ILLINIOS SPORTS FACILITIES AUTHORITY (ISFA)
GUARNTEED RATE FIELD

TECHNICAL SPECIFICATIONS
FY27 Scoreboard Control Room – Audio Upgrades

INTEGRATED AUDIO-VISUAL SYSTEMS AND EQUIPMENT – SOUND SYSTEM

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Project Specification Description
B. Contractor Qualifications
C. Submittal Requirements
D. Closeout Submittals
E. Equipment General Specifications
F. Quality Assurance
G. Warranty and Service

2.02 DESCRIPTION

A. Contractor is responsible for providing all audio equipment as described and listed in the project RFP Bid Form document. All additional equipment needed to provide a complete turn-key system shall be listed by the Contractor in the "Additional Items Required" section of the RFP Bid Form document.

B. Contractor is responsible for supplying complete and fully operational system(s) as intended by the RFP documents and any subsequent addendums. Prior to executing a contract for the project, Contractor is responsible for notifying Owner of any equipment omissions in the RFP documents that may prevent the completion of fully operational system(s). If the Contractor fails to notify Owner of any equipment omissions, Contractor shall assume responsibility for providing the required equipment at no additional cost to Owner.

C. Contractor shall field verify all work-site conditions prior to submitting shop drawings.

D. All equipment (except Owner Furnished (OFE)) and materials shall be new (latest version at time of RFP) and shall conform to applicable UL, EIA, TIA, or ANSI guidelines. Remanufactured or "B" stock equipment will not be accepted without prior written consent from the Owner. Evidence of unauthorized remanufactured or "B" stock equipment on the project site will be deemed evidence of the Contractor's Failure to Perform the Work.

E. Contractor must take care during installation to prevent scratches, dents, chips, or disfiguration.

F. Contractor will provide and install specified amplifiers, digital signal processing (DSP) equipment and required signal transmission equipment.

G. Contractor will provide and install "Head End" equipment listed in the RFP Bid Form and Technical Specifications.

H. Contractor will provide single-line schematic drawings of all systems being provided and installed. Include existing systems in the shop drawings submittal where new system device(s) may interface. Provide floor plans and elevations as required, including 3D or isometric views showing this work.

I. Contractor is responsible for the provision and installation of all secondary structural steel (i.e., conduit and raceway supports, hardware mounting systems, etc.), as well as mounting brackets and hardware required to accommodate the new system(s). This includes all labor, materials, equipment, tools, transportation, and project management required to complete fully operational system(s) for the project.

J. Contractor is responsible for assembly, secondary modifications (if necessary) and mounting of all system(s) components to new and/or existing structures.

K. Owner will provide Primary Power at defined demarcation points as shown in the project drawings.

L. Contractor is responsible for all power and electrical distribution from demarcation points (Secondary Power) to new system(s).

M. Contractor will provide all Secondary Power connections/terminations required to power new system(s).

N. Contractor may utilize available existing conduits for low voltage cabling with the Owner's permission. Additional conduits and raceways required to complete a pathway to each system component will be furnished and installed by Contractor.

O. Contractor is responsible to furnish, install, and terminate all required cabling needed to make new and related existing system(s) complete and fully operational.

P. Contractor shall grant Owner a license to use all proprietary software provided with this RFP for the life of the system(s).

Q. Manufacturer(s) of sound reinforcement system components shall continue to make all parts necessary for continued full function of the system for a minimum of ten (10) years after acceptance of this project. Furthermore, upon "end-of-life" of any component used in the sound reinforcement system, that is not replaced by a "backward compatible" component, Manufacturer shall notify Owner of "end-of-life" status assigned to components of this system and shall give Owner an opportunity to buy spare parts from stock or final production run, at commercially viable prices.

R. The sound system providing coverage for the seating bowl and concourse areas must interface with the existing fire alarm system to provide ancillary audio support for egress announcements from the fire alarm system during an emergency. All event-driven sound systems other than specified high frequency portions of the main seating bowl and public concourse systems will mute during an emergency message. Field coordinate with the stadium fire alarm provider for provision of trigger and audio signal from the fire alarm system.

2.03 CONTRACTOR QUALIFICATIONS

A. Owner seeks to contract with a qualified audio contractor for full performance of the work as described in this RFP. This will include the option to obtain a long-term service contract and support for all equipment supplied by the selected contractor. To ensure the chosen contractor has the long-term interests of Owner in mind, the following shall be required to submit a proposal for this project. Failure to submit acceptable responses to the listed requirements shall eliminate a contractor from consideration. The Owner, in its sole discretion, shall reserve the right to waive any or all requirements listed below:

1. The Proposer shall be or shall sub-contract with a certified dealer as required by the specified equipment manufacturers and provide evidence upon request by Owner or Owner's Consultant.
2. Contractor shall provide a list of a minimum of three (3) facilities (facility, contact name, title, address, and current phone number) where the contractor has provided equipment and services of equivalent size and scope within the last five (5) years.
3. Contractor will provide a minimum of one (1) facility (facility, contact name, title, address, and current phone number) where the contractor has provided equipment and services of equivalent size and scope that is at least five (5) years old.
4. Contractor is required to provide a Letter of Surety from their bonding agent, stating their ability to provide a 100% payment and performance bond if they are the successful Proposer.
5. Contractor must provide a direct service employee or certified Contractor capable of providing maintenance response within 24 hours of a call for service.
6. Contractor must have a minimum of 6 years participating as an integrator and authorize dealer in the sound reinforcement business.

2.04 SUBMITTAL REQUIREMENTS

A. Contractor is required to provide electronic submittals and shop drawings to the Owner within twenty-eight (28) calendar days from date shown on award notice, acknowledged with a binding letter of intent.

B. Contractor is responsible to ensure that the dimensions and specifications of each component and all systems fit within the building allowances.

C. Contractor will advise the Owner of any discrepancy that may affect the installation. If Contractor fails to notify Owner of any discrepancies, Contractor assumes responsibility for providing the required equipment and labor to correct such discrepancies at no additional cost to Owner.

D. The following required submittals will be defined by guidelines established by the Owner and shall include, but not be limited to:

1. One (1) set of electronic shop drawings, product data, and samples in PDF format, compiled in one file within twenty-eight (28) calendar days of the date shown on the Contract Award Notice, and prior to ordering equipment.
2. Catalog data sheet PDF files, bound into a single file with title page, space for submittal stamps, and divider pages between sections.
3. A complete list of proposed equipment with reference to its corresponding specification paragraph number, or equipment title in specification paragraph order. Denote all approved substitutions.
4. Point-to-point wiring diagrams and an associated table of wire lists identifying every connection. Include all terminated system devices and ancillary components.
    a. Indicate locations of all components.
    b. Identify cables by types and wire numbers.
    c. Provide complete, detailed wiring diagrams for systems based on the contract documents. Include cable types, identification numbers, detailed connections, connector types, and cable lengths.
    d. Drawings shall comply with ANSI and International Electro Technical Commission recommendations and standards as appropriate. Provide drawing set cover sheet clearly dimensioning all cable details for each cable type and connector utilized in the system.
5. Structural drawings (where applicable) for all secondary engineered steel framing are required for this scope of work.
    a. Structural drawings submitted shall include attachments to primary steel structure and method of attachment for all required components. A professional engineer licensed/registered in the state in which the project is located shall stamp and seal all structural drawings.
6. Conduit riser diagrams showing required conduits and junction boxes along with types and quantities of cables contained in each conduit. Show details of weatherproofing, lightning protection and grounding, strain relief and cable support, fire stop protection, and wall penetrations.
7. Rack elevations indicating the proposed arrangement of mounted equipment. BTU load, weight, electrical power load and circuit information for each piece of equipment shall also be included in the rack elevation drawing.
8. Detail drawings of all custom fabricated items and approved equipment modifications. Include complete parts lists, schematic diagrams, and all dimensions required for proper assembly.
9. Drawings shall indicate proposed color selections and finishes for all exposed surfaces and custom fabricated items. Submit actual color/finish samples, wall plates, and custom labels upon request.

10. A list of all lower tier subcontractors and suppliers. List must include lower tier subcontractor's qualifications indicating performance of work similar to past projects of this type and scope.
11. A project schedule in Gantt chart format 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 the ability to monitor installation progress daily.
12. Copies of all required business and Contractor licenses.
13. Copies of proof of insurance.
14. Approval of submitted items indicates only the acceptance of the manufacturer and product quality. Specific requirements, arrangements, and quantities must comply with the intent of the Contract Documents as interpreted by the Owner unless specifically approved in writing.
15. 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.

2.05 CONTRACT CLOSEOUT SUBMITTALS

A. When the installation is substantially complete, including the Testing Reports in Part 3.11 of this document, Contractor must submit to the Owner an electronic file (pdf format) of contract closeout submittals for review. After review and approval of the closeout document set, Owner will return to Contractor the file with comments for updating. Contractor will return a final updated set of closeout submittals to Owner (electronic copy) in PDF format, and one (1) electronic copy of As-Built files in .dwg format (or current format approved by Owner) as related to discipline. Closeout submittals will include, but not be limited to:
   1. Project Record Drawings (As-Built Drawings) including wiring schedules, final device locations in plan-view, final device locations in reflected ceiling plan-view, final device locations in section and elevation view, secondary steel structural drawings (plans and elevations), custom plate and panel details, system schematic diagrams, electrical power schematic drawings, and rack elevation detail drawings.
   2. Electronic and hard copy of Operation & Maintenance Manual. (See section B. below)
   3. A list of all equipment provided and its location within the facility. List must include manufacturer name, model identifier, serial number, and any other pertinent information needed to obtain service, maintenance, and/or replacement.
   4. A list of all Subcontractors who performed work for Contractor during installation. List must include company name, physical company address, phone number, and contact person(s).
   5. Copies of all software, settings, and programs used in the control and operation of this system.
   6. Copies of all equipment registration documentation.
   7. Test reports for all new copper and fiber optic cable installed under this scope of work. Test reports must indicate that end-to-end signal loss does not exceed applicable industry standards.

B. Operation & Maintenance Manual
   1. Upon substantial completion but prior to onsite training with the Owner, Contractor will provide one (1) printed hard copy of the final Operation & Maintenance Manual (O&M Manuals) and one electronic PDF copy. O&M Manuals must have tab dividers and be logically organized to provide easy access to information without the need to research through the entire manual. All documents provided in the O&M Manual will be written in English and provide sufficient detail for an individual with knowledge of the provided systems. Contents of the O&M Manual will include, but not be limited to:
      a. Table of Contents.

b. Description / overview of system(s) including key features and operational procedures.
c. Startup procedure for all systems equipment and any additional networking components written under the assumption that all equipment was in full powered-off mode.
d. Full shutdown procedure for all systems equipment written under the assumption that the facility is in an extended power failure situation.
e. Owner's Manuals for all third party and "off the shelf" type equipment provided by Contractor, e.g., KVM's, media converters, network switches/routers, and UPS battery backups.
f. Small scale plans showing locations and circuit numbers for all system outlets and receptacles.
g. Single-line block diagrams showing all major components of the systems.
h. All third-party equipment and "off the shelf" equipment warranties and a notarized System Warranty.

2.06 EQUIPMENT GENERAL SPECIFICATIONS

A. All equipment and materials, except Owner Furnished, will be new and the latest version at the time of RFP and must conform to applicable UL, ULC, CSA or ANSI provisions. Remanufactured or "B" stock equipment will not be accepted without prior written consent from the Owner. Evidence of unauthorized re-manufactured or "B" stock equipment on the project site will be deemed evidence of the Contractor's failure to perform the work. Contractor must take care during installation to prevent scratches, dents, chips or disfiguration of equipment and materials supplied. All damaged equipment and/or materials will be repaired or replaced at Owner's discretion. Contractor will perform either option selected by Owner at no additional cost to the Owner.

B. All cabling [power and data] must be labeled at each end of the cable with a description in English and a reference to a wire designation on a wiring diagram. These diagrams must be part of the Project documentation submitted to the Owner at time of acceptance.

C. Each device will meet all published manufacturers' specifications. Verify performance as required.

D. Provide an uninterruptable power supply (UPS) at the bottom of each specified equipment rack as noted herein. The UPS will be connected to all specified processor driven equipment including but not limited to DSP, fiber optic, and network devices. This does not include loudspeaker amplifiers for the main system. UPS will have the capability of providing power to all equipment within the rack for a period of 15 minutes in the event of a power failure at the facility.

E. Some rack-mounted equipment may require shaft locks, security covers, or removal of knobs. Provide and install during acceptance testing.

F. Enclosures exposed to the outdoors must be NEMA 4X rated or approved equal. Provide adequate environmental conditioning and control to ensure long-term equipment survivability.

G. Provide labeling at the front and rear of all rack-mounted audio signal equipment. Mount labels on the equipment chassis and attach in a neat and permanent manner. Label equipment with schematic enumeration reference, and with descriptive information regarding its function or area it is serving. Similarly, provide self-adhesive labels at the rear only of equipment mounted in furniture consoles.

H. All labeling will be 1/8" block lettering unless noted otherwise. On dark panels or pushbuttons, letters will be white. Letters will be black on stainless steel, brushed natural aluminum plates or light-colored surfaces.

I. Mounting hardware exposed to the weather will be aluminum, brass, epoxy painted galvanized steel, or stainless steel. Apply corrosion inhibitor to all threaded fittings where applicable.

J. Unless directed otherwise, equipment racks will be Middle Atlantic Products model WRK-44-32, or approved equal, with accessories as noted below. Quantity of racks will be required to house all equipment supplied under this scope of work. Any unused rack mounting spaces will have color matching blank panels to fully enclose the rack assembly. Multiple racks will be anchored together using appropriate ganging hardware. Standard solid rear doors will be replaced with vented rear doors unless noted otherwise.
    1. Provide two (2) side panels per individual stand-alone rack or series of racks ganged together. The intent is to have an enclosed rack system. A single stand-alone rack will have two (2) side panels and a series of three (3) racks ganged together will also have two (2) side panels. Side panels will be Middle Atlantic Products model SPN-44-32 or approved equal.
    2. Provide Middle Atlantic Products model MW-4QFT-FC integrated fan top, or approved equal, for each rack. Fan must be thermostatically controlled to ensure in-rack temperatures of less than 68 degrees Fahrenheit.
    3. Provide Middle Atlantic Products in-rack vertical power strip. Power strip will have enough receptacles to accommodate all equipment housed in the associated rack with a minimum of two spare receptacles per rack.
    4. Provide Middle Atlantic Products model PDLT-815RV-RN horizontal rack-mount power/lighting, 8 Outlet, 15A, surge protection accessory power strip as necessary.

K. Any rear-mounted rack equipment will be placed so the equipment does not block access to the back of front-mounted equipment.

L. Contractor will exercise care when wiring racks to avoid damaging cables and equipment. Contractor will install grommets around cut-outs and knockouts where conduit or chase nipples are not installed.

M. Power wiring and signal/data wiring will be installed on opposite sides of rack. Contractor may determine which side is used for power and which side for signal. Method will be kept the same for the entire installation if multiple racks are required. Contractor will exercise care when wiring racks to avoid damaging cables and equipment.

N. Per IEC-268 standard, all XLR connectors not mounted on equipment will be wired pin 2 +, pin 3 -, and pin 1 shield.

O. Equipment installed in exterior locations will be IP67 rated and operating temperature range of 0 degrees F to 90 degrees F and survivable from -20 degrees F to 110 degrees F.

P. Any equipment mounted above seating areas and venue floor is required to be secondarily fastened to structure using aircraft cable and appropriate fasteners. Cable sizing and fasteners must be capable of supporting a minimum of five (5) times the weight of affixed devices and eight (8) times the weight of movable devices.

2.07 QUALITY ASSURANCE

A. All requirements of the latest published editions of the following standards will apply, unless otherwise noted. In the event of conflict between cited or referenced standards, the more stringent will govern.
    1. National Electric Code (NEC).
    2. National Electrical Manufacturers Association (NEMA).
    3. American National Standards Institute (ANSI).
    4. Occupational Safety and Health Administration (OSHA).
    5. American Iron and Steel Institute (AISI).
    6. Underwriters Laboratories (UL).
    7. Federal Communications Commission (F.C.C.) Rules and Regulations, Part 76.

8. Society of Cable Television Engineers (S.C.T.E.).
9. Society of Motion Picture and Television Engineers (S.M.P.T.E.).
10. American Society for Testing and Materials (A.S.T.M.).
11. National Cable Television Association (N.C.T.A).
12. Electronic Industries Association (E.I.A.).
13. Telecommunications Industries Association (T.I.A.).
14. MIL SPEC – MIL – TFDFO.

B. Review all architectural, civil, structural, mechanical, electrical, and other project documents related to this work.

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

D. Coordinate the specified work with all other trades.

E. Maintain a competent supervisor and supporting technical personnel, acceptable to the Owner during the entire installation. Change of supervisor during the project will not be permitted without prior written approval from the Owner.

F. Provide all items not indicated on the drawings or mentioned in the specifications that are necessary, required, or appropriate for this work to realize a complete and fully operational system that performs in a stable and safe manner.

G. Review project documentation and continuously make known any conflicts discovered.

H. Provide all items necessary to complete this work to the satisfaction of the Owner without additional expense. In all cases where a device, item, or equipment is referred to in singular number or without quantity, each such reference will apply to as many such devices or items as 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 and approved by the Owner, without additional cost to the Owner.

J. Regularly examine all construction, and the work of others, which may affect the Contractor's work to ensure proper conditions exist at the site for equipment and devices before their manufacture, fabrication, or installation.

K. Contractor will be responsible for the proper fitting of the systems, equipment, materials, and devices provided as part of this work.

L. Promptly notify the Owner in writing of any difficulties that may prevent proper coordination or timely completion of this work. Failure to do so will 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.

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

2.08 WARRANTY AND SERVICE

A. Contractor will warrant labor, equipment, and materials for twenty-four (24) months following the date of Final Acceptance of permanent system installation.

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

C. Contractor is responsible to repair or replace equipment or parts with defects that occur in labor, equipment, and materials within the warranty period.

D. On-site labor will be included during the warranty period for all work beyond simple component replacement. Simple component replacement will be defined as all equipment that does not require tools to perform the equipment replacement.

E. Failed parts will be returned to the Contractor for repair at a service facility located in the United States. Contractor will identify the location of its service facility in the documentation provided when submitting an RFP for this work.

F. The Contractor will replace failed parts that cannot be repaired.

G. Upon receipt of a failed part, Contractor will return a repaired or replacement part to the Owner within fifteen (15) business days from receipt of failed part.

H. Contractor will provide at least one local service employee or local authorized service agent for servicing and repairing all equipment during the warranty period. Local service employee or local authorized service agent will be located within 75 miles of Owner's facility.

I. The local service employee or local authorized service agent will be the entity responsible for providing the following emergency response availability:
   1. Telephone service assistance and technical support from 8:00 am to 11:00 pm local time at Owner's facility, 7 days per week.
   2. Answer all service calls and requests for information within one (1) hour during the warranty period.
   3. A parts exchange program, including same day shipment of exchange parts. The manufacturer will keep a ready stock of key assemblies available to ship to the facility upon notice of a parts failure if part is not available in spare parts inventory at Owner's facility.
   4. The advance replacement should contain all shipping information and packaging necessary to return the defective part or assembly back to Contractor at no cost to the Owner.

J. Warranty will cover all equipment, including processors, controllers, operating systems, and software.

K. Warranty will include two annual on-site system check-ups by a qualified technician who is a full-time employee of the Contractor. Visits occur approximately 3 weeks prior to the start of the second and third seasons or as determined by the Owner.

L. Check-up will include all regular maintenance; a complete inspection of all systems, parts replacement where required and a complete written report of all findings.

END OF PART 1 GENERAL

PART 2 PRODUCTS

3.01 BASIS OF DESIGN

A. See accompanying Bid Form for Basis of Design.

B. Basis of Design is intended to include all major system components. AV Contractor is responsible for including all miscellaneous components to provide a complete and fully operational system.

C. Provide, install, commission, and configure all new devices, inclusive of any associated materials.

D. Provide all devices, materials, installation, commissioning, and configuration required to incorporate existing Owner-furnished devices into the new solution where indicated.

3.02 ACCEPTABLE MANUFACTURERS: ALPHABETICALLY

A. Acceptable loudspeaker manufacturers
   1. JBL
   2. Genelec

B. Acceptable power amplifier manufacturers
   1. Powersoft

C. Acceptable Distribution Amplifier Manufacturer
   1. ATI

D. Acceptable DSP manufacturers
   1. QSC Q-SYS

E. Acceptable mixing console manufacturers
   1. Yamaha
   2. DiGiCo
   3. Studer

F. Acceptable wireless microphone and IFB manufacturer
   1. Shure

G. Acceptable custom plates and panels manufacturers
   1. RCI Custom

H. Acceptable equipment rack manufacturers
   1. Middle Atlantic Products

I. Acceptable cable manufacturers
   1. West Penn
   2. Belden
   3. Gepco

J. Acceptable Patchbay Manufacturer
   1. Bittree

K. Acceptable Rack Monitor Manufacturer
   1. Wohler

L. Acceptable PC Manufacturer
   1. Dell
   2. HP
   3. Superlogics

END OF PART 2 PRODUCTS

PART 3 EXECUTION

4.01 SCOPE OF WORK

A. The following outlines the turnkey delivery and installation responsibilities that define the project scope of work. All work outlined in this section is the responsibility of the Contractor unless otherwise noted. Contractor is required to provide all labor, materials, tools, supervision, and equipment to perform the following:

1. Provide all labor, materials, equipment, accessories, installation, configuration, integration, testing, and commissioning required to complete the FOH audio upgrades.
2. Provide and install all equipment listed in the Bid Form document. Include all equipment not specifically listed but required to provide a completely functional system as part of this RFP.
3. Coordinate all work with the Owner, CWS Engineering, project management, existing facility systems, and other affected trades.
4. Maintain existing system functionality except where specifically identified for replacement or modification.
5. Integrate new equipment with existing audio, control, GPI, networking, and emergency audio systems as applicable.
6. Provide all required mounting hardware, cabling, connectors, adapters, patching, labeling, and miscellaneous accessories necessary for a complete and operational installation.
7. Verify final system operation, signal routing, control functionality, and system performance prior to turnover.
8. Install new equipment within designated existing equipment racks in the designated locations as noted.
9. Provide new electrical power circuits for new equipment in the designated amp racks and locations as noted. Contractor is encouraged to correspond with the project electrical contractor to confirm audio system power, conduit, and cabling work associated with this project.
10. Provide and install new fiber optic cabling as noted.
11. Provide and install new multi-pair analog audio signal cable between the audio FOH and the audio system devices as necessary.
12. Provide and install new audio cabling, including analog and fiber optic cable as required between the audio FOH and the dedicated locations within the facility as necessary.
13. Provide and install dedicated ethernet network for audio, DSP, and system control devices as necessary.
14. Complete the following tasks associated with Audio Processing and Emergency Audio at Rack ER-01:
    a. Integrate new equipment with the existing BSS DSP system, including audio, control, and GPI interfaces.
    b. Remove and replace existing COMP-10 and COMP-11 compressors with Behringer MDX4600 V2 compressors.
    c. Remove existing Tascam CD-450 and provide a current multimedia playback device for emergency-message playback, including required GPI-trigger functionality.
    d. Provide all necessary signal, control, GPI, and power connections for a complete installation.
    e. Provide and install specified digital audio mixing system and audio source devices as specified.
    f. Provide analog audio backup for the stadium audio system as required.

g. Remove existing Yamaha MV800 backup analog mixer and provide a replacement backup mixer.
h. Integrate the replacement backup mixer into the existing emergency audio paths and verify proper operation.
i. Install a new mixer DSP engine and/or stage-box breakout equipment as required to support the revised system architecture.

15. Complete the following tasks associated with Audio Monitoring, Patching, and Distribution at Rack ER-02:
    a. Remove existing MON-01 anchor speaker and provide a Wohler AMP1-2SDA for general-purpose audio monitoring.
    b. Provide and install MON-02 Wohler iAM-SUM32 for MADI and Dante audio monitoring.
    c. Remove existing APB-00 through APB-11 audio patchbays.
    d. Provide and install new 2RU normal-out EDAC patching/connection assemblies.
    e. Remove existing APB-12 interconnect panel and provide a new custom interconnect panel.
    f. Remove SUM-28, SUM-29, and associated microphone preamplifier equipment.
    g. Remove and replace CC-01 ATI Audio Distribution Frame and associated cards.
    h. Provide a minimum of one spare ATI distribution card and one spare power supply.
    i. Label and document all new and modified connections.
16. Complete the following tasks associated with DJ, Playback, and Audio Interface Systems located at Rack ER-DJ:
    a. Remove and replace APB-11 and APB-12 patching with new normal-out EDAC connections.
    b. Remove existing Wohler AMP-2 and provide a Wohler AMP1-SDA monitoring device.
    c. Remove existing Click Effects audio playback rack-mount PC and provide a replacement rack-mount playback computer with a minimum 4 TB media drive for 7 Point Audio.
    d. Remove two existing Lexicon Alpha Link interfaces and provide two Focusrite 18i20 USB audio interfaces.
    e. Remove existing Tascam CD-240 and provide a DN-300Z CD/media player supporting Bluetooth, USB, SD, and auxiliary inputs.
    f. Provide and install a replacement DJ mixer.
    g. Provide and install a replacement DJ audio-playback touchscreen.
    h. Inspect existing antenna-farm cabling and repair, replace, or add antenna cables as required for proper RF performance.
    i. Remove and replace existing Shure and Listen antennas as required.
    j. Verify complete DJ audio, playback, monitoring, and RF functionality.
17. Integrate the audio operator’s dual computer monitors into the existing Adder KVM system.
18. Remove and replace existing control-room monitor speakers, including left, right, and center channels.
19. Remove and replace existing Shure wireless charging bays.
20. Integrate replacement Shure charging equipment with the existing Shure Axient network.
21. Verify proper network connectivity, device management, charging, and wireless-system functionality.
22. Perform final system tuning, alignment, and time synchronization in coordination with CWS Engineering and the designated project management/service personnel.
23. Complete final operational testing of all modified audio, monitoring, wireless, playback, emergency, and control functions.

24. Contractor is responsible for assembly, secondary modifications and mounting of all audio components onto existing structures within the facility as required.
25. There is a significant amount of DSP programming required to direct, matrix, and control audio signals required for coordination of several audio channels for arena events, presentations, and broadcast functions. Coordinate with the Owner regarding the programming expected for functionality within the audio DSP and sub-systems throughout the facility.
26. Provide DSP programming for necessary Graphical User Interfaces(s) (GUI) and system control.
27. Deliver sample DSP GUIs for review by the Owner at least six weeks prior to system completion. Owner will review and sign off on functionality or provide requests for revisions. Revisions to DSP programming are the responsibility of the Contractor at no additional cost to the Owner through three programming revisions.
28. Furnish manufacturer provided training on the operation of the new digital audio mixing console.
29. Provide all required permits and licenses.
30. Provide on-site installation supervisor per Section 1.7.E.
31. Coordinate work with other trades and coordinate scheduling with the construction supervisor to minimize delays.
32. Deliver all Equipment to site and convey it to appropriate locations within site as directed by Owner.
33. Perform point-to-point verification of all new and modified audio, MADI, Dante, GPI, control, RF, and emergency audio paths.
34. Verify normal, backup, emergency, DJ, playback, monitoring, and wireless operating modes.
35. Configure and commission all new equipment in accordance with manufacturer requirements and the final system design.
36. Coordinate final system tuning and time alignment with CWS Engineering.
37. Correct deficiencies identified during testing and commissioning.
38. Provide updated rack elevations, signal-flow documentation, equipment lists, connection schedules, and other project record documentation reflecting the completed installation.
39. Provide equipment labeling consistent with the Owner's and project documentation standards.
40. Conduct final operational review with the Owner and designated facility personnel.

B. Store all Equipment in a safe and secure manner until installed or otherwise directed by Owner. Coordinate onsite storage container or available space in facility.

4.02 GROUNDING AND SHIELDING

A. Mount and enclose all electrical and electronic equipment in metal enclosures and equipment racks.

B. Use EMT type conduit for all cabling outside of equipment racks, except where plenum rated cabling is used above lay-in ceilings, cable trays, and designated raceways. Rigid type conduit will be used for underground raceways.

C. Use flexible conduits and PVC fittings to provide insulated connections of the building electrical raceways to equipment racks. Mount all equipment racks at the job site in a manner which provides electrical isolation from the building structure and electrical raceways.

D. Provide a single Technical Ground at equipment racks where necessary

4.03 WIRING PRACTICES/INSTALLATION

A. Provide rated cable for work to meet NEC codes.

B. Provide wet rated electrical power cords that connect to the nearest electrical outlet provided by others if environmental conditions require. Appropriate AC power connections are to be field verified.

C. Cables will be bundled, supported, and professionally installed. Include service and drip loops as necessary.

D. In all applicable instances use Neutrik or Switchcraft signal connectors that are gold plated. Use Hubbell or equivalent electrical connectors for power. Use West Penn, Belden, or Corning fiber connectors.

E. Where specific instructions are not given, perform all wiring in strict adherence to standard audio engineering practices in accordance with the references listed in Section 1.7.

F. Group all cables into the following classifications by power level or signal type:

1. Microphone Level: less than -20dBm.
2. Line Level Audio: -20dBm
3. DC Control Circuits: -20dBm.
4. Speaker Level: greater than +30dBm.
5. Copper Data.
6. Fiber Data.
7. AC Power Circuits.

G. Separate wiring of differing classifications by at least six (6) inches, wherever possible. Wherever lines of differing classification must come closer together than six (6) inches, cross them perpendicular to each other.

H. Neatly harness wires together within racks by power level classification using horizontal and vertical wiring supports as required. Rigidly support all wires with fixed connection points. Leave service loops of sufficient lengths to allow rack hinges or slides to fully extend to facilitate access to rear panel connectors from the front of each rack. Do not use self-adhesive tie-wrap pads for support of cables unless fastened with screws.

4.04 OBSERVE CONSISTENT POLARITY THROUGHOUT THE AUDIO SYSTEMS AS FOLLOWS:

1. Use only balanced differential inputs throughout the audio system.
2. Use approved transformers as directed to reduce objectionable system noise to acceptable levels.

B. Exercise care in wiring to avoid damaging the cables and equipment. Use grommets around cut-outs and knockouts where conduit or chase nipples are not installed.

C. Cut off unused wire ends approximately one-half inch (1/2 “) past the wire jacket. Fold them back over the jacket, and secure in place with heat-shrink tubing. In multi-conductor cables, preserve all unused conductors for future use. Failure to do so may result in replacement of cables at the contractor’s expense.

D. Make connections using rosin-core solder or approved mechanical connectors. Connect microphone, control, and line level wiring through approved connectors. Connect speaker level wiring using approved terminal barrier strips. Mount all terminal devices on a non-conductive (electrically) rigid surface. Provide 10% spare terminals at each location. Label each terminal with a unique number.

E. All fiber splicing will utilize the fusion splice method. The maximum allowable loss per fusion splice will be 0.5 dB.

F. Pull mandrel one size smaller than the conduit, through entire length of all underground conduits.

G. Cable pulling lubrication must be utilized when pulling cable in conduits.

H. A dynamometer must be used to measure pulling tension during long or difficult runs. The dynamometer is to be placed between the cable puller and the pull line to monitor pulling tension. The manufacturer’s pulling tension maximum range must not be exceeded.

I. Pulling grips suitable for use with fiber cables will be applied to the ends of the cable. Consult cable manufacturer to determine appropriate pulling grip and method of attachment. Breakaway or fuse links will be used at the pulling grip. Ensure that the correct fuse pin is installed in the fuse link.

J. The bend radius for all cables will conform to manufacturer's specifications.

4.05 LABELING

A. Label products in a logical, legible, and permanent manner corresponding to the Drawings. Wording, format, style, color, and arrangement of text will be subject to the consultant's approval.

B. Submit samples and labeling schedule for approval upon request. Labeling will be verified at final system adjustment and equalization.

C. Label all wall plates for input, output, and control receptacles as well as connector mounting plates in all boxes using 1/8" lettering of contrasting color, as approved.

D. Use self-adhering labels, squarely and permanently attached, to label the following:

1. Patch panel designation strips.
2. Front and back of all rack mounted equipment including controls.
3. Barrier strips, terminals, transformers, switches, relays, volume controls and similar devices.

E. Label pushbutton switches with lettering of contrasting color.

F. Label all permanently installed wires on both ends with approved permanent clip-on type or sleeve type markers. Wrap-around adhesive labels will not be accepted unless completely covered with clear heat shrink tubing.

G. Label all portable equipment with block letters using initials and/or words. Label all portable cables similarly with printed heat-shrinkable tags located 12 inches from the male connector end. Verify lettering through the consultant prior to engraving or printing.

H. Label access panels and backboards with designations corresponding to the drawings.

4.06 ENGINEERING

A. Contractor will provide stamped and sealed engineered drawings of all loudspeaker mounting locations. Engineer must be certified in the state of the project.

B. Contractor will provide stamped and sealed engineered drawings of all device mounting and rigging assemblies. Engineer must be certified in the state of the project.

C. Owner must approve all drawings in writing prior to the fabrication and installation of any equipment.

D. Engineered drawings must include both structural and electrical.

E. The Contractor is solely responsible for verification of the integrity of all engineering calculations. Contractor is responsible for verification of all information provided or implied.

4.07 STRUCTURAL CONSIDERATIONS

A. Contractor is responsible to design, engineer, build, deliver, install, integrate, and commission complete a turnkey sound reinforcement system as specified with all required sub-structure needed to support all speaker devices and associated components.

B. Install all loudspeakers using the best industry practices and as recommended by the Manufacturer. The speakers, accessories, and required rigging materials will be stainless steel or weather rated as appropriate. Contractor will verify all field conditions and coordination prior to installation.

C. Mount all audio system(s) devices, fiber interfaces, UPS, and other required devices to make for a complete operating system.

D. Contractor is responsible for design and erection of all mounting equipment, material, and hardware related to the new equipment.

E. Mounting equipment, material, and hardware will be fabricated using structural steel and/or aluminum (optional). Contractor will provide necessary protective separation when connecting dissimilar metals to prevent galvanic corrosion.

F. Bolted and/or field welded connections will be subject to special inspection by an independent testing & inspection agency certifying that bolted and/or welded connections meet the minimum requirements of the engineered structural drawings, the governing building code, or as required by the building official; whichever is more restrictive. Inspections will take place prior to painting any connection.

G. Documentation will be provided to Owner verifying acceptable results from all special inspections. All items failing inspection will be repaired or replaced and re-inspected at no additional cost to the Owner.

H. All components that are painted or otherwise finished for exterior service conditions will be warranted to be free of rust or other defects for a period of ten years.

I. All welders must be certified, and certificates must be on site and available for inspection as requested.

J. To minimize fading or oxidation, all finishes must be primed and coated. All areas of the secondary support structure must be primed and painted to match.

4.08 ELECTRICAL AND DATA

A. The electrical design and installation of all branch circuits by the Contractor will comply with NEC, state, and local codes, as well as Owner regulations and guidelines.

B. The Contractor is required to provide signal and data one-line diagrams.

C. Contractor will provide six (6) spare strands of fiber in addition to the total amount of fiber required for audio and/or data communication transport. All fiber will be terminated and landed in an appropriate fiber patch panel. All new fiber supplied by Contractor will be tested and will not exceed maximum allowable dB loss.

D. Multi-mode fiber tested will not have a signal dB loss greater than 0.1dB per 100 feet (30m) for 850nm fiber or a loss greater than 0.1 dB per 300 feet (100m) for 1300nm fiber.

E. Single-mode fiber tested will not have a signal dB loss greater than 0.1dB per 600 feet (200m) for 1310nm fiber or a loss greater than 0.1 dB per 750 feet (250m) for 1550nm fiber.

F. Contractor will provide all required fiber transmitters and receivers (including amplifiers where required). Contractor will be responsible to terminate and perform final connection of all cables. Cables will be routed from the specified control locations to the audio components per Contractor's diagram upon approval by the Owner.

4.09 AESTHETIC CONSIDERATIONS

A. Contractor will assume premium finishes on all elements not yet defined.

B. For Owner's approval prior to contract award, the Contractor must provide a comprehensive outline of intended finish details of all equipment that will be located in public viewing areas. Failure to submit these details prior to contract award will make Contractor responsible for all finishes as required by Owner at no additional cost to Owner.

C. No exposed bolts or unfinished surfaces are permitted on equipment that is within public view. Any part of the secondary steel frame exposed to public view will be covered with flashing or structure if requested by Owner.

D. The Contractor will not visibly display its trademarks or insignia on any of the Equipment or structural elements within public view.

4.10 FINAL ADJUSTMENT AND EQUALIZATION

A. Ensure that the system is free from oscillation, noise, hiss, buzzes, or other extraneous noises. Coordinate with LED board contractor (or Owner) to identify structure rattles so they may be eliminated during testing phase.

B. Schedule a time for the Owner's representative or consultant to be present at system Final Adjustment and Equalization. Notify the Owner at least two weeks in advance.

C. Furnish a technician who is familiar with the system to assist the consultant during Final Acceptance and Adjustment.

D. Record final settings on all equipment and submit with contract closeout documents.

4.11 TRAINING

A. The Contractor, at its own expense, will provide designated Owner employee, operator, and maintenance training.

B. Training will be performed at the site by a qualified technician and will occur either during installation of the equipment or immediately thereafter. O&M Manuals per Section 1.5.B will be provided to Owner prior to training.

C. The training will cover the operation, routine maintenance, and troubleshooting of the sound system and control equipment.

D. Furnish manufacturer provided training on the operation of the new system(s).

E. Training will consist of at least 24 hours over the course of 3 days of instruction.

F. Contractor will video record all training sessions and submit recorded training sessions to Owner in DVD or USB format with O&M Manuals.

G. Contractor will be required to have a systems operator on site for the first event and continue to be on site for three (3) consecutive problem free major events as approved by the Owner. "Problem-free" constitutes an event where the sound system, and any other components installed by the Contractor, perform without failure during an event. It will be required that each successful event will be "signed off" by the Owner until three (3) consecutive events are achieved.

H. Warranty period will commence at the conclusion of the third consecutive successful event.

4.12 TESTING AND ACCEPTANCE

A. Contractor must demonstrate the full capabilities of the provided systems and prove performance meets contractual specifications.

B. Confirmation will be required for, but not limited to the following functions:
   1. Operation of each system component including:
      a. Back-up systems
      b. Control system(s) functionality
      c. Integration with existing systems

C. Contractor must provide all necessary testing equipment for acceptance.

D. Upon notice from the Contractor of substantial completion and at a time to be mutually agreed upon, the Contractor will arrange for testing of all operations of the systems comprised in scope of work at the time of substantial completion.

E. The following items must be completed and signed off by an appointed Owner's official before the Owner will deem the system "Accepted":
   1. The Owner will not be responsible for any added costs resulting from an unsuccessful acceptance test.
   2. Acceptance of the system includes, but is not limited to, the completed installation of all physical components and the issuance of the Certificate of Approval for code compliance by the Code Authority having Jurisdiction.
   3. Tests of the system will not occur until after the system has been installed, and all work has been completed.

F. Document all acceptance testing, calibration, and corrective procedures described herein. Include the following information:
   1. Performance date of the given procedure.
   2. Conditions related to the performance of the procedure.
   3. Type of procedure, and description.
   4. Parameters measured and their values, including reference values measured prior to calibration (or correction), as applicable.
   5. The names of personnel conducting the procedure.
   6. The equipment used to conduct the procedure.

G. Upon completion of initial tests and adjustments, submit written report of tests to the Owner along with all documents, diagrams, and recorded drawings required herein.

H. Final Procedures.
   1. Perform all "punch-list" work to correct inadequate performance or unacceptable conditions, as determined by the Owner representative, at no additional expense to the Owner.
   2. Furnish all portable equipment to the Owner along with complete inventory documentation. All portable equipment will be presented in the original manufacturers packing, complete with all included instructions, miscellaneous manuals, and additional documents.
   3. Test and demonstrate portable equipment or systems as requested by the Owner.
   4. Provide new acceptance testing in the same format as initial test reports.
   5. Check, inspect, and if necessary, adjust all systems, equipment, devices, and components specified, at the Owner's convenience, approximately thirty (30) days after the Owners acceptance.
   6. Upon completion of the Work, the Owner may elect to verify test data as part of acceptance procedure. Provide personnel and equipment, at the convenience of the Owner, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Owner.

END OF PART 3 EXECUTION