SECTION 27 41 17.1 - GYMNASIUM AUDIO VISUAL SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Work in this Section includes, but is not limited to, furnishing, and installing fully integrated audio-visual systems in the in the Gymnasium.

B. This Section and the associated Drawings and Diagrams convey the intent of the design. The system(s) shall be provided in its entirety to provide a complete and working system(s) as expressed by this intent. Items drawn but not specified or specified but not drawn shall be provided as if included in both. Furthermore, it is incumbent on the Contractor to provide any device(s) required to make the system(s) fully functional to the intent of the design, whether indicated or not.

C. Products Supplied but not installed by the Contractor
   1. The Contractor shall coordinate the delivery of items that must be installed by other trades to assure timely delivery.
   2. The Contractor shall verify lead times of all items required under this heading. Should the delivery of such items be delayed due to the Contractor's efforts, or lack thereof, the Contractor shall bear the burden of compensation to all related trades and for any expedited handling, so as to regain any loss incurred by the project schedule.

D. Products Installed but not Supplied by the Contractor
   1. It shall be incumbent upon the Contractor to verify the exact requirements of any system, device, equipment, or Materials supplied to them for installation by others. Any deviations between the Contract Documents and these requirements shall be brought to the immediate attention of the Engineer, and to the other trades as necessary.

E. Devices, equipment, or other infrastructure installed by other contractors in support of this Contractors efforts
   1. It shall be the responsibility of this Contractor to coordinate with the other contractors on the project who shall be providing items such as rough-in box and conduit to facilitate this Contractor's systems and device to verify the appropriateness and location of these items.
   2. This Contractor shall provide any necessary guidance as to the correctness of the information being used by these other contractors. Any item(s) either being provided out of Specification, in the wrong location, or inappropriate for the application shall be:
      a. intervened upon immediately,
      b. communicated to the CM/GC for resolution in writing,
      c. communicated to the Engineer for resolution.
   3. Should the Contractor fail to coordinate, intervene and communicate the issue(s) to the aforementioned parties, it shall be the responsibility of this Contractor to correct such issues at the sole burden of this Contractor.

   Note: It is understood and acknowledged that this Contractor cannot and shall not be held accountable for items of this nature, prior to this Contractor's authorized involvement in this project.

F. Products furnished and/or installed by others requiring integration to the system
   1. Products furnished and/or installed by others requiring integration to the system, e.g. Owner provided displays or projectors shall be fully integrated into the system.
   2. Coordinate with the provider of products.
      a. Provide all needed interconnecting cabling and connectivity.
      b. Provide all needed programming.
      c. Locate all associated devices and materials to facilitate effective integration.
      d. Coordinate with the Electrical Contractor to assure effective placement of any supporting infrastructure provided by EC.
      e. Coordinate with the General Trades to assure effective placement of backing or other materials required.

1.2 DESCRIPTION

A. The systems shall provide room divisibility between the two halves of each gym.

B. The systems shall provide two distinct areas of sound distribution being bleachers and floor.

C. The systems shall provide wireless microphone capability for both scorekeeping/tabletop/semi fixed location functionality and officiating/instructing or other active motion use.

D. The systems shall include connectivity for the Owner provided projector, with wireless connectivity for source input to the projector, and audio output to the audio system.

E. The systems shall include a wall mounted receptacle station for a wired connection from the audio output of the projector into the audio system.

F. The systems shall include a program playback source at the equipment cabinet.

G. The systems shall provide Bluetooth/Aux input connectivity.

H. The systems shall provide control of audio devices by means of a control station providing source selection, individual and master volume control, as well as system/device power on and off utilizing a simple tactile user interface.

I. The systems shall provide ADA required hearing assistance.

J. The systems shall provide a key-switch override for use by first responders to facilitate emergency response directions to the occupants of the space.

K. The systems shall provide a digital input sensing of the fire alarm system to provide a trigger which shall cause ducking of all audio allowing the fire alarm annunciation in the area to be heard.

L. The systems shall provide stereo line level output to their associated Dining Area audio visual systems allowing distribution of any audio to those areas for overflow capability.

1.3 PRODUCTS INCLUDE

A. Products include, but are not limited to,
   1. Audio

a. Microphones and related hardware
b. Audio player
c. Digital Signal Processor
d. Amplifiers
e. Speakers
f. Hearing Assistance

2. Video
   a. Owner provided Projector
3. Control
   a. Control Station
4. Connectivity
   a. Cabling
   b. Wireless AV Extenders
   c. Receptacle Stations
   d. Bluetooth and Auxiliary I/O
5. Hardware
   a. Equipment cabinet
   b. Power Distribution Unit
   c. Grounding

B. Refer to the Drawings for additional information and requirements

C. While due diligence has been exercised to provide multiple product manufacturers for devices and/or equipment, some components, to assure interoperability and/or compatibility, may be a single name specification. Where these items occur, the Contractor shall provide the device as specified without substitution. Should the Contractor wish to provide an alternative device for a single named product, they shall supply a formal product substitution as defined elsewhere in These Documents. This substitution request shall provide all system wide substitutions required to assure all required inter-compatibility and functionality as expressed and/or implied by the intent of the design indicated in These Documents. Such substitutions shall only be acceptable after thorough review and approval by the Engineer. Should the engineer deem a component to be unacceptable, all substitutions within that request shall be deemed unacceptable in the context of that request. Substitution requests shall be made as far in advance as possible to provide the Engineer sufficient time for review. Should insufficient time be available for review to affect bid submission, the Contractor shall provide Materials as specified.

1.4 RELATED DOCUMENTS

A. Related Standards: All requirements of the latest published editions of the following standards and/or codes shall apply, unless otherwise noted. In the event of conflict between cited or referenced standards, the more stringent shall govern.

1. ANSI/INFOCOMM IM-2009 Audio Coverage Uniformity
2. ANSI/INFOCOMM 10:2013 Audiovisual Systems Performance Verification Guide
3. AVIXA F501.01:2015 Cabling Label for Audiovisual Systems
4. AVIXA F502.01:2018 Rack Building for Audiovisual Systems
5. RP C303.01:2018 Recommended Practices for Security in Networked Audiovisual Systems
6. NFPA 70 - National Electric Code (NEC)

B. Related Sections

1. Section 27 01 00 – Communications Common Work Results
2. Section 27 05 24 – Technology Firestopping
3. Section 27 05 26 – Grounding and Bonding for Communications Systems
4. Section 27 05 28 – Pathways for Communications Systems
5. Section 27 05 36 – Cable Trays for Communications Systems
6. Section 27 11 00 – Equipment Room Fittings
7. Section 27 13 23 – Communications Optical Fiber Backbone Cabling
8. Section 27 15 13 – Communications Copper Horizontal Cabeling
9. Section 27 41 16 – Classroom AV System
10. Section 27 41 17.2 – Dining Area Audio Visual Systems
11. Section 27 41 17.3 – Vocal and Music Room Audio Visual Systems
12. Section 27 41 17.8 – Miscellaneous Audio-Visual Devices and Systems
13. Section 27 51 23 – Central Sound and Paging

1.5 QUALITY ASSURRANCE

A. Qualifications:
   1. Bidder Qualifications: To ensure the chosen bidder has the long-term interests of Owner in mind, the following shall be required to submit at bid time for this project. Failure to submit acceptable responses to any/all requirements shall be sufficient reason to eliminate a bidder from consideration. The Owner, in its sole discretion, shall reserve the right to waive any or all the requirements listed below on an individual basis.
      a. Bidder shall have a history of completing projects of like size and complexity for a minimum of 5 years.
      b. Bidder shall provide a list of a minimum of three (3) facilities (facility, contact name, title, address, and current phone number) where the bidder has provided equipment and services of equivalent brand, size and scope within the last 3 years
      c. Bidder shall provide a minimum of one (1) facility (facility, contact name, title, address, and current phone number) where the bidder has provided equipment and services of equivalent brand, size and scope that is at least five (5) years old.
   2. Manufacturer Qualifications: At least 5 years of documented experience in the production of the specified products or as approved by Owner.
   3. Contractor/Integrator Qualifications: An entity that employs installers and supervisors who are trained, approved and, where available, certified by the manufacturer. Full time qualified staff personnel shall be responsible and execute all programming, configuration, and training. Subcontractors for the programming, configuration and/or training purposes shall not be acceptable, and may, at the discretion of the Owner, disqualify the bidder's bid submission.

B. General:
   1. Contractor shall Install all equipment, devices and cabling in compliance with all associated Codes and Regulations, and with the highest degree of workmanship in conformance with the documented standards and industry best practices that apply to these applications.
   2. Contractor shall field verify all work site conditions, including dimensions and site lines prior to submitting shop drawings.
   3. As stated elsewhere in these documents, the Contractor shall be knowledgeable in and perform all installation procedures in accordance with the current release of NFPA 70, the National Electrical Code, as well as any other applicable code or regulations. Furthermore,

all materials utilized in this installation shall be new and UL listed for the application for which it is being utilized.

4. The installation shall be neat and orderly and in accordance with the highest quality as documented in all current governing and industry standards as relating to the installation of said systems, including, but not limited to, NICET, IEEE, EIA/TIA, and BICSI.
5. All terminations and programming shall be completed by technicians trained and certified by appropriate parties, including, but not limited to, InfoComm/AVIXA and the manufacturers from whom the various components are manufactured, as well as previously experienced in completing these tasks.
6. System performance and operational expectations have been developed by using the products Specified herein. Should the bidder wish to provide, AS A VOLUNTARY ALTERNATE, substitutions for these materials whether through formal substitution during bidding, as or a cost reduction measure after Contract assignment, they shall provide the following for evaluation:
    a. During the bidding process, the bidder shall follow defined material substitution requests as outlined in the Division 0/1 Specifications and Related Documents, provide all required materials, and in the timetable allotted,
    b. The bidder/contractor shall be responsible to provide for review and approval, all calculations and/or performance modelling and simulations to substantiate requested substitutions. All audio performance predictions shall be created in EASE for compatibility of that software used by the design team to create the baseline model.
    c. The bidder/contractor shall provide line-item detailed cost savings for a complete list of all items required to both provide complete uniformity of design as well as required modifications to the design to fulfill the intent of the design.
    d. The bidder/contractor shall provide data sheets clearly indicating the proposed materials being substituted for all materials being substituted containing all pertinent and salient performance data.
    e. The Engineer/Owner retains the right to reject proposed substitutions and require those materials, equipment and work as initially specified.

C. Review all architectural, structural, electrical, and other project documents relative to this work.

D. Verify all dimensions and site conditions prior to starting work.

E. Coordinate the specified work with all other trades.

F. Maintain a competent on-site supervisor and supporting technical personnel, acceptable to the Owner during the entire installation. Change of supervisor during the project shall not be permitted without prior written approval from the Owner. On-site supervision shall be provided by a member of the contractor's regular full-time staff who holds a current certified technology specialist - Integrator (CTS-I) as offered through AVIXA/InfoComm International. Lack of a qualified on-site supervisor as defined herein shall, at the discretion of the Owner, be deemed sufficient reason to consider in breach of the Contract.

G. Provide all items express or implied on the drawings or in the specifications that are necessary, required, or appropriate for this work to realize a complete and fully operational system that performs in stable and safe manner.

H. Review project documentation and continuously make known any conflicts discovered and provide all items necessary to complete this work to the satisfaction of the Owner without additional expense. In all cases where a device or item or equipment is referred to in singular number or without quantity, each such reference shall apply to as many such devices or items as are required to complete the work.

I. Provide additional support or positioning members as required for the proper installation and operation of equipment, materials and devices provided as part of this work as approved by the Owner, without additional cost to the Owner.

J. Regularly examine all construction, and the work of others, which may affect Contractors work to ensure proper conditions exist at site for the equipment and devices before their manufacture, fabrication, or installation. Contractor shall be responsible for the proper fitting of the systems, equipment, materials, and devices provided as part of this work.

K. Promptly notify the Owner in writing of any difficulties that may prevent proper coordination or timely completion of this work. Failure to do so shall constitute acceptance of construction as suitable in all ways to receive this work, except for defects that may develop in the work of others after its execution.

L. After installation, submit photographs showing cable entries and terminations within equipment racks, enclosures, and pedestals at the job site.

1.6 CONTRACTOR QUALIFICATIONS

A. The Contractor or sub-Contractor if so, executed shall currently maintain a locally run business within a 100-mile radius for a minimum of five years, and shall be an authorized distributor and service center for the supplied equipment having full warranty privileges.

B. The Contractor or sub-Contractor if so, executed shall maintain at his facility the necessary spare parts in the proper proportions as recommended by the equipment manufacturer to maintain and service the equipment being supplied. These facilities and inventory shall be made available for inspection by the Engineer.

C. At the time of bid submission, the Contractor or sub-Contractor if so executed shall have manufacturer specific certifications, with regard to programming, installation, troubleshooting and servicing, for the system components being provided, in particular certifications for the Digital Signal Processors, Digital Mixing Consoles and Amplifiers, as well as an Infocomm Certified Technology Specialist – Installer (CTS-I) who shall act as the on-site foreman, and an Infocomm Certified Technology Specialist – Designer (CTS-D) who shall act as on staff engineering support. Furthermore, all Dante programming and configuration shall be performed by an Audinate Level 2 Certified technician.

D. The Contractor or sub-Contractor if so, executed shall have a minimum of five installations of like magnitude and complexity within the last three years.

1.7 SUBMITTAL REQUIREMENTS

A. Contractor shall be required to provide submittals and shop drawings to Owner within twenty (20) calendar days of date of award notice, acknowledged with a binding letter of intent. Contractor shall be responsible to ensure that the dimensions and specifications of each component and all systems fit within the building allowances. The Owner, Architect and Engineer must review and approve all submittal documents prior to the start of work. Contractor shall advise the Owner of any discrepancy that could affect installation. If Contractor fails to notify Owner of any discrepancies, Contractor shall assume responsibility for providing the required equipment or correcting such discrepancies at no additional cost to Owner.

B. Submittals that are incomplete, deviate significantly from the requirements of the Contract Documents, or contain numerous errors will be returned without review for rework and re-submittal, and may result in back charges to the contractor

C. Approval of submitted items indicates only the acceptance of the manufacturer and quality. Specific requirements, arrangements, and quantities shall comply with the intent of the Contract Documents as interpreted by the Owner unless specifically approved in writing

D. Submittals shall be provided digitally in PDF electronic file format and include Contractor's approval.

1.8 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Provide a complete LIST of proposed equipment with reference to its corresponding specification paragraph number or equipment title in specification paragraph order. Where multiple devices can utilize the same product data sheet, provide individual submissions for each device specifically hi-lighting or otherwise making the specific selection obvious to the reviewer that information which specifically applies to the device for which the submission is being provided.
2. Provide preparation instructions and recommendations.
3. Provide storage and handling requirements and recommendations.
4. Provide installation methods.

B. Shop Drawings: For all speakers, speaker clusters, equipment racks and related equipment.
1. Include plans, elevations, sections, and attachment details.
2. Include detail drawings of all custom fabricated items and approved equipment modifications.
3. Include complete parts lists, schematic diagrams, and all dimensions required for proper assembly.
4. Include component weight and power calculations.
5. Include point-to-point wiring diagrams from initial signal source to final signal destination and typed wire schedule identifying every connection and cable utilizing an Owner approved cable identification scheme. Include in schedule cable type and gauge. Include all intermediate electronic devices such as all electronic components, transceivers, switches, transformers and terminal blocks. Indicate locations of all components. Identify cables by type, color, and cable identification.
6. Submit conduit riser diagrams showing required conduits and junction boxes along with fill including types and quantities of cables to be contained in each conduit. Where existing

pathways are utilized indicate such re-utilization and restate the specifics of that pathway as to size, etc. as well as any current contents of pathway. Show details of weatherproofing, lightning protection and grounding, strain relief and cable support, fire stop protection, and wall penetrations through all rated partitions.

7. Submit rack layouts indicating the proposed arrangement of mounted equipment including power junction box location. Rack layouts shall be dimensionally accurate and include front and rear views.

1.9 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Manufacturer and Installer
   1. Submit a list of all lower tier subcontractors and suppliers. List shall include lower tier subcontractor's qualifications indicating performance of similar work on past projects of this type and scope, as well as indicating any special certifications associated with said work; e.g. submit a copy of the certification(s) held by the party responsible for the termination and testing of the fiber optic system. The Owner reserves the right to reject any subcontractors without reservation or cause and shall have the final authority on such rejections.

B. Product Test Reports: For each type of equipment, for tests performed by a qualified testing agency.

C. Product Certificates: For each type of equipment.

D. Project Schedule: Outlining equipment delivery dates and installation start and finish dates. Project schedule shall be broken down into sufficient detail (work task and duration) to permit Owner to monitor installation progress on a daily basis. Include required approval dates by Owner/Architect.

E. Field quality-control reports.

F. Sample Warranty: For all manufacturer's special warranties and system warranties.

G. Copies of all required business and contractor licenses.

H. Proof of Insurance

1.10 CLOSEOUT SUBMITTALS

A. In addition to any close-out requirements that may defined elsewhere in these Documents, when the installation is substantially complete including the Testing Reports in Part 3 of this Section, Contractor shall submit two (2) complete initial hard copy sets of the closeout submittals as listed below to the Owner and Engineer for review and approval. After review and approval of initial set, Owner shall return one (1) initial hard copy to Contractor with comments for updating. Contractor shall provide four (4) final sets of closeout submittals to Owner and one (1) electronic copy in PDF format. Closeout submittals shall include, but not be limited to:
   1. Project Record Drawings (As-Built Drawings) including, but not limited to:
      a. electrical drawings,
      b. device and equipment schedules,
      c. system block diagrams,
      d. system wiring diagrams,
      e. rack layout drawings,
      f. custom fabricated signage drawings (final fabrication version)

g. testing and commissioning data formalized into a report format

2. An Operation and Maintenance Manual.
3. Full documentation of all programming provided, including, but not limited to, initial configurations settings and system presets or other operational settings in a robustly commented pre-compiled format, or for those pieces of equipment programmed through a graphical programming interface full graphic configuration with a types listing of any calibrations or settings input for any graphic element not explicitly listed in the graphic.
4. Provide two (2) copies of electronic backups of all programming and configuration executed.
5. A schedule of all equipment provided and its location within the facility. List shall include manufacturer name, model identifier, serial number, firmware versions and any other pertinent information needed to obtain service, maintenance, and/or replacement.
   a. For all devices and equipment utilizing an Ethernet based transport, include the MAC addresses.
   b. For all devices and equipment that utilize TCP/IP routing protocol, include the internet protocol addresses.
   c. For all devices and equipment that utilize any other addressable protocol(s), include the names, addresses and/or any other unique information utilized to track and/or communicate with the devices or equipment.
6. Provide a list of ALL passwords for programming, administration and control features and functions for all hardware and software. Submission of the form to be included shall be sufficient for the engineering review copy of this document, as it will only be necessary to provide the passwords to the Owner.
7. Provide three (3) sets of all keys for each locked piece of equipment.
8. A list of all Subcontractors who performed work for Contractor during installation. List shall include company name, physical company address, phone number, and contact person(s), as well as the scope of work provided by the subcontractor.
9. Documentation certifying old equipment and associated support structures that were demolished by Contractor prior to the installation of new equipment have been properly disposed or recycled per local, provincial, and/or federal law(s).
10. Test reports from an independent testing & inspection agency certifying that bolted and/or welded connections for primary and/or secondary structural steel meet the minimum requirements of the engineered structural drawings, the governing building code, or as required by the building official; whichever is more restrictive.
11. All testing and commissioning reports as specified in Part 3 below.
12. Warranty Documentation, including, but not limited to, specific warranty verbiage from the various manufacturer, durations for each device covered, as well as start date(s), and copies of any/all documents submitted to the manufacturer on behalf of warranty commencement.

1.11 OPERATION AND MAINTENANCE MANUAL

A. Upon substantial completion and prior to onsite training with the Owner, Contractor shall provide four (4) final hard copies and one electronic copy Operation and Maintenance Manuals (O&M Manuals).

B. Electronic files shall be in .pdf format, except for drawings which shall be in .DWG format, and programming files which shall be in the native format of the programming software within which it was created pre-compiled a heavily commented.

C. O&M Manuals shall have tab dividers and shall be logically organized to provide easy access to information without the need to research through entire manual.

D. All documents provided in the O&M Manual shall be written in English and shall provide sufficient detail as to be understood by an individual with no knowledge of LED displays or the associated control equipment and/or operating systems.

E. Contents of the O&M Manual shall include, but not be limited to:
1. Table of Contents
2. Description of system(s) including key features and operational procedures.
3. Full start up procedure for all equipment written under the assumption that all equipment was in full powered off mode.
4. Full shutdown procedure for all equipment written under the assumption that the facility is in fully powered up use
5. Troubleshooting procedures for DSP's, amplifiers, Dante network devices and equipment, and all related equipment provided by Contractor. Troubleshooting procedures shall include demonstration photos and/or diagrams as required.
6. Maintenance procedures for DSP's, amplifiers, Dante network devices and equipment, and all related equipment provided by Contractor. Maintenance procedures shall include demonstration photos and/or diagrams as required. Contractor shall indicate whether maintenance procedures should be performed monthly, bi-annually, or annually.
7. Owner's Manuals for all third party and/or "off the shelf" type equipment provided by Contractor; e.g., KVM's, fiber modems, network switches/routers, and UPS battery back ups
8. All third-party equipment and/or "off the shelf" equipment warranties and a notarized System Warranty.
9. Instructions for alternative control operations for intramural or other non-game day use by untrained university staff.
10. Hard copy listings and electronic copies transferred to a USB connected mass storage device of all programming code and configuration software data files in a pre-compiled format capable of being opened and modified in the standard software utilized to do the initial programming.

1.12 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products in strict compliance with the manufacturer's instructions and recommendations, as well as industry standards.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store materials within absolute limits for temperature and humidity recommended by manufacturer. Protect from damage.

1.13 SEQUENCING

A. Ensure that information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress. Coordinate with the General

Contractor for the associated infrastructure bid package to assure effective and complete installation of work.

1.14 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.

B. Verify field measurements prior to commencement of work.

C. Do not install products under environmental conditions outside manufacturer's absolute limits.

D. Do not install suspended products and/or products located on the catwalk until contractor responsible for any/all structural modifications has completed work impacted by such additions of weight and/or structural stresses.

E. Products shall not be installed until painting and other finish work is complete.

1.15 WARRANTY AND SERVICE

A. Contractor shall warrant all labor and materials for twenty-four (24) months following the date of Final Acceptance.

B. During the warranty period the system shall be free of defects and deficiencies and conform to the drawings and specifications with respect to the quality, function, and characteristics stated.

C. Contractor shall repair or replace all defects that occur in labor or materials within the warranty period. On-site labor shall be included during the warranty period. Any/all warranty replacements and repairs shall not lessen or terminate subsequent warranty for all material and labor for the entirety of the system including those materials either repaired or replaced.

D. Failed parts whose replacement is performed without onsite intervention by the Contractor shall be returned to the Contractor for repair at a service facility located in the United States. Contractor shall identify the location of its service facility in the documentation provided when submitting a bid for this work.

E. The Contractor shall replace failed parts that cannot be repaired.

F. Upon receipt of a failed part, Contractor shall return a repaired or replacement part to the Owner within fifteen (15) business days from receipt of failed part. Replacement parts shall be new, or like new and operational as if new.

G. The Contractor shall be responsible for providing the following emergency response availability:
   1. Telephone service assistance and technical support for problem diagnostics and programming/operational issue resolution.
   2. A parts exchange program, including advance parts replacement via same day shipment. The manufacturer shall keep a ready stock of key assemblies available to ship out upon notice of a parts failure if part is not available in spare parts inventory at Owner's facility.
   3. During the warranty period all devices and equipment necessary for the ongoing operation of

the scoreboard shall be available to be provided as an advanced replacement. The advance replacement should contain all of the shipping information and packaging necessary to return the defective part or assembly back to Contractor at no cost to the Owner.

H. The Contractor shall supply at least one local service employee or local authorized service agent for servicing and repair of all equipment during the warranty period. Local service employee or local authorized service agent shall be located within 200 miles of Owner's facility.

I. The local service employee or local authorized service agent shall, when required, provide on-site support within 24 hours of notification.

J. The local service employee or local authorized service agent shall maintain at their office/service depot a stock of the most common components that may require replacement. The stock shall be maintained and shall be eligible as previously define in this Section as advance replacement stock. And, when necessary, shall act as same with the manufacturer replenishing their local service stock instead or requiring a second site visit and system replacement.

K. Warranty shall cover all equipment, including processors, controllers, operating systems, and software.

PART 2 - PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. As indicated elsewhere in These Documents, the products specified on these Construction Documents are to be furnished as indicated. Any deviation from the use of materials or products shall be handled in accordance with terms and conditions established elsewhere in These Documents. Where substitutions are not previously approved in writing by the Engineer, they shall be deemed unacceptable.

2.2 PRODUCTS

A. All products shall be new, UL listed and comply with all applicable Federal, State and Local regulations. B Stock items are not allowed.

B. Audio
1. Microphones
a. Wireless
1) Performance Metrics:
(a) Dynamic Range: >115 dB A weighted, typical
(b) Output: XLR Balanced +14 dBV minimum
(c) THD: <1.0%, 1kHz, ±17.5 kHz
(d) Modulation: FM
(e) Operating Sensitivity: 20dBuV @ 60dBA SNR
(f) Channel Config:

(1) 40 Channels/band minimum, Frequency Agile
(2) 25 kHz Channels

(g) Spectrum: UHF, coordinate availability in band with local licensing and conditions
(h) Operating Range: 100m, open field

2) Receivers:
(a) ATW-3211 Series (470-530 MHz) – Provide 4

3) Handheld
(a) ATW-T3212 Series (470-530 MHz) – Provide 2
(b) ATW-C510 Cardioid Dynamic Microphone Capsules – Provide 2

4) Headworn
(a) ATW-T3201 Body-Pack Transmitter – Provide 2
(b) BP-894 MicroSet Cardioid Condenser Headworn Mic – Provide 2

5) Antenna System
(a) Remote antennas to within the room serviced
(b) Provide cabling and combining system as provided by the microphone system manufacturer to provide complete coverage of the entire space

6) Charging System
(a) As manufactured by the manufacturer of the microphone system. Provide either individual chargers or multiple charger units for 100% of the battery powered devices being provided.

7) Manufacturers and Series
(a) Audio Technica 3000 Series,
(b) Equivalent product by: Shure, Sennheiser

b. Microphone Stands
1) Floor Stand
(a) Adjustable 36” – 60” chrome stand with 10” diameter round base, rubber feet, and minimum 9 pound weight – Provide 2

2) Table Top
(a) Adjustable 9” – 13” chrome stand with 6” diameter round base, rubber feet, and minimum 2 pound weight

3) Manufacturers
(a) Atlas Soundolier
(b) Proline
(c) Shure

2. Audio Player
a. Disk Formats and File Systems:
1) Disk: CD-DA, CD-ROM, CD-R,
2) USB: FAT16 and FAT32
b. File Formats: .cda, .wav, .mp3
c. SNR: >90 dB (A-weighted)
d. Frequency Response: 10Hz – 20kHz
e. THD: 0.01%
f. Dynamic Range: > 85dB
g. Channel Separation: >80dB
h. Outputs:
1) Unbalanced: RCA, >10kΩ, 2 Vrms @ 10kΩ
2) Balanced: XLR, >10kΩ, +4dBu
i. Remote Control: IR, RS-232C, IP
j. Bluetooth:

1) Version 4.0
2) Codecs: SBC, MP3
3) Range: 82 ft.

k. File Folder Limits:
1) Storage Capacity: ≤ 2TB
2) File Size: ≤ 2GB
3) File Name Length: ≤ 255 Characters
4) Number of Files: ≤ 999/Folder
5) Number of Folders: ≤ 999
6) Number of Folder Levels: ≤ 8

l. Manufacturer and Model:
1) Denon-700CB, equal by Tascam or Yamaha

3. Digital Signal Processor
a. Fixed preconfigured I/O configuration
b. Input: 12 mic/line (minimum)
c. Output: 8 mic/line (minimum)
d. GPIO: 4 channel (minimum)
e. Frequency Response; 20 Hz to 20 kHz, +4 dBu output: +0.25 dB/-0.5 dB
f. THD+N (22 Hz to 22 kHz)
1) 0dB Gain, +4 dBu input: <0.006%
2) 54 dB gain, -50 dBu input: <0.040%
g. Dynamic Range; 22 Hz to 22kHz, 0 dB gain: >108 dB
h. Input Impedance (Bal): 8kΩ
i. Output Impedance (Bal): 207Ω
j. Max input: +24 dBu
k. Max Output: =24 dBu, +18 dBu, +12 dBu, +6 dBu, 0 dBu, -31 dBu selectable
l. Input Gain Range: 0-66dB (6 dB steps)
m. Sampling Rate : 48 kHz
n. Processor programming configurable through GUI programming interface
o. Network Connectivity: Gigabit Ethernet
p. Remote control: Ethernet
q. Basis of Design:
1) Biamp Forte AI
2) Equivalent Product by: QSC or Extron

4. Amplifiers
a. Configuration: 8 Ch
b. Sensitivity: 1.4V
c. Power Output: 600W/Ch
d. Input Impedance : >20kΩ
e. Output : 70V
f. Frequency Response : 20 Hz – 20 kHz
g. THD <0.5% @ 1KhZ
h. SNR 100 dB, 20 Hz – 20kHz
i. Processing : Integrated DSP
j. Manufacturer
1) Crown, LEA, QSC

5. Speakers:
a. Configuration: Two way 12” LF Driver, 1” HF Driver

b. Nominal Dispersion Pattern: 90°H x 40°V Max
c. Frequency Range: 85 Hz – 16 kHz
d. Power Handling: 200W continuous @ 8Ω
e. Output: 126 dB continuous, 132 dB Peak
f. Sensitivity: 103dB 1W/1M
g. Mount: Hardware as recommended by Manufacturer
h. Finish: White, Uniformly textured
i. Manufacturer and Model
1) Community R.5-94Z, equal by JBL, QSC

6. Hearing Assistance System
a. Frequency Response: 50 Hz – 15 kHz
b. SNR: 50 dB minimum
c. Input: XLR-F, balanced, -55 dBu mic level, 20kΩ impedance
d. THD: <2%
e. Technology: RF
f. Spectrum: VHF
g. Transmitter Output Power: 100 mW
h. Range: 3000 ft., open field
i. Components:
1) Transmitter: Stationary: Provide 1
2) Rack Mount Kit: Provide 1
3) Antenna Kit: Provide 1
4) Assistive Listening Notifications Signage Kit: Provide 1
5) No receivers, ear buds or induction loops required, as this system will use those provided under the scope of the Stadium System
j. Manufacturers
1) System shall match and be compatible with that which is being provided for the stadium.

C. Video
1. Owner provided projector

D. Control Station
1. Control station shall be Ethernet based and designed by the DSP manufacturer to connect to and control all aspects of the DSP.
2. Control station shall support a 12-button touch screen capability.
3. Control station brightness shall be automatically adjust for ambient light level
4. Control station shall have a visual indicator that shall show the system state and status of audio mute.
5. Control station shall be powered by standard Power over Ethernet
6. Control station shall be CE marked, UL listed and RoHS compliant
7. Control station shall be as manufactured by and compatible with the DSP system provided.
8. Power shall be provided as required.
9. Acceptable Manufacturer and Model:
a. Bi-amp TEC-X 2000, Equal by QSC or Extron

E. Connectivity
1. Cabling
a. All cabling shall be new and UL listed.
b. Microphone
1) All microphone cable shall be 22 AWG stranded copper wire.

2) All microphone cable shall be low capacitance.
3) All microphone cable shall have a continuous foil shield with drain conductor.
4) Acceptable Manufacturer and Model shall be:
(a) West Penn D25291 plenum and 77291 for non-plenum
(b) Or equivalent product by Liberty Wire and Cable or Belden

c. Speaker
1) All speaker cable shall be 12 AWG stranded copper wire.
2) Acceptable Manufacturers
(a) West Penn: 25227 plenum
(b) Or equivalent product by Liberty Wire and Cable or Belden

d. Patch Cords:
1) Provide all indicated or as may be required for complete connection of all system components
2) All terminations shall be tinned with solder prior to termination, and solder to their connector where the means of connection can withstand such process.
3) All patch cords for network connections shall comply with Section 27 15 13 Communications Copper Horizontal Cabling, and match the manufacturer provided under the structured cabling scope of work.
4) All audio patch cords shall match the gauge of the cabling being provided for the balance of the cabling run, and be terminated with a mechanical means assuring disconnection and reconnection consistency.

2. Wireless AV Extenders
a. Compatible with Windows, MAC, iOS and Android
b. Wireless Point to Point connection.
c. Capable of receiving video with a minimum of 1080p/60 with stereo audio.
d. Provides a canvass capable of concurrently up to 4 simultaneous video inputs.
e. Compliant with HDCP 2.3.
f. Acceptable Manufacturer and Model:
1) Barco Clickshare CX-20, Extron eLink 100, Crestron AM-200

3. Receptacle Stations and Related Hardware
a. Standard Faceplates: Brushed Aluminum, as manufactured by ProCo, Panelcrafters/Liberty A/V or Switchcraft.

4. Bluetooth Receiver: Attero Tech UNBT2A with AXP20 Receiver

5. Transformer: For transforming constant voltage paging from the local zone to line level for input into the audio system.
a. Radio Design Labs, TX-70A

6. Projector Audio Extension: Provide transmitter and receiver as defined by the wireless microphones above. Integrate antenna and frequency into and with the wireless microphone system

F. Hardware
1. Equipment Cabinet
a. Black electrostatic finish
b. EIA 19” Rack mount front and rear rails, 10x32 drilled and tapped with visible RU indicator
c. 16 Rack Units high
d. Three section
e. 22.3” Deep
f. Front and Rear locking

g. UL Listed 1678
h. 14 gauge frame, 16 gauge side frame, 14 gauge top and bottom sections
i. Provide 3U drawer with customizable foam insert.
j. Provide lacing brackets vertically at both back corners, and a lacing bar per each component mounted in the cabinet.
k. Acceptable Manufacturer and Model:
1) Middle Atlantic DWR-16-22

2. Power Distribution Unit
a. PDU shall be horizontal, rack mount, 15A 120V
b. PDU shall provide three duplex receptacles that shall power up and down per safe sequence to protect the equipment in the cabinet, plus one duplex that is non-switched.
c. PDU shall have all connections rear mounted.
d. PDU shall be controllable by a minimum of a discrete closure from the control system, RS-232 control acceptable.
e. Provide 1 per cabinet
f. Acceptable manufacturer and model:
1) Furman M8-S

3. Grounding
a. 19” x ½” horizontal ground bar as provided the cabinet manufacturer.

G. Miscellaneous Hardware
1. Provide any/all hardware and accessories required to complete the design intent provide, as well as may be required to comply with any/all applicable codes, audiovisual industry standards and best practices, and to assure a safe operational environment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall neatly label and dress all cabling to assure easy maintenance and troubleshooting. Within all equipment enclosures, including but not limited to, video equipment racks, the Contractor shall utilize Velcro straps or Milli-Tie wraps for bundling of signal wires. Within all enclosures provide and utilize lacing bars and surfaces to assure neat and trouble-free system operation and maintenance.

B. All cabling labeling shall be by means machine generated labels that wrap the complete cable diameter. Adhere labels within 6” of each end of the cable ends. Label all speaker cabling at the rack end with the specific speaker ID. Label all speakers at the speaker end with both the speaker ID and the amplifier ID.

C. Label all components with the device name derived under Paragraph 3.2 below. Labels shall be machine generated on a self-adhesive tape or phenolic engraved tag.

D. Rack and stack all cabinets, and/or clusters of equipment in the Contractor’s shop in a controlled environment. Verify that the completed cabinets, and/or equipment cluster operates properly prior to transporting the cabinets and/or equipment clusters to the job site for final assembly.

E. After assembly of the system on site, execute all required programming, calibration, and commissioning to optimize performance of the system within the constraints of the installed

environment.

F. Mount all speakers and other components as either specified or drawn, or for cases where explicit instructions are not given within these Documents, execute all installation to the highest level of industry best practices. After installation of these speakers and other devices are completed, verify all mechanical and electrical connections are executed per recommended by the device manufacturer, and all items are safe and secure.

G. Fully test the system for component operation, as well as project specific programming. Document the testing procedures and the results of the testing. Submit hard copy of the testing documentation in the Operations and Maintenance Manuals submitted at time of close out.

H. Equipment Racks
1. The Contractor shall submit to the Engineer for approval, the intended cabinet layouts, prior to installation. Upon written approval of the cabinet layouts the Contractor may proceed with this installation.
2. Cabling shall be routed, combed, and bound neatly as it is routed in the cabinet. Orderly cable bundles shall be grouped and secured to the cabinet structure. Cables shall be provided with enough service loop to enable the contractor to route all cabling up the sides of the cabinet to the height of the device to be connected, and then over to that device.
3. Failure to comply with this requirement shall give the Owner or Engineer the option to require the Contractor re-dress the cabling or remove it in whole and re-install the cabling.

3.2 PROGRAMMING and CONFIGURATION

A. Unless otherwise directed by the District IT staff, all network devices shall be assigned permanent IP addresses. These addresses shall be coordinated with Owner's IT personnel. The Contractor shall then program all devices with these IP addresses and inventory. Document all MAC addresses, manufacturers, model numbers and serial numbers. Include all assigned IP addresses in the aforementioned documentation. Include both hard and electronic copies in the Operations and Maintenance Manuals submitted at time of close out.

B. All devices having the ability to program names shall be programmed with meaningful names. Coordinate the naming convention with the Owner prior to programming. Include a schedule of the devices and the corresponding names in the Operations and Maintenance Manuals submitted at the time of close out.

C. Program the mixer channels with user friendly names consistent with the naming convention previously mentioned. Program the DSP utilizing the same user-friendly names.

D. Program the internal DSPs of each amplifier with the proper characteristic parameters unique to the speakers being installed.

E. Equalize and tune the system to provide optimum performance of all components and the complete system. Equalize and time alignment all speakers. Equalization and time alignment shall be programmed within the system DSP, not the mixers or the amplifier's processing.

F. Calibrate the signal chain's gain structure to maximize the dynamic range of the system. Adjust the gain structure to a threshold just below clipping and to provide a minimum of 14dB of headroom.

G. Program the systems for:
1. System On/System Off
2. Source-select for individual volume control
3. Master Volume control

H. While both project specific and general best practice procedures for programming and operations have been explicitly indicated herein, provide all required programming and configuration to fully realize the intent of the design.

3.3 LABELING

A. All wires and cables shall be labeled with either a self-laminating label designed for labeling wire and cable, or by wrapping a pre-printer or computer-generated label designed by the manufacturer for this purpose, and by sealing it with clear heat shrink tubing over the entire label.

B. Failure to comply with this requirement shall give the Owner or Engineer the option to require the Contractor re-dress and re-label the cabling or remove it in whole and re-install and re-label the cabling.

3.4 GROUNDING

A. This rack shall be bonded back to the nearest available TELECOMMUNICATIONS BUSBAR with a minimum #6 AWG bonding conductor, utilizing a two-hole irreversible lug at both ends of the conductor. Each cabinet or rack shall have an individual homerun bonding conductor. Daisy chaining of the bonding conductor is unacceptable.

3.5 CALIBRATION AND COMMISSIONING

A. System Commissioning, including testing and certification of system performance, shall be completed by a factory certified/authorized representative prior to final payment. Said representative shall be fully certified by the manufacturer, and not simply an employee of the Contractor relying upon the Contractors company certifications. All system operation or installation deficiencies and resultant corrective actions shall be documented and submitted to the Owner at time of commissioning and shall be resolved prior to final training and final payment. Final payment shall be held until such time that final commissioning and training is completed to the satisfaction of the Owner and Engineer.

B. All installation and calibration of equipment shall be by qualified and certified personnel. All calibrations shall be checked by appropriate calibration equipment. Calibrations made simply by authoritative and/or experienced eyes and/or ears are not acceptable.

C. Test all cables prior to termination. Cabling having industry recognized standardized testing procedures, above basic continuity, and other simple testing, shall be tested utilizing test devices designed for said tests
.

D. All test and measurement devices and equipment that are designed to be calibrated, shall be calibrated by a NIST certified process/test facility no more than one year time prior to use. This threshold shall be shorter where recommendations either by the device/equipment manufacturer or industry best practices recommend more frequent calibration for optimum results.

E. Turn on, and individually test all components to assure the individual component or device is operating within normal operational parameters, prior to assembling them into the larger system.

F. Document all calibrations and adjustments in machine generated print in a neat and organized fashion for transmission to the Owner. Include any/all test and measurement device and equipment reports in human readable format. The Engineer reserves the right to review, reject or require modification or further documentation prior to completion of the project.

G. Unless otherwise recommended by industry acknowledged best practices or standards for this application. calibrate the system to provide a unity gain structure through the signal path. Where said best practices or standards would indicate other than this gain structure, provide documented procedures and expected results as to the alternative method to the Engineer for review and approval prior to execution. Do not proceed with these alternative calibrations without the prior written approval of the Engineer.

H. The Engineer shall be given the opportunity to monitor, and as may be needed participate in, the calibrations and commissioning. The Contractor shall apprise the Engineer two weeks prior to commencement of said calibrations and commissioning to facilitate effective scheduling of the Engineers time to attend same. Should such courtesies not be extended to the Engineer prior to the final calibrations and commissioning, the Engineer reserves the right for the procedures to be completely repeated prior to considering job completion.

3.6 WORK COMPLETION

A. The Contractor shall provide a complete and functioning system, based on the intent of the designs as set forth in these Documents. Any/all equipment, either implied or intentionally omitted from these documents, but generally accepted as being required for the completion of the installation, as represented in these Documents, shall be provided by the Contractor at no additional cost to the Owner.

B. The Contractor shall provide a copy of all test results, programming, or other documentation to the Engineer for review and approval prior to Owner acceptance
.

C. The Contractor shall provide all recommended fixed and flexible wire management to achieve a high-quality installation both visually and operationally, and that would be considered within the standard practices of good workmanship. The Contractor shall speed wrap all loose cables routed between end devices and their associated destination such as between a projector and the associated faceplate, or between the cabinets and enclosures, and the associated faceplate and ancillary devices.

D. Demonstrate the fully functional system to the Engineer and Owner prior to training or job completion to assure compliance with the design intent.

E. Complete ALL punch list items provided by the Engineer prior to submission for substantial completion.

F. Create electronic backup files of configurations and other programming for each of the preset operations. Record same onto electronic storage media. Make 3 copies of same. Provide these copies to the Owner at the point of system acceptance. Should system acceptance extend past the expected point of facility substantial completion, provide interim copies for the Owner prior to first use of the systems(s).

G. Complete training as prescribed elsewhere in these Documents.

H. Submit close out documentation for review and approval by the Engineer prior to Substantial Completion or processing of O&M manuals through the construction process to the Owner. Correct any/all issues sited by the Engineer prior to submission to the CM for release to the Owner.

3.7 TRAINING

A. The Contractor shall perform formal training with permanent staff personnel under the employ of the Owner. Such training shall last a minimum of 2 hours.

B. At the time of training, the Contractor shall obtain a sign in sheet that shall be copied with one copy being kept on file by the Contractor, and one copy being forwarded to the Owner. The sign in sheet shall at a minimum contain the following information:
1. Date
2. Time
3. Location of training
4. Name of system on which trained
5. Name, organization, department, role, E-Mail address and phone number of each participant.
6. The signature of the trainer
7. A copy of the approved itinerary

C. The training shall be video captured in a minimum of 1080p resolution in a standard digital format capable of viewing on a standard computer running current releases of Windows, Mac or Linux. The subsequent video shall be recorded on to a USB connected storage device. The Contractor shall provide four copies of the USB connected storage device, one for each copy of the Operations and Maintenance manuals.

D. All costs associated with these training requirements, including, but not limited to the supplemental trainings and their associated travel, shall be included in the base bid costs of the Contractor, and shall garner no additional reimbursements or funds.

3.8 WARRANTY

A. Warranty of the system, including parts and labor, shall be by the system supplier and manufacturer for all materials and workmanship for a period of no less than two (2) years, or for the duration of the manufacturer’s documented warranty whichever is greater. Should for some unforeseeable reason, the installer not be able to complete the term of the warranty, the manufacturer shall bear the complete responsibility of the warranty for both parts and labor and shall appoint a certified service organization to complete the term of the warranty. The manufacturer shall inform the Owner of this

appoint in writing. The Contractor shall present assurance of this stipulation from the Manufacturer to the Owner in writing prior to commencement of work. Should the Contractor not provide this written assurance, the Owner shall retain the right, as outlined elsewhere in these Documents, to obtain satisfaction, including but not limited to, financial restitution to the Owner.

END OF SECTION 27 41 17.1