, the qualification package shall include the following:

1. A list of AV systems of comparable size and scope to that described herein, completed by the AV Contractor in that last five (5) years. Provide the project name, address, year of completion, and the name and telephone number of a person to contact who is a representative of the facility.

2. A personal resume of formal education, experience, and certifications of the identified team members. Including Project Manager, Project Engineer, and Software Programmer.

3. A description of the AV Installer's capabilities and facilities for rack assembly, shop fabrication software programming, repair, and servicing of AV systems.

4. A letter from the control system manufacturer(s) certifying that the AV Installer's software programmers have been factory trained and are qualified to provide the proposed installation.

5. All certifications and licenses shall be current must be held by the AVC for no less than one (1) year prior to this bid submittal

1.010 SUBMITTALS

A. Long Lead-Time Items: Prior to submittal of Shop Documentation, and within one (1) month of contract award, the AVC shall submit a list of anticipated long lead-time items (i.e., items with a lead time of 8 weeks or longer) for early approval. It is expected that all items listed in this submittal be furnished immediately upon approval.

B. Shop Documentation: The Shop Documentation submittal shall include the following items to be submitted simultaneously, no exceptions.

1. Bill of Materials: A complete list with quantities of equipment to be provided for the systems, including that required for items which are to be fabricated by the AV Contractor (i.e., a bill of materials). Products shall be listed in the same order as found herein. No exceptions.

2. Product Data: A complete set of manufacturer's equipment specifications with detailed technical information describing and illustrating all components and materials to be used in the installation of the AV systems. This would include those items listed by manufacturer and model number herein and any other components needed to provide complete functional systems.

3. Cabling Schedule: A complete materials list containing cable type, cable marker identifier, connector type, and origin and destination location for each cable.

4. Shop Drawings: The shop drawings shall be submitted after the award of contract and be of a scale suitable for use for fabrication. The AVC shall maintain on-site a hardcopy of their shop drawings detailing the latest as-built conditions. AV Contractor shall make the following shop drawings submittals:
   a. A one-line signal flow block diagram showing exactly the manner in which the AV Contractor proposes to install the system. Show all switches, modifications to equipment, relay and control circuits. Show all equipment/apparatus items which are required for realization of the functions described herein.
   b. Detail diagrams of items which are to be fabricated by the AV Contractor and/or which the AVC intends to fabricate or has fabricated, including, but not limited to, the custom panels

and receptacle plates. They shall show materials, finishes, panel/control markings, and complete dimensions when applicable.

c. Detailed diagrams showing equipment rack layouts.

d. Detailed diagrams showing loudspeaker mounting details with all hardware identified by manufacturer and model number.

~~e. A signal loss diagram for the coaxial distribution of video signals with calculations to verify that the signal strength at each endpoint is within industry specifications.~~

~~f. Any wireless microphone or monitor system shall indicate its proposed frequency band (such as G50 or J50A) on the one-line signal flow interconnect diagram.~~

C. Field Reports:

1. Electrical Infrastructure Site Survey required in Part 1 article “Milestones” of this Section.

2. System Start-Up Report specified in Part 3 article “Initial System Start-Up” of this Section.

D. Closeout Documents: Prior to Final Acceptance, AV Contractor shall submit the following:

1. System test reports, as specified in Part 3 of this Section. These documents are required twenty-one (21) calendar days before the anticipated final acceptance testing, else the appointment shall be rescheduled.

2. Updated control system and DSP source code and executable files, with all tunings and adjustments incorporated.

3. Updated frequency coordination, including specific “real world” frequency selection, showing no intermodulation distortion or channel conflicts.

4. Complete and accurate Final As-Built Drawings prior to final acceptance testing.

5. O & M manuals / documentation, programmable software files and executables as specified herein.

6. Written warranty, as specified herein, to take effect after the Consultant Final Acceptance Testing has occurred and any punch list-items have been completed.

1.011 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:

1. All electronic products shall be designed and marketed by the manufacturer for application in professional sound amplifying, reproduction and recording systems.

2. Obtain common materials and equipment through one source from a single manufacturer as much as practical.

B. Installer Qualifications:

1. Project Manager: At least one (1) person involved in the daily installation of these systems shall hold an AVIXA CTS-I certification.

2. Project Engineer: A qualified staff engineer shall have five (5) years minimum experience and be certified as an AVIXA CTS-I. In place of a qualified staff engineer, the AV Contractor may retain a consulting engineer to direct the project. The staff or consulting engineer shall:
   a. Provide all technical liaison between the AV Contractor and the Construction Manager.
   b. Represent the AV Installer at meetings and conferences and be present at the job site for final inspection.
   c. Be responsible for the supervision of all technical and engineering work required to execute the contract and approve and sign the shop drawings.
   d. The staff engineer shall remain on the project (at a minimum) in a supervisory role until the completion of all AV-related work.

3. Software Programmer: A manufacturer-certified software programmer shall be required to author the control system programming component of this project.

4. The AVC's installation team members shall hold the following documentation of the following manufacturer certifications and training:
   a. Q-SYS Level 2
   b. Q-SYS Control & UCI Fundamentals through Advanced

C. Once site installation begins, written field updates, including photos, shall be required every two (2) weeks.

D. Final Acceptance: Final Acceptance will be contingent upon issuance by the AV Consultant of a letter of acceptance stating that the work has been completed and is in accordance with the contract documents. This is when the warranty period shall begin and not at "Substantial Completion".

1.012 DELIVERY, STORAGE, HANDLING

A. AV systems, infrastructure, raceways and equipment are sensitive to environmental conditions such as temperature, dirt, dust, and water. The AV contractor shall ensure the storage and installation of all AV Systems components are sequenced and scheduled accordingly to prevent any damage, loss of performance, and warranty void of such systems. All miss-installed components shall be replaced with new parts and re-installed at the AV Contractor's expense.

B. The AV Contractor shall ensure the storage and installation of all AV Systems components are sequenced and scheduled accordingly to prevent any damage, loss of performance, and warranty void of such systems.

C. All incorrectly installed components shall be replaced with new parts and re-installed at the AV Contractor's expense.

1.013 WARRANTY

A. Manufacturer Warranties:

B. Provide a written warranty, signed by the AV Contractor, due when the AVC issues the As-Built Documentation. The warranty period shall equal the requirements described the Division 00 sections.

C. Include the following provisions:

1. Warranty all equipment and the installation to be free of faulty workmanship.

2. Warranty all components, including solid state devices, to be free of defects.

3. Paint and exterior finishes, fuses and lamps are excluded from above warranty, except when damage or failure results from defective materials or workmanship covered by the warranty.

D. If, within the warranty period of the installation or within a longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents or provided by a manufacturer, any of the work or equipment is found to be defective or not in accordance with the Contract Documents, the AV Contractor shall correct it promptly including all parts and labor after receipt of notice from the Owner to do so unless the Owner has previously given the AV Contractor a written acceptance of such condition. This obligation shall survive termination of the contract. The Owner shall give such notice promptly after discovery of the condition. Such notice shall be provided by Owner representatives, to be identified, either verbally or in writing.

E. Nothing contained in the Contract Documents shall be construed to establish a shorter period of limitation with respect to any other obligation which the AV Contractor might have under the Contract Documents or any manufacturer's warranty. The establishment of the time period noted above, after the date of Final Acceptance or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligation of the Contractor to correct the work or equipment, and has no relationship to the time within which their obligation to comply with the Contract Documents may be sought to be enforces, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to their obligations other than specifically to correct the work or equipment.

F. The Owner reserves the right to expand or add to the system during the warranty period using firm(s) other than the AV Contractor for such expansion without affecting the Contractor's responsibilities, provided that the expansion is done by a firm which is an authorized dealer or agent for the equipment of system being expanded.

G. Structured Cable:

1. The manufacturer shall provide a warranty with a minimum term of twenty-five (25) years for structured cabling and all communications cable infrastructure components. This warranty shall cover all components including cables, jacks, patch panels, and wiring panels, etc. to maintain the specified performance, physical criteria, and applications assurance.

2. Any such components, link, or channel shall be replaced by the manufacturer at no cost to Owner during this period.

3. The Contractor and Manufacturer shall submit all information and documentation on Warranty

H. Service Warranty:

1. Replace defective materials and repair faulty workmanship within 72 hours of discovery at no cost to the Owner during the period of the Warranty.

2. If during the warranty period, system operation is not fully restored, or a working temporary solution is not deemed acceptable by the Owner, within four (4) business days, the Owner reserves the right to require the Contractor to provide on-site manufacturer's service technicians at no additional cost.

3. At no additional charge, provide maintenance service for a period of one (1) year after the AV Consultant's Final Acceptance of installation. This service shall consist of at least one (1) visit six (6) months and one (1) visit eleven (11) months after Final Acceptance for regular maintenance responsibilities, checking equipment and systems operations / functionality, and rigging safety. The AVC shall make all necessary adjustments in a timely manner.

4. If, during the warranty period, any component is out of service for more than four (4) days due to unavailability of parts or service, supply and install an identical new component. If an identical component is not available, temporarily substitute equivalent equipment, but only with the written approval of the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Unless otherwise indicated, equipment in this Section shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. All components used in the system shall be commercial designs that comply with the Specifications.

B. All materials, equipment and apparatuses shall be new and of the latest design or model offered for sale by the manufacturer.

C. Each major component of equipment shall identify the manufacturer's name, model and serial number. Items of the same classification shall be identical. This includes equipment, modules / cards, parts, and components.

D. Principal items of equipment and apparatuses are identified herein by part number and manufacturer. Alternate part numbers and manufacturers are identified in instances in which equivalence has been determined.

E. Acceptability for use in the systems shall be determined by the AV Systems Consultant. Such items shall be installed only after receipt of written approval. The Consultant retains the right to reject products which reflect, in the Consultant's opinion, sub-standard design practices, manufacturing procedures, support services, or warranty policies.

2.02 SUBSTITUTE EQUIPMENT

A. AV Contractors who wish to provide substitution options to the base bid may do so by providing a completely separate and discrete bid document in addition to the original bid documentation.

B. All substitution devices shall provide equal or better electronic or acoustical performance than the originally specified devices. This submittal would require a new EASE model for any proposed loudspeaker(s) to verify compliance with the Construction Documents where necessary.

C. The AV Consultant shall be the final judge regarding the validity of substitution bid data submitted. Acceptance of any / all substitutions shall be under the direction of the consultant only, who may or may not accept the substitution with or without explanations. The consultant approvals or rejections shall be noted as final. No exceptions.

2.03 MANUFACTURERS QUOTES

A. Though manufacturers may provide quotes for equipment intended for use in this scope of work, it is the responsibility of the AVC to verify the completeness of any such quotes / documentation as they are solely responsible for any discrepancies that arise during the shop drawing process and installation. No additional requests for payment after the bid award with regards to manufacturer quote discrepancies will be accepted.

2.04 DEVICE QUANTITIES

A. Every attempt has been made to provide an accurate and detailed equipment schedule. However, when a discrepancy is found, the quantities found on the one-lines shall take precedence over the equipment schedule specified herein. AVC shall issue a pre-bid RFI requesting clarification no later than five (5) working days prior to the bid due date. Responses shall be provided to all bidders prior to the bid due date.

2.05 EQUIPMENT SCHEDULE

A. Refer to Appendix A for the Audio-Video Systems equipment schedule.

2.06 EQUIPMENT PERFORMANCE SPECIFICATIONS

A. For all items which are identified by part number and manufacturer, performance specifications which are published in the most recent manufacturer's data sheets available at the time of bidding this contract shall be applicable to the present work as though fully written out herein.

B. For those items which are not identified by part number and manufacturer, the AV Contractor may select items which conform to the functional and/or technical specifications. For all such items, the AV Contractor shall submit for approval all technical data which is available from the supplier or manufacturer.

C. All terminated and bulk cable types shall be submitted in the shop documentation prior to purchase and installation.

2.07 CABLING, WIRING AND CONDUCTORS

A. General Notes:

1. Any specific cable AWG gauge detailed in the drawing package supersedes this document. These cable types are cited to illustrate the type and quality of cable required. Plenum cable must be utilized as required. Unless otherwise noted, cables from other reputable manufacturers will be considered acceptable only if data sheets are submitted and approved by the AV Consultant prior to installation. The AV Contractor must verify cable lengths and confirm the suitability of the cables listed above but may change based on field conditions. Where signal loss is beyond anticipated norms, the AVC shall coordinate with manufacturers and the AV Consultant to select a cable that will meet or exceed the requirements. No exceptions.

2. Cables running in plenum areas without conduit shall be plenum rated cable and match the specified cable below. It is the responsibility of the bidder to inspect the electrical drawings and verify in what spaces plenum cable shall be used. No claims for additional monies, based on the use of plenum cable, will be allowed.

3. All cables (except video and pulse cables which must be cut to an electrical length) shall be cut to the length dictated by the run. No splices shall be permitted in any pull boxes without prior permission of the AV Consultant. For equipment mounted in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length based on the bend radius of the cable.

4. All cable that shall be used in outdoor applications shall be tactical / outdoor rated weather block cable and all connectors shall also be outdoor rated Neutrik “True Outdoor Protection” terminations where applicable.

5. All category cable channels, including patch cords, and patch bays must not exceed the 100-meter length. If it is determined in the field that a run will exceed this distance, immediately contact the AV Consultant for consultation and direction. No exceptions.

6. All USB-C cables must comply with the following:
   a. EMCA Certification for electromagnetic compatibility (EMC) and electromagnetic interference (EMI).
   b. Be rated as a Billboard Device to announce its capabilities to connected components.
   c. Be rated to USB 3.2 [Gen 1 (5 Gbps) or Gen 2 (10 Gbps)] as indicated.
   d. Be rated to support Power Delivery (PD) at the Profile/wattage level as required to fully power the connected device.

B. Approved Bulk Cabling

Approved Bulk Cabling for Audio-Video Systems					
Type / ID	Signal Type / Application	Cable Type	OSP / Plenum	Manuf.	Model
Analog Audio					
AA01	Mic / Line Audio (Mono Signal)	22 AWG STP	-	Belden	9451
			Plenum	Belden	9451P

			OSP	Belden	9451WB
RF Distribution					
RF01	50-Ohm Antenna (Low-Loss)	10 AWG Coax (RG-8 Type)	-	Belden	9913
			-	ECORE	EMR-400
			Plenum	Belden	89913
			OSP	Belden	9914
UTP					
U01	Control / Network Applications (Not audio or video streaming)		Plenum	Belden	2433
			OSP	Belden	OPS6AU
STP					
S01	4k / 8k HDBaseT Video Applications	4pr 23 AWG STP	-	Belden	2183R
			Plenum	Belden	2183P
			OSP	Belden	2141A
S02	Dante, AES67, NDI, and other audio or video over IP applications	4pr 23 AWG Cat6A STP	-	Belden	10GXS12
			Plenum	Belden	10GXS13
Control					
C01	IR & Serial Control (RS-232/-422)	4pr 22 AWG STP	Plenum	Belden	1502P
C02	Serial Control (RS-485) or DMX-512 (4-cond)	2pr 24 AWG STP	-	Belden	9842
			Plenum	Belden	82842
C03	Dry Contact & Signal Input / Output	1pr 22 AWG STP	-	Belden	8761
			Plenum	Belden	82761

C. Pre-Terminated Cables

Type / ID	Signal Type / Application	Cable Type	Manuf.	Series
	HDMI 2.1 8k60 4:4:4		Crestron	CBL-8K-HD
	Balanced XLR		Mogami	Gold Studio

2.08 FABRICATED MATERIALS

A. Designation / Engraving

1. All equipment controls, receptacles and all indicators shall have, unless otherwise noted, etched, permanently engraved, or silk-screened fully descriptive identification labels. The resolution of silk-screened labels shall not be less than 90,000 dots/sq. in.

2. The word “engraved” shall mean that the identification shall be engraved into the indicated panel, plate or control surface.

3. All engraving shall be with 5/32-inch high characters, unless otherwise noted, and shall be filled with engraver’s enamel of a contrasting color.

B. Receptacle Plates:

1. Receptacles shall be screwed, bolted or flush-riveted to the plate.

2. Plates shall be marked to indicate function and circuit of the receptacle, for example: MICROPHONE. Each receptacle shall have a discrete and unique identifier, for example: MIC 1, MIC 2, etc. All identifiers shown on the Contract drawings are for reference only.

3. All wall plates shall be powder coated rather than having an adonized finish.

4. Color and finish of blank panels and custom assembly panels shall match adjacent equipment panels to the extent possible. The finish of wall mounted receptacle panels shall be coordinated with the Architect.

C. Terminals and Terminations:

1. Microphone cables shall not be spliced or otherwise interrupted from termination to termination. All cables shall have visible adhesive identifying markers on each end.

2. Wiring in terminal cabinets shall be tied and clamped neatly to backboards or cable-forms.

3. Terminals shall, unless otherwise specified, be one of the following types:
   a. Wire-wrap type terminal block.
   b. Barrier strips with screw terminals.

4. Each terminal strip shall have a legibly marked identification strip.

D. Structural Assemblies:

1. Provide holes required for securing other components or assemblies to structural steel framing and for passage of other components through steel framing members as shown on final shop drawings. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning.

2. In fabricating mounting brackets and other steel components requiring bends, the radii of the bends shall not be less than three times the thickness of the steel being bent.

3. All bolts and nuts used in the fabrication of mounting hardware shall be Grade 5 or better, i.e. rated five (5) times the anticipated load.

2.09 PAINTED ASSEMBLIES

A. Where the drawings or equipment list call for devices to be field-painted, the AV contractor shall be ultimately responsible for directing/supervising, and/or performing, any painting required. This responsibility shall not be delegated to a paint subcontractor without prior approval obtained through submission of a formal Request for Information (RFI) addressed to the attention of the AV consultant.

B. Loudspeakers and other acoustically transparent surfaces that are to be field-painted shall be painted with non-bridging paint. Product must be able to match any color of existing ceiling or desired look.

1. Basis Basis of Design product: ProCoat ProCoustic
   ProCoat Products, Inc.
   260 Centre Street, Suite D
   Holbrook, MA 02343
   P: (781) 767-2270
   F: (781) 767-2271
   E: info@procoat.com

C. Detach loudspeaker grilles, remove acoustically transparent backing foam (if present), and paint grilles separately. Do not paint grilles while still attached to the loudspeakers.

D. Paint loudspeaker cabinets only after performing the following:

1. Temporarily remove grilles (for painting separately per the requirement listed above); manufacturer logos; and any other detachable parts such as brackets, cable covers, etc.

2. Mask all non-paintable surfaces or sub-components such as acoustic transducers, port holes, and wiring terminal areas.

E. Non-acoustically transparent surfaces, such as back boxes, cover plates, and other devices, shall be hand-painted by the AVC, or under the direct supervision of the AVC, to ensure that access panels, covers, and trim pieces remain accessible after being painted. Grounding/bonding holes, embosses or lugs shall be masked to prevent being painted.

PART 3 - EXECUTION

3.01 INSTALLATION PRACTICES

A. The AV Contractor shall coordinate with EC on conduit/junction box locations for audio equipment and routing of audio, control, and power cables/conduits from terminals, poke-thru /floor and pull boxes, wall plates, and stub-ups to system equipment racks. This shall be done prior to the installation of wall or ceiling finishes.

B. Installation shall include the delivery, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, interconnecting wiring of the system components, equipment alignment and adjustment, and all other work whether or not expressly required herein which is necessary to result in complete operational systems.

C. Contractor shall construct AV equipment racks and sub-assemblies, including all equipment to be installed therein off-site. All wiring work, labeling of wiring, cable dressing, hardware supports, and connection panels, cable wiring documentation, socket installation, ventilation and power supply regulation and filtering component installation shall be performed in AV Contractor's own premises.

D. The Contractor shall not deliver equipment in original packaging to the site for installation. All such equipment will be unpacked and checked thoroughly in AV Contractor's premises. Contractor shall test such equipment as it is received to ensure that it conforms to the manufacturer's specifications. On no account shall the Owner be liable for any delays of completion of the installed system due to defective equipment being received by Contractor.

E. Keep the job adequately staffed at all times. Designate a field supervisor to be present on the job site and in responsible charge during all phases of installation and check out. Maintain the same supervisor throughout the execution of the work unless circumstances beyond the control of the AV Contractor intervene. Install the system in cooperation with other trades in order to achieve coordinated progress and satisfactory final results. Watch for conflicts with work of other trades on the job. Execute without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or preserve symmetry and pleasing appearance.

F. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors. Any issue regarding a visual aesthetic shall be brought to the attention of the GC and Architect immediately so that all parties can coordinate and provide an adequate solution in a timely manner.

G. For the purposes of coordination with Architects specified furniture, the AV Contractor will ensure that such equipment or mounting hardware is compatible with and suitable for installation in that furniture. It shall be the AV Contractor's responsibility to ensure they coordinate with the furniture and / or millwork contractor and that parties shall exchange and follow their Shop Drawings to ensure that dimensions and structural supports are adequate for the AV equipment installation. It is the AV Contractor's responsibility that the request and delivery of such critical coordination information is satisfactorily executed and in as much as the Contractor has control over the delivery of such information, the AV Contractor shall deliver it as requested by the Architect.

H. The equipment specified herein must be capable of operation in environments of normal humidity, dust and temperature. AV Contractor should avoid installing equipment where extreme environmental conditions can occur and shall be responsible for protection of equipment and related wiring from such conditions.

I. The AV Contractor shall take precautions to prevent electromagnetic and electrostatic hum. Install the equipment to provide safe operation. Provide ventilation as required to maintain equipment within the manufacturer's specified temperature limits.

J. The AV Contractor shall do all cutting and patching necessary for proper installation of the system and shall repair any damage done by themselves or their workers. Any required penetration of slabs or CMU walls shall be made by a cutting method rather than by a concussive method.

K. All installation practices shall be in accordance with, but not limited to, the general design and construction requirements of the Architect, and these specifications and drawings.

Installation shall be performed in accordance with the applicable standards, requirements and recommendations of local authorities having jurisdiction (AHJ). Before commencing work, the Contractor shall familiarize all project team members with all of these requirements.

L. If, in the opinion of the AV Contractor, an installation practice is desired or required, which is contrary to these specifications or drawings, a written request for modification shall be made to the AV Consultant and / or Architect. Modifications shall not commence without written approval.

M. During the installation, and up to the date of issuance of the Final Acceptance Memorandum, the AV Contractor shall be under obligation to protect their finished and unfinished work against damage and loss. In the event of such damage or loss, they shall replace or repair such work at no cost to the Owner.

3.02 GENERAL INSTALLATION PROCEDURES

A. Locate all apparatuses requiring adjustments, cleaning or similar attention so that they will be accessible.

B. All boxes, equipment, wall plates, loudspeakers, antennas, and cabling shall be secured plumb and square.

C. All supporting structures and enclosures supplied by the AV Contractor, not having a standard factory paint finish, shall be painted. Paint specifications and color shall be supplied by the Architect.

D. Clearly, logically and permanently mark switches, connectors, jacks, relays, receptacles, cables and cable terminations.

E. Etch, engrave, silk screen or apply in a similar permanent manner all legends and markings on all custom panels and receptacle plates. Embossed tape, press type, etc., are not acceptable.

F. Provide all cables necessary for interconnection of permanently mounted equipment. Use terminations required to achieve full function of equipment as specified herein.

G. Exercise care in wiring, to avoid damage to the cables and to the equipment. Make all joints and connections with rosin-core solder or with mechanical connectors approved for Class I wiring. Execute all wiring in strict adherence to standard broadcast and BICSI procedures. AVC shall adhere to the cable manufacturers' recommended cable bend radius, no exceptions.

H. Run lines in separate metallic conduits for line level circuits (up to +30.0 dBm), loudspeaker circuits (above +30.0 dBm) and power circuits. Non-metallic or PVC conduits for AV system wiring are not acceptable. Confirm with EC that all metallic raceways have been properly bonded. Use only cables which are insulated from the conduit and from each other for the entire conduit length.

I. All shielded audio cable shall be bonded at both ends. Do not ground audio cable shields only at the source end. Preserve continuity of microphone shields at both connecting points. Connect all audio grounds in this system to a common point.

J. All equipment shall be firmly secured in place unless the equipment has been documented to be portable in nature, either within this Specification or as shown in the Construction Documents.

K. All fastenings and supports shall be adequate to support their loads with a safety factor of five (5) times the load weight or as required by ESTA , whichever is greater. Wind shear must be taken into account when installing all outdoor pole mounted devices.

L. All loudspeakers shall be installed according to the manufacturer's instructions. All loudspeakers shall be installed with a secondary seismic safety harness assembly in addition to the specified loudspeaker mount. No exceptions.

M. It is the responsibility of the AVC to test all loudspeakers and/or loudspeaker line arrays for sound pressure levels to verify that the full frequency spectrum coverage area is uniform throughout the listening area. AVC shall reposition and or adjust aiming angles as necessary until uniform full frequency coverage is reached per the specification. This work shall be done as part of this contract and no additional funds shall be provided to the AVC to accomplish this requirement. No exceptions.

3.03 COORDINATION

A. All work shall be reviewed and coordinated with the GC prior to commencing work.

B. The AV Contractor shall coordinate all AV equipment connections, panels and control locations with the Architect prior to installation.

C. Coordinate installation with Structural, Electrical, Mechanical, Plumbing, Fire Protection, and other trades to eliminate disruption and/or conflict with other systems.

D. Sequence installation of the AV Systems and infrastructure with other work to minimize possibility of damage and soiling during remainder of construction.

3.04 structural installation requirements

A. It is the GC's responsibility to provide structural support elements for the mounting of audio-video equipment. AVC shall closely coordinate with the GC regarding structural support required to safely install the AV equipment as needed.

B. Structural support elements are defined as those materials added to the structure for the reinforcement of general construction methods to meet a designed minimum load factor of five (5). These include but are not limited to:

1. Backing boards / plywood required for the support of audio-video equipment or cabling.

2. Strut supports hung from structural beams or concrete slab.

C. The AV Contractor shall provide all audio-video mounting and rigging equipment that fasten to the structural support elements.

D. All support elements and fastenings shall be able to support a minimum load factor of five (5) times the total assembled weight.

E. The AV Contractor shall be responsible for the complete and correct installation of all the audio-video equipment.

F. Hard Ceiling Lid Loudspeaker Locations: Hard lid ceiling loudspeaker locations requiring trim rings, rough-in brackets, and back boxes shall be installed during conduit installation where possible.

1. The Contractor shall install the trim rings, rough-in brackets, and back boxes for hard ceiling locations in a timely manner, not to conflict with scheduled work of other trades. In the event that this equipment is not installed in a timely manner, the Contractor shall be responsible for all retrofit work and materials to provide a fully functioning speaker assembly.

G. Trim and Escutcheon Components:

1. To ensure a proper finished appearance, the AV Contractor shall furnish and install trim / escutcheon components in all conditions where AV components pass through the finished walls, floors and ceilings. This would include but not be limited to video projector supports, video flat panel monitors, and control panels for supports which are not specifically supplied with integral flanges / trim components.

2. The visible component of any trim shall be as small as possible, preferably no wider than 1/2-inch. All trim components at the ceiling plane shall be finished to match the approved ACT ceiling grid system components. The AVC shall obtain a sample from the GC, including any custom color information, or standard color numbers. All trim components shall be submitted to the Architect for review and approval prior to fabrication.

3.05 BONDING

A. The Contractor shall be responsible for correcting any signal grounding problems within the AV System (excluding Division 26 grounds) including but not limited to electromagnetic / electrostatic hums, ground loops anomalies, and distortions.

B. A bonding buss bar shall be installed at each equipment rack location. The copper buss bar shall be sized to accommodate all connections plus future expansion.

C. In locations where multiple AV equipment racks exist, they shall be bonded to each other as well as bonded to the Secondary Bonding Bus Bar (SBB).

D. Ground all components according to the following methods:

1. Equipment having a power cord without a grounding conductor connected to chassis: Furnish and install 14 AWG grounding conductor from the component's metallic chassis to grounding buss bar within rack.

2. Equipment having a power cord with a grounding conductor connected to chassis: Do not install an additional grounding conductor.

E. Shielded audio signal cables shall have the shields terminated at both ends. No exceptions.

F. All video and data shielded cables shall have the shielded conductors terminated on both ends.

3.06 PATCH PANEL ASSIGNMENTS

A. The Contractor shall provide patch panels that shall be the same category as the cable being passed through them and match the more stringent category rating if multiple cable types are terminated there. The AVC shall provide shielded terminations that also match the category of the most stringent cable type.

B. All patch panels shall be wired so that the signal “sources” (outputs from) appear on the upper row of a row pair; and all “loads” (inputs to) appear on the lower row of a row pair.

C. All audio and video patch panel designation strips shall utilize alphanumeric identifications and descriptive information. The jack position in each horizontal row shall be numbered sequentially from left to right. The horizontal jack rows shall be lettered sequentially from top to bottom. The alphanumeric identification of each jack shall be included on the shop documentation functional block drawings, as well as on reproductions of these drawings, which shall be mounted in an appropriate location near the patch bays.

3.07 CABLE INSTALLATION

A. All cables for this project must conform to the latest version of NFPA 70 as well as local code requirements.

B. Where existing cabling is to be abandoned, it shall be completely removed as directed in the NFPA 70 / NFPA 72. No exceptions.

C. All cables, regardless of length, shall be marked with permanent wrap-around number letter cable markers at both ends. There shall be no unmarked cables at any place in the system. Wire labels done by hand in the field must be replaced with computer-generated labels for legibility. Marking codes used on cables shall match the codes / labels shown on the AVC shop drawings and on run sheets.

D. CAT6A / 4k cable runs shall not exceed the most current BICSI telecommunications cabling standards, i.e. 100 meters inclusive of all cross-connects and patches. When the distances are longer, the AVC must coordinate with the cable manufacturer to verify performance is still within the acceptable range of performance for this scope of work. No exceptions.

E. Internal and inter-rack cabling shall be neatly strapped, dressed, labeled, and adequately supported without pinching the cable bundle.

F. Use only Velcro-type cable straps to mount and bundle all cables. The use of plastic wire ties is prohibited. No exceptions.

G. Terminal blocks, boards, strips, or connectors shall be furnished for all cables that interface with racks, cabinets, consoles, or equipment modules. The use of “wire nuts” to terminate or connect cabling is strictly prohibited.

H. All cables and bundles shall be grouped according to the signals being carried. In order to reduce signal intermodulation distortion, separate groups shall be formed for the following cables:

1. Power loudspeaker cables
2. Low voltage system cables
3. Video cables / Category cables
4. Audio cables carrying signal levels less than -20.0 dBm
5. Audio cables carrying signal levels between -20.0 dBm and +20.0 dBm
6. Audio cables carrying signal levels greater than +20.0 dBm

I. All cables shall be continuous lengths without splices. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No bare wire terminations shall be allowed, unless specified on the drawings. No exceptions. Heat-shrink tubing shall be used to insulate the ground or drain wire.

J. All solder connections shall be made with rosin-core solder using temperature-controlled solder stations. No cold or cracked solder joints are acceptable. Any connections, which do not appear to be clean and shiny, or which show signs of cracking, shall be re-soldered by the AV Contractor before Final Acceptance testing of the system.

K. Mechanical connections using insulations, crimp-type connectors shall be bonded to the connector by soldering the wire to the metal part of the connector.

L. Connections made with screw actuated pressure type terminal strips shall be made by stripping approximately 1/4-inch of insulation from the stranded connector. The un-tinned wire shall be inserted into the terminal and tightened.

M. All wire bundles are to be neat and combed free of cable crossovers.

N. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer.

O. All wire markers / labels shall face a common direction.

P. All cables shall have proper connector housing.

Q. All cables located in the ceiling areas, excluding corridors, where conduit as not been provided for are to be J-hooked and kept separate from data cables with crossovers at ninety (90) degrees. Large conduit sleeves shall be required for all inaccessible ceiling areas or hard lid ceilings.

R. All cable passing through penetrations in fire rated walls must be fire blocked after cable installation by the AV Contractor.

3.08 FIELD QUALITY CONTROL

A. During the installation, the Contractor shall be expected to maintain a clean and safe working environment.

B. Upon completion of the work the Contractor shall remove all their waste material from the site and shall leave the relevant areas and equipment clean and in an operational state. The Contractor shall be responsible for repairing any damage caused to the premises by the AV Contractor's installation activities, at no cost to the Owner.

3.09 PROTECTION

A. Protect Work, stored products, and construction equipment from theft and vandalism.

B. Protect Owner's operations at site from theft, vandalism or damage from AV Contractor's work or employees.

C. Maintain security program throughout construction period, until Owner occupancy or Owner acceptance precludes the need for AV Contractor security.

3.010 INITIAL SYSTEM START-UP

A. Immediately after installing and energizing products and ensuring normal temperature/humidity operating conditions will be maintained, Contractor shall burn-in all mains-powered electronics for a period of not less than 48 hours continuously, to detect any possible “dead on arrival” (DOA) and/or early-life product manufacturing defects.

B. During the system burn-in period, Contractor shall monitor for any failures, degradation, or other anomalies.

C. Upon discovery of any product defects or failures, Contractor must immediately contact the manufacturer support team to begin expedited product replacement.

D. Upon completion of the system burn-in period, Contractor shall submit a written System Start-Up Report, listing which components were burned-in, the duration of burn-in, any abnormal occurrences, and steps taken (or being taken) to resolve any defects, degradation, or failures.

3.011 DEMONSTRATION AND FINAL ACCEPTANCE TESTING

A. General:

1. Final Acceptance Testing shall not be performed until the AV Contractor’s system checkout has been completed, documented, and results submitted to the AV Consultant for approval.

2. Upon approval of the AVC test reports by the AV Consultant, and at a time established by the Consultant, demonstrate the operation of each major component of the system and the completed installation. Typically ten (10) working days after the AVC test documentation / As-Built Drawings have been submitted for approval.

B. Site Testing: To be conducted in the presence of the Architect / Construction Manager / Owner (or representative) and the AV Consultant and shall consist of the following:

1. Final As-Built Drawings, run sheets, O & M Manuals, submitted test results, and other required documents, as detailed in the Construction Documents shall be on hand. One (1) complete set of these documents shall be delivered to the Owner at this time (one complete set shall have been delivered to the Architect prior to the scheduling of Final Acceptance Testing in PDF format).

2. A physical inventory will be taken of all equipment on site and will be compared to equipment lists in the contract documents.

3. The AVC shall demonstrate the operation of all system equipment installed.

4. Both subjective and objective tests shall be required by the AV Consultant to determine compliance with the specifications. The AVC shall be responsible for providing test equipment for this exercise. Therefore, be prepared to repeat and verify test results previously submitted to the AV Consultant. It is anticipated that final loudspeaker tuning / equalization adjustments shall be made at the direction of the AV Consultant.

C. After demonstration, assist as required in the following acceptance tests:

1. Listening tests: These tests may include speech intelligibility survey and subjective aural evaluations by observers at various positions under various operating conditions, using live speech and/or recorded music material.

2. Equipment tests: Any measurements of frequency response, distortion, noise or other characteristics and any operational tests deemed necessary may be performed on any item or group of items to determine conformity with these requirements.

D. Control System Operation: AVC shall coordinate with the Owner to review the operation of the AV system prior to and during installation. During the second training session, the Owner can request additional changes and updates to the GUI and system functionality if they so choose without additional cost to the project.

E. If the need for adjustment or modification becomes fully evident during demonstration and testing, continue working until the installation operates fully in accordance with the requirement of this specification.

F. In the event significant adjustments are required during the Final Acceptance Testing phase, or defective equipment must be repaired or replaces, tests may be suspended or continued at the option of the AV Consultant, Architect, and/or the Owner. The AVC can and shall be responsible for the AV Consultant’s expenses such as, but not limited to, lodging, travel, airfare, and the AV Consultant’s billable time.

3.012 DOCUMENTATION

A. Project Record: The AV Contractor shall supply one (1) clean full-size print of the system drawings which show all changes which were made during fabrication and installation to the Architect / Owner.

B. Maintenance Information:

1. The AV Contractor shall provide technical information for all electronic apparatuses, including but not limited to schematic diagrams and parts lists, manufacturer's installation instructions, operating instructions, and technical specifications.

2. The AV Contractor submittal shall include all shop drawings prepared and used by the AVC, as well as those which were not required to be submitted for approval. This shall include, but not be limited to, wiring diagrams, schedules for identification of building wiring and installation details useful to a maintenance technician.

C. Operation and Maintenance (O & M) Manuals: Provide one (1) hard copy of an instruction manual to the Owner containing the following:

1. Table of Contents

2. Bill of Materials

3. Instructions for operating the system in all modes of operation and for fulfilling all functional requirements.

4. List of settings and adjustments for semi-fixes controls.

5. Manufacturer's sheets of specifications, operating instructions, and service information arranged alphabetically by manufacturer and then by model number.

6. Detailed wiring diagrams and the simplified one-line diagram.

7. All system and device software files, executables, and GUIs.

D. Quick Reference Guides:

1. AVC to provide the Owner with two (2) laminated "Quick-Reference Guides" detailing the operation of each standalone AV system.

2. This shall include both touch-panel layouts and general system "how-to" quick-referenced.

3. This guide should be no longer than two (2) pages where both sides of a standard letter sized sheet are used.

3.013 TRAINING AND INSTRUCTION

A. A minimum of eight (8) hours of training shall be provided by the AV Contractor, at a time mutually agreed upon between the Owner and AV Contractor.

1. Four (4) hours prior to Final Acceptance Testing.

2. Four (4) hours one (1) month following the initial training. This will allow the Owner to acquaint themselves with the system so that they can provide follow up questions as to the systems operation.

B. During the training, the participants shall be given opportunities for “hands-on” experience with operating the controls. There shall be visual and audible demonstrations using the systems themselves as aids. Personnel for instruction and training for the AV systems shall be designated by the Owner.

C. In the event the AVC does not have qualified instructors on staff for projects with sophisticated or complex equipment, the Contractor will provide a manufacturer’s representative for such instruction at no additional cost to the Owner.

D. Training and instruction shall be provided in the presence of the AV Consultant. This condition may be waived at the discretion of the Consultant.

E. Training will be video recorded by the AVC on a DVD / Blu-ray disc or flash drive as designated by the Owner. AVC will supply the equipment necessary to record the training sessions. The AV Contractor shall provide two (2) electronic copies to the Owner and one (1) full-size set of documentation.

SEE APPENDIX ON FOLLOWING PAGES.