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ADDENDUM

Date: November 3, 2026

Addendum #3 updates the 11 63 50 specification document. A redline version of the original is attached for clarity.

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SECTION 11 63 50

VIDEO PRODUCTION SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Work under this Contract includes all labor, materials, tools, transportation services, supervision, coordination, etc., necessary to complete the supply and installation of a Video Production System, as described in these specifications and illustrated on the associated drawings. The systems shall be called the "Video Production System (VPS)" and the video production installer the "Installer". The systems include the following major items:

1. PTZ cameras
2. PTZ signal transport
3. PTZ Controller
4. Character Generators and Content Management Systems
5. Coordinate with 11 63 10 replacement of Daktronics Show Control equipment
6. Intercom Frame
7. Intercom User Panels
8. Wireless Intercom Antennas
9. Wireless Intercom Beltpacks

B. The Contract also includes:

1. Verification of dimensions and conditions at the job site.
2. Preparation of submittal information.
3. Coordination with other trades.
4. Installation in accordance with the contract documents, manufacturer's recommendations, and all applicable code requirements.
5. Manufacturer's commissioning for all major items of equipment.
6. Initial tests and adjustments, written report, and documentation.
7. Instruction of operating personnel; provision of manuals.
8. Maintenance services; warranty.

C. The nature of this Contract is "design-build".

1. That is the Installer is responsible for all subsequent design and engineering not included within the RFP documents. The Installer is responsible for providing all components necessary for complete and operational system.
2. Any system changes or revisions necessary to make the system conform to the building, walls, electrical services etc., shall be included at time of proposal and installed without claims for additional compensation.

D. The Contract Documents are complementary and are intended to include or imply all items required for the proper execution and completion of the work. Any item of work required by the Specifications or other portion of the Contract Documents, but not shown on the drawings, or shown on the drawings but not required in the Specification, shall be provided by the Contractor without extra charge as if shown or mentioned in both.

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E. Existing documents are available at:

1. 2023 Video Production As-builts
   a. PDF: 4581 - MILWAUKEE BREWERS - MIL026 - VIDEO PRODUCTION CONTROL ROOM 08.02.2024.pdf

1.2 SYSTEM DESCRIPTION

A. The Video Production systems herein are to be utilized to create content for the stadium LED displays and distributed TV system. The Production Control System and Data Center are located in room #3412.

B. Video System Operation:

1. The Video Production System will operate at a resolution of 1920x1080p 59.94 SDR and will utilize 3Gb/s SDI infrastructure.

C. Video Production Installer will be working in the following major locations:

1. A Production Control Room (PCR).
2. A Production Data Center (PDC).
3. Various POV camera locations throughout the stadium.
4. Various locations throughout the stadium for wireless intercom antenna placement.
5. Various office locations throughout the stadium for staff offices.

D. The POV Camera System:

1. Provide a number of remote operated Digital Servo Pan/Tilt/Zoom head cameras.
2. Provide a Joystick controller to allow for live control of each camera and/or rapid selection of presets from controller.
3. The Installer is to utilize existing fiber infrastructure for POV locations when able.
4. Provide any additional fiber required for POV locations without existing infrastructure cabling.
5. Provide signal transport from the POV location to the Video Production System.
6.

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7. Integrate with the existing Production Switcher.
8. Integrate with the existing Router Switcher.
9. Responsibility:
   a. Coordinate mounting location with Owner's Representative as well as:
      1) Do not mount cameras until given permission.
      2) Expect to provide mockups of each location at least 1 time.
      3) Mount camera.
      4) Provide any additional infrastructure required for installation.
      5) Connect to power (within 150').
      6) Interconnect cabling between camera and the fiber location.
         a) POV fiber location must be located within 75% of the terminal cabling length from the camera location.
      7) Provide weatherized and conditioned enclosures as required to support active conversion equipment
      8) Skin or paint all POV's as required by the owner
10. Locations:
    a. POV Type 1 Outdoor Locations
       1) Home Bullpen / CAM- 07
       2) Visitor's Bullpen / CAM-08

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3) Section 328 / CAM-09
4) Bernies Chalet / CAM-10
5) High Home / CAM-11

b. POV Type 2 Indoor Locations
1) Media Interview Room / CAM-12

E. The LED Content Management System:

1. Provide replacement Dashboard Servers to integrate into the existing LED CMS system.
2. Provide replacement Tessera Render Engines to integrate into the existing LED CMS system.
   a. Confirm existing LED Processor mapping before deployment of new Tessera Render Engines.
3. Provide replacement Mosaic Compositing Engines to integrate into the existing LED CMS system.
4. Support data feeds from the scoring system in the Stadium;
   a. Scoring feed shall be interfaced to the Render Engines and Character Generators and text/stat capable Clip and Still Store Devices to allow automatic extraction and CG display of scoring and statistics information from the scoreboard system.
   b. Support additional data sources will be made available from outside sources. These feeds shall be interfaced to the Render Engines and Character Generators and text/stat capable Clip and Still Store Devices to allow automatic extraction and CG display of scoring and statistics information from the outside data sources.
5. Locations:
   a. Dashboard Servers:
      1) DBSVR-01
      2) DBSVR-02
   b. Tessera Render Engines:
      1) XPNODE-09
      2) XPNODE-10
      3) XPNODE-11
   c. Mosaic Compositing Engines:
      1) XSWR-03
      2) XSWR-04

F. The Intercom System:

1. Provide replacement Intercom Frame.
   a. Maintain existing connections.
2. Provide replacement wired User Intercom Panels.
   a. Confirm existing User Interface before deployment to new User Intercom Panels.
3. Integrate with the existing Riedel Intercom System
4. Provide replacement Wireless Intercom Antennas
5. Provide Mobile Wireless Antenna Kit
   a. The Installer is responsible for mounting antenna and extending cables (data and RF) from intercom matrix to antennas and connection to equipment specified herein.
   b. Existing cabling may be re-terminated and re-used at the discretion of the Installer. Any re-used cabling shall be warranted as new.
   c. Extend cabling as required to support new intercom antennas.
6. Connect to the existing Dante media network.
7. Provide replacement Wireless Intercom Belt packs and accessories
   a. Belt Clips
   b. Spare Batteries
   c. Charger Stations

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8. Locations:
   a. Wired User Intercom Panels (ICOM)Type 1
      1) Panel 304
      2) Panel 306
      3) Panel 308
      4) Panel 504
      5) Panel 506
   b. Wired User Intercom Panels (ICOM) Type 2
      1) Panel 202
      2) Panel 300
      3) Panel 302
      4) Panel 500
      5) Panel 502
   c. Wireless Intercom Antennas
      1) 1st Base Line / ICAP-01
      2) 3rd Base Line / ICAP-02
      3) Home Plate / ICAP-03

G. Daktronics Show Control System

1. Coordinate will ~~11 63 11~~ 11 63 10 the replacement of the following Daktronics Show Control System Equipment
   a. Show Control Rack Mount User Stations – Quantity (2)
   b. Stats Server – Quantity (4)
   c. DMP-8300 Media Player – Quantity (2)
   d. DI-6000 Controller – Quantity (10)

1.3 RESPONSIBILITIES AND RELATED WORK

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A. Demolition of existing POV, LED CMS, Intercom and Daktronics Show Control systems

1. Mark and label all cabling entering and impacted area for extension/re-termination.
   a. Extend existing cabling as required for a complete and functional system.
2. Pull existing cable beyond the perimeter of the impacted area.
3. Remove all Owner equipment that will be re-used
4. After the Owner has marked equipment for reuse or storage, remove all unused cabling and equipment from rack room, control room or interconnecting spaces. Dispose of equipment that is not being reused or salvaged by owner.

B. Supply accessories and minor equipment items needed for a complete system, even if not specifically mentioned herein or on the drawings, without claim for additional payment.

C. Notwithstanding any detailed information in the Contract Documents, it is the responsibility of the Installer to supply systems in full working order. Notify the Owner's Representative of any discrepancies in part numbers or quantities before bid. Failing to provide such notification, supply items and quantities according to the intent of the Specification and Drawings, without claim for additional payment.

D. Obtain all permits necessary for the execution of any work pertaining to the installation.

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E. Any record drawing provided do not show complete and accurate building details. The Installer is responsible for making field measurements necessary to establish exact locations, relationships and load capacities necessary for the installation of these systems.

F. If a conflict develops between the contract documents and the appropriate codes and is reported to the Owner's Representative prior to proposal opening, the project team will prepare the necessary clarification. Where a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform work.

G. All structural support, design, and engineering for installation of all system components.

H. Power is as existing in the rack room and remote locations. The Installer shall be responsible for distributing any additional electrical power required for a complete and working system.

1. The Installer shall be responsible for connecting appropriate grounds to all equipment in accordance with applicable codes and standards.

I. Coordinate work with other trades to avoid causing delays in construction schedule.

1.4 SUBMITTALS

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A. Submit all shop drawings and submittals in accordance with Project Requirements.

B. Shop drawings and submittal data shall contain sufficient information to describe the Work to be performed. Drawings shall be executed at an appropriate scale. Submit all Shop Drawing information at one time.

C. Submittals must be original work produced by the Installer responsible for performing the work defined in this specification. Scanning, photographic copying, material copying, or any other reproducing the contents of the drawings or specifications contained within the Contract Documents will be marked as unacceptable and not reviewed for any content. No claim shall be made for delay, undue burden, or additional costs for the effort to produce shop drawings, schedules, and equipment lists addressing this specification or the overall project manual.

D. Denote any changes on resubmissions with revision clouds. Any unclouded changes will not be reviewed. Approval of resubmitted documents does not imply approval of unclouded changes within the document.

E. The following outlines expected submittal packages:

1. Project and Submittal Schedule
   a. Include major construction milestones and expected delivery date of all submittals.
   b. Provide initial Project and Submittal Schedule within 3 weeks of notice to proceed.
2. Product Data
   a. A material list of all equipment to be furnished, arranged in specification order and noted as to which device the equipment represents.
      1) Where a data sheet shows more than one product, indicate the relevant model with an arrow or other appropriate symbol.

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2) Where a data sheet shows multiple options for the same product, indicate the relevant option with an arrow or other appropriate symbol.

3. Proposed cable labeling technique.
4. One Line diagrams for all signals (without cable numbering or patch points)
   a. Wiring diagrams. Complete, detailed wiring diagrams for all systems, based on the contract documents but including cable types, identification and color codes, and detailed wiring of connections, both at equipment and between equipment racks and wiring in conduit.
   b. Schematic drawings of any custom circuitry or equipment modifications, including connector pinouts and component lists.
5. Detail Submittal
   a. Patch panel layouts and designation (labeling) strips.
   b. Custom Plates. Provide complete shop drawings on custom fabricated plates or panels. Drawings to include dimensioned locations of components, component types, engraving information and plate material and color.
   c. Representative equipment labeling sizes, styles, and numbering.
   d. Any structural mounting details (including structural engineers seal as appropriate)
   e. Samples as required in various specification paragraphs.
6. Commissioning Plan and Training Resume Submittal
   a. Provide integrators commissioning plan, if it differs from the plan in Part 3.
   b. Part 3 lists training that is to occur on the system. Provide resumes as required for training on specific device(s).
   c. If Installer desires to utilize own forces for specified manufacturers commissioning, submit resume and relevant references for approval.
7. Commissioning Completion Submittal.
   a. At the conclusion of the commissioning process provide a written submittal indicating the completion of each commissioning task.
8. Training and Event Attendance Submittals:
   a. All Operations and Maintenance manuals, as well as as-built drawings must be on site for all sessions of training (drafts are acceptable).
   b. Following discussions with Owner and Tenant, formally submit a Training and Event Attendance submittal 4-8 weeks prior to first training. Submittal shall:
      1) Include a separate page/entry for every training session.
      2) Indicate date, time, and approximate length of training session.
      3) Indicate person(s) conducting training.
      4) Indicate whether training will be videotaped.
      5) Intended curriculum and most appropriate attendees (e.g., engineer, operations, IT, etc.)
      6) Include signature and title lines for:
         a) Owner acknowledgement and acceptance of training schedule. Include both an accepted and rejected box. An alternate schedule time should be suggested by the Owner in the event the schedule is rejected.
         b) Countersigning by trainer indicating that training actually occurred.
         c) All persons attending training. Where attendees do not stay for the entire session, this should be noted on the form and initialed by Owner's representative attending training.
         d) Owner's representative attending training at the end of the session shall initial that Training Occurred, Training Materials were provided and left with Owner, training was not interrupted or shortened by equipment or system troubleshooting (If it is, then there should be a line where Owner and Contractor can indicate when make-up training will be provided and how long it should be), Training was generally sufficient for the proposed curriculum.

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e) Include Notes section for Owner and Contractor to note any issues during training (areas requiring further development, etc.).

7) Following training occurrence, submit completed training records no later than 5 days following end of training. When training is conducted over a period of weeks, completed training submittals shall be consolidated into a single submittal and submitted every 2 weeks.

8) Event attendance, as specified herein, shall be performed by a staff member associated with the project integration. They shall submit an event attendance report of any issues encountered, resolution or next activities to resolve in a timely fashion.

9. Training Attendance Sign In Submittal
   a. Submit copies of all sign-in sheets from owner training at a maximum of one week after training has occurred.
10. Final Inspection Notification Report.
   a. Two copies of a typed, neatly prepared checkout report for each piece of equipment and the entire system shall be prepared and submitted; it shall include:
      1) A complete listing of every piece of equipment, the date it was tested and by whom, the results and date re-tested (if failure occurred during any previous tests).
      2) The final report shall indicate that every device tested successfully
      3) A performance test report indicating that the system meets all the Installers testing requirements of Part III.
11. Contract close-out submittals
   a. Keep a complete set of drawings on the job, note any changes made during installation, and submit 1 corrected set of reproducible drawings showing Work as installed.
   b. Submit the following data for review, prepared as indicated, at least one week prior to acceptance testing (exceptions noted):
      1) System Operation and Instructions. Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity. This procedure should describe the operation of all system capabilities. Assume the intended reader of the manual to be technically inexperienced and unfamiliar with this facility.
      2) Final Documents:
         a) A list of all equipment, indicating manufacturer, model, serial number, power consumption, warranty terms if greater than the specified warranty and equipment rack location. Update following acceptance testing, if changed.
         b) Manufacturer's Instruction Manuals for all items of equipment, incorporating or followed by manufacturer's warranty statements.
         c) Where manufacturer registration is required, register warranty in Owner's name, and at an address determined by Owner. Provide copy of registration.
         d) For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item.
         e) A list of settings of all semi-fixed controls. Update following acceptance testing. (This shall specifically include all computer-based software settings, e.g. IP addresses, gateways, drive mapping, backup procedures etc.)
         f) Schematic wiring diagrams of the Video Production System sub-system, based on the as-built documentation, at a reduced scale easy to handle but fully legible.
         g) Maintenance Instructions, including Installer's maintenance phone number(s) and hours; maintenance schedule; description of products

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recommended or provided for maintenance purposes, and instructions for the proper use of these products.

h) A legend of acronyms and abbreviations must accompany all documentation.

i) Any other pertinent data generated during the Project or required for future service.

j) System Reference Manual
   (1) Furnish multiple copies as required by Project Requirements, in 3 ring binders, sized to hold the material plus 50% excess, with clear vinyl pockets on cover and spine for project title.
   (2) Provide a digital copy installed on all engineering PC's, as well as a copy on a removable USB drive.
   (3) After acceptance of submittal, host all close out documents online at a secured link for a period of 10 years.
      (a) Provide 1RU rack blanks with a QR Code accessing this link and all relevant log information at the beginning of every row of racks in the PDC.

k) Electronically editable files for all project work:
   (1) AutoCAD DWG
   (2) AutoDesk Revit
   (3) Excel
   (4) Word
   (5) PDF is not considered an editable file.

1.5 QUALITY ASSURANCE

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A. Video Production Installer's Qualifications: Firm experienced in the installation of systems similar in complexity to those required for this project. Specific proposal submission requirements are:

1. Experience with at least three (3) comparable scale sports projects within the last three years.
2. Provide reference information and contact information for each project.
3. In the event sport specific projects are not available, other projects may be considered.

B. Maintain a fully staffed and equipped service facility. In the event the Installer is outside a one (1) hour support time for the project, identify local resource(s) to be developed and assigned to support the project during the warranty duration.

C. The Installer is authorized to sell all equipment specified within this system.

D. The Installer shall demonstrate that it has:

1. Adequate plant, equipment bonding and insurance capabilities to complete the work.
2. Adequate staff with commensurate technical experience. Identify the following roles for the project and provide appropriate resumes:
   a. Senior Project Engineer(s).
   b. IT Project Engineer
   c. Project/Site Supervisor (aka lead installer).
   d. Project/Off-site project manager.
   e. Purchasing and expediting staff
   f. Vice President/Operator for escalation contact in the event of difficulties

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g. Other staff and their experience that may assist in evaluating the installer's proposed deployment team

3. Suitable financial status to meet the obligations of the work.
4. Any installation, labor or electrical subcontractor (this does not include millwork) whose contract value will exceed $10,000.
5. A proposed project schedule with resource loading diagram (based on a system of this complexity).
   a. Sample submittals are encouraged as part of the proposal submittal. This is including but not limited to:
      1) One-line diagrams
      2) As-built documentation
      3) Photographs of work (showing the rear of equipment racks, not the fronts).
      4) Commissioning procedure(s)
      5) Training documentation
      6) Other information that may assist in evaluating the vendor's past performance.

1.6 PROJECT CONDITIONS

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A. Verify all conditions on the job-site applicable to this work. Notify Owner's Representative in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The drawings diagrammatically show cables, conduit, wiring, and arrangements of equipment fitting the space available without interference. If conditions exist at the job site which make it impossible to install work as shown, recommend solutions and/or submit drawings to the Owner's Representative for approval, showing how the work may be installed.

1.7 ACCEPTANCE TESTING

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A. Upon completion of installation and initial tests and adjustments specified in Part 3, acceptance testing shall be performed by the Owners Consultant.

B. Provide one person familiar with all aspects of the system to assist the Consultant during acceptance testing.

C. The process of acceptance testing may necessitate moving and adjusting certain component parts; perform such adjustments without claim for additional payment.

D. In the event that the system is used prior to final acceptance, attendance in support of system usage shall not be construed as acceptance, or as event attendance.

1.8 WARRANTY

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A. Warrant labor and materials provided under this agreement for one year following the date of the first regular season game, trouble free operation, or final acceptance, whichever is later.

B. System to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics; repair or replace defects occurring in labor or materials within the Warranty period without charge. Warrant all replaced products as new.

C. This warranty shall not void specific warranties issued by manufacturers for greater periods of time. Nor shall it void any rights guaranteed to the Owner by law.

D. Within the warranty period, answer service calls within 8 hours, and correct the problem within twenty-four hours.

E. Register all manufacturers' warranties (e.g., software, computers, etc.) in Owner's name.

1.9 SPECIFIED PRODUCTS AND MANUFACTURERS

A. Model numbers and manufacturers included in this specification are listed as a standard of quality. Regardless of the length or completeness of the descriptive paragraph herein, each device shall meet all of its published manufacturer's specifications. Verify performance as required. Where two or more acceptable products are listed, the Installer may use either at their discretion.

B. Other qualified manufacturers will be considered subject to approval of complete technical data, samples, and results of independent testing laboratory tests of proposed equipment, submitted in accordance with project requirements.

C. If the proposed system includes equipment other than specified model numbers, submit a list of major items and their quantities, with a one-line schematic diagram for review.

D. Include a list of previously installed projects using proposed equipment that are similar in nature to specified system.

E. If a product is discontinued or made obsolete due to continuing product development, replace it with manufacturers' equivalent at time of installation at no additional cost subject to approval by the Owner's representative.

1.10 OPERATOR OR TENANT FURNISHED, CONTRACTOR INSTALLED EQUIPMENT

A. Certain Equipment is identified as Owner or Tenant Furnished Equipment, Contractor Installed (OFCI). This Owner Furnished Equipment will be available from the Owner. Coordinate pickup and/or delivery of Owner furnished equipment with the Owner.

B. Inspect the Operator Furnished Equipment and advise the Operator of damage or defect and the extent of repair and/or adjustment required to bring the Operator Furnished Equipment to original operating specifications. Any repair service is beyond the current scope. Service the Operator Furnished Equipment, as directed by the Operator, as change to this contract or under separate agreement.

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C. Incorporate into the system as if new including all relevant firmware/software updates, excepting warranty coverage.

D. Existing/Legacy Operator Furnished Equipment reused as part of the system:

1. As-builts are provided for reference for maintaining connections to existing equipment. Onsite verification is required.
2. Riedel NSA002A (ICOM IF) Type A
3. New network switches or additional ports provided by Owners IT.
4. All current software licensing
   a. Reuse any current licensing that may be transferred to new systems. At the time of bid provide information on which licenses are planned to be transferred to new hardware.

E. Related work provided and installed by others

1. LED/Scoreboard Contractor supplied and installed.
   a. ~~LED Content Management System~~ Daktronics Show Control System
   b. LED Display Processors
      1) Coordinate with 11 63 10 for schedule and final requirements.

1.11 OPTIONS SHOULD REFLECT THE NET COST (ADD OR DEDUCT) FOR THE OPTION AND ALL IMPACTED ELEMENTS. IN THE EVENT SUPPLIER CANNOT QUOTE A SPECIFIC PRODUCT; LIST NA ON BID FORM.

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1. Option 11 63 50-A1: Provide annual costs for all software support for all new LED Content Management System components, provided as base bid. Annual costs shall be for five years following expiration of the project warranty period. Note: if base bid product is significantly higher than alternate products, a note to the order of magnitude would be appreciated.
   a. Option 11 63 50-A1.2: Provide year 2 cost for all software support for new LED Content Management System components provided as base bid.
   b. Option 11 63 50- A1.3: Provide year 3 cost for all software support for new LED Content Management System components provided as base bid.
   c. Option 11 63 50- A1.4: Provide year 4 cost for all software support for new LED Content Management System components provided as base bid.
   d. Option 11 63 50- A1.5: Provide year 5 cost for all software support for new LED Content Management System components provided as base bid.
2. Option 11 63 50- A2: Provide annual costs for all hardware support for new LED Content Management System components, provided as base bid. Annual costs shall be for five years following expiration of the project warranty period. Note: if base bid product is significantly higher than alternate products, a note to the order of magnitude would be appreciated.
   a. Option 11 63 50- A2.2: Provide year 2 cost for all hardware support for new LED Content Management System components provided as base bid.
   b. Option 11 63 50- A2.3: Provide year 3 cost for all hardware support for new LED Content Management System components provided as base bid.
   c. Option 11 63 50- A2.4: Provide year 4 cost for all hardware support for new LED Content Management System components provided as base bid.
   d. Option 11 63 50- A2.5: Provide year 5 cost for all hardware support for new LED Content Management System components provided as base bid.

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1.12 UNIT COSTS SHOULD REFLECT THE NET COST (ADD OR DEDUCT) FOR THE UNIT COST AND ALL IMPACTED ELEMENTS. IN THE EVENT SUPPLIER CANNOT QUOTE A SPECIFIC PRODUCT; LIST NA ON BID FORM.

A. Unit Cost 11 63 50-A. Unit Cost to add/deduct PTZ/POV Cameras

1. Unit Cost 11 63 50-A1 Unit Cost to add/deduct one (1) POV Camera Type 1 and associated support equipment.
2. Unit Cost 11 63 50-A2 Unit Cost to add/deduct one (1) POV Camera Type 2 and associated support equipment.
3. Unit Cost 11 63 50-A4 Unit Cost Unit Costs to add/deduct one (1) POV Control Panel (POV CP) Type 1 and associated support equipment.

B. Unit Cost 11 63 50-B Unit Cost to add/deduct LED Content Management System components.

1. Unit cost 11 63 50-B1 Unit Cost to add/deduct one (1Dashboard Server (DS) Type 1
2. Unit cost 11 63 50-B2 Unit Cost to add/deduct one (1) Tessera Render Engine (RE) Type 1
3. Unit cost 11 63 50-B3 Unit Cost to add/deduct one (1) Mosaic Compositing Engine (MCE) Type 1

C. Unit Cost 11 63 50-C Unit cost for Systems Engineer to be on site and available to support events beyond the specified quantity

PART 2 - PRODUCTS

2.1 GENERAL

A. All equipment and materials shall carry the original manufacturer's warranty. Take care during installation to prevent scratches, dents, chips, etc.

B. Regardless of the length or completeness of the descriptive paragraph herein, each device shall meet all its published manufacturer's specifications. Verify performance as required. Where two or more acceptable products are listed, the Installer may use either at their option.

C. Provide engraved lamicoid labels at the front and rear of all signal processing equipment mounted in racks. Mount labels on the equipment and attach in a neat, plumb, and permanent manner. Embossed labels will not be accepted. Provide engraved labels at the rear only of equipment mounted in furniture consoles.

D. Custom rack panels shall be 1/8" thick aluminum, standard rack sizes, brushed black anodized finish unless otherwise noted. (Brush in direction of aluminum grain only.) Custom connector plate (speaker, microphone, etc.) finishes shall be selected from manufacturer's full range of standard finishes. Plastic plates will not be accepted, even if they are building standard in other areas.

E. All engraving shall be 1/8" high block sans serif characters unless noted otherwise. On dark panels or push buttons, letters shall be white; on stainless steel or brushed natural aluminum plates, or light-colored push buttons, letters shall be black.

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F. In accordance with IEC-268 standard, all XLR connectors shall be wired pin 2 hot (high), pin 3 cold (low), and pin 1 screen (shield).

G. All patch panels shall be wired so signal "sources" (outputs from devices) appear on the upper row of a row pair; all "loads" (inputs to devices) appear on the lower row of a row pair. All patch panel designation strips shall utilize alphanumeric and descriptive labels. The jack positions in each horizontal row shall be numbered sequentially from left to right. The horizontal jack rows shall be lettered sequentially from top to bottom. The alphanumeric identification of each jack shall be included on the functional block drawings.

2.2 VIDEO PRODUCTION SYSTEM CAMERAS AND SUPPORT EQUIPMENT

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A. Remote Operated Cameras

1. Remote Operated Pan/Tilt Zoom Camera (POV) Type 1
   a. Remote Operated PTZ; permanently installed
   b. To be operated in 1080p 59.94 SDR
   c. Provide appropriate mounting solutions for each location
   d. Cameras can utilize either local power or appropriate POE power insertion.
   e. Acceptable Solutions:
      1) Canon CR-X500
      2) Panasonic AW-UR100
      3) Sony BRC-X1000 with
         a) Sony BRZ-12CDH Environmental Dome Enclosure
      4) As Approved
2. Remote Operated Pan/Tilt Zoom Camera (POV) Type 2
   a. Remote Operated PTZ; permanently installed
   b. To be operated in 1080p 59.94 SDR
   c. Provide appropriate mounting solutions for each location
   d. Cameras can utilize either local power or appropriate POE power insertion.
   e. Acceptable Solutions:
      1) Canon CR-N700
      2) Panasonic AW-UE160
      3) Sony BRC-X1000
      4) As Approved
3. POV Transmitter (POV TX) Type 1
   a. Transport Video, IP Control and Sync from remote location to Video Production System
   b. Provide appropriate mounting solution at fiber demarcation point
   c. Use same manufacturer as POV RX Type 1
   d. Acceptable Solutions
      1) Joseph Electronics SIL-1040-STADT-ST1
      2) Multidyne V4-3802-1X0-SDXEA-ST
      3) As Approved
4. POV Receiver (POV RX) Type 1
   a. Transport Video, IP Control and Sync from remote location to Video Production System
   b. Use same manufacturer as POV TX Type 1
   c. Acceptable Solutions
      1) Joseph Electronics SIL-1040-STADR-ST1
      2) Multidyne V4-3802-0X1-SDXEB-ST
      3) As Approved

5. Media Converter (MC) Type 1
   a. Transport gigabit ethernet via single mode fiber optic cabling
   b. Acceptable Solutions
      1) YelloBrik OET 1510 with
         a) YelloBrik RFR 1001 on remote side
         b) YelloBrik RXT 1001 on remote side
         c) YelloBrik RFR 1200 in PDC
            (1) Provide QTY. 1 for every (14) Media Converters
      2) As Approved
6. POV Controller (POV CP) Type 1
   a. PTZ Control Panel
   b. Provide same manufacturer as selected POV Type 1 and POV Type 2 cameras
   c. Acceptable Solutions:
      1) Canon RC-IP1000
      2) Panasonic AW-RP-150GJ
      3) Sony RM-IP500
      4) As Approved
   d. Quantity: 1

2.3 LED CONTENT MANAGEMENT SYSTEM

A. Dashboard Server (DS) Type 1

1. Custom 1RU rack mount server with:
   a. Microsoft Windows Pro 64-bit
   b. Intel Core i7 13th Generation or newer AMD Ryzen 7 7000 series or newer
   c. 32GB DDR4-3200 RAM
   d. 1TB SSD Storage
   e. 4 Port Gigabit Network Interface Card
   f. Four USB ports
   g. Sliding Rack Rails
   h. Ross Video Dashboard Software
2. Acceptable Solutions:
   a. BSI
   b. Dell
   c. SuperLogistics
   d. SuperMicro
   e. As Approved
3. Quantity: 2

B. Tessera Render Engine (RE) Type 1

1. Provide (3) configurable 1080p 59.94 Key/fill outputs per system
2. Provide (2) 1080p 59.94 inputs per system
3. Current software licenses in existing Xpression servers are perpetual. Migrate existing USB license dongle from current Xpression servers (Node 09, 10, 11) to new servers.
   Acceptable Solutions:
   a. Ross Video Solution
      1) Ross Video XPN-1RU-RS2-M9 with
         a) Ross Video XPN-KBD-BACKLIT (Quantity: 2)
4. Quantity: 3

C. Mosaic Compositing Engine (MCE) Type 1

1. Provide (24) 1080p 59.94 inputs per system

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Frame Sync (FS) Type 1¶
1080p Capable Up/Down/Cross converter¶
Provide HDR/SDR Cross Mapping capabilities¶
Provide cross format capabilities to take signals interchangeably between 480p, 525i, 720p, 1080i, 1080p and 4K¶
Support 3G inputs and outputs¶
Support for SDI over Fiber inputs and outputs¶
Each channel of conversion must be able to be configured individually¶
.¶
Acceptable Solutions¶
AJA FS-8¶
Ross Video GATR-TOOLBOX-2F-R4F¶
As Approved¶
Quantity: As required¶

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2. Provide (10) configurable 1080p 59.94 outputs per system
3. Current software licenses in the existing Carbonite Ultra are perpetual. Migrate existing software from current Carbonite Ultra (XSWR-03, XSWR-04) to new Carbonite Ultra.
4. Existing power supplies to be reused.
5.
6. Acceptable Solutions:
   a. Ross Video Solution
      1) Ross Video Carbonite Ultra (CUF-124)
7. Quantity: 2

2.4 INTERCOM

A. Wired Matrix Intercom Solution

1. Network based distribution.
2. Provide adequate IO to support existing and replacement wired intercom panels.
3. Provide adequate IO to support existing and replacement wireless intercom beltpacks.
4. Provide any required configuration software.
   a. Install on existing owner furnished computers
5. Intercom Matrix (ICOM MTX) Type 1
   a. Acceptable Solutions:
      1) Riedel
         a) Riedel ARTIST-1024
         b) Riedel VAE-16 (Quantity: As required plus 1)
         c) Riedel UIC-128-II used as NIC (Quantity: As required)
         d) Riedel ART-Z-SFP-CPU-SM-1310-10 (Quantity: 4 per solution)
         e) Riedel ART-Z-LWL-cable-SM-LC-Duplex (Quantity: 1)
         f) Riedel UIX-128-II used as SIC (Quantity: As required)
         g) Riedel MN-Z-SFP-1000baseT (quantity: As required)
         h) Riedel Director Configuration Software
6. Quantity: 1

B. Matrix Intercom Panels

1. Use same manufacturer for Matrix Intercom Panels as selected for ICOM MTX Type 1
2. Coordinate sex and pin out of headset connectors to correlate with headset and camera connections.
3. Intercom Panel (ICOM) Type 1
   a. One (1) RU matrix intercom panel.
   b. Network-based connectivity.
   c. 18 Key panel
   d. 3 Multi-touch Color Displays
   e. Provide (1) Type 1 Headset With each Type 1 Intercom Panel.
   f. Acceptable solutions:
      1) Riedel
         a) Riedel SmartPanel RSP-2318 with
            (1) Riedel RSP-2318-APP-PRO
   g. Quantity: As required plus 1
4. Intercom Panel (ICOM) Type 2
   a. One (1) RU matrix intercom panel.
   b. Network-based connectivity.
   c. 18 Key panel
   d. 3 Multi-touch Color Displays
   e. Provide (1) Type 1 Headset with each Type 2 Intercom Panel.

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f. Acceptable solutions:
1) Riedel
a) Riedel SmartPanel RSP-2318 with
(1) Riedel ESP-2324 Expansion SmartPanel
(2) Riedel RSP-2318-APP-PRO
g. Quantity: As required plus 1

C. Matrix Intercom Panel Accessories

1. Footswitch
a. Include any licensing required to connect foot switch to Matrix Intercom Panels
b. Acceptable Solutions:
1) Dayton 6GPD5
2) Linemaster 632-S
c. Quantity: 5

D. Wireless Matrix Intercom

1. Wireless based matrix intercom
2. A minimum of six (6) discrete channels of intercom per belt pack.
3. DECT based transport
4. Expandable up to 50 antennas and 50 belt packs.
a. Wireless Intercom Belt Pack (WL BP) Type 1
1) Acceptable Solutions:
a) Riedel BL-BPK-1006-19-US with:
(1) Riedel BL-BAT-1015-ST spare battery
b) Riedel ICOM BL-BCL-1000-00
c) Riedel BLBPK-COVER-YELLOW
(1) Quantity: As required
d) Riedel BL-BPK-COVER-VIOLET
(1) Quantity: As required
e) Riedel BL-BPK-COVER-WHITE
(1) Quantity: As required
f) Riedel BL-BPK-COVER-GREY
(1) Quantity: As required
2) Quantity: 12
b. Wireless Intercom Belt Pack Charger
1) Acceptable Solution:
a) Riedel BL-CHG-1005-R
c. Quantity: (1) for every (5) Type 1 Wireless Intercom belt packs.
5. Wireless Intercom Antenna Distribution (WL ANT) Type 1
a. Provide replacement as noted above.
b. Acceptable Solution:
1) Riedel BL-ANT-1010-19G-US-G2 with
a) Riedel BL-EPS-1001-00 External Power Supply
b) Provide Media Converters (MC) Type 1 as required.
c. Quantity: 3

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6. Wireless Intercom Mobile Antenna Kit Tripod Type 1
a. Provide tripod solution to use with mobile antenna kit
b. Adjustable height
c. Tripod base
d. Provide any necessary adapters
e. Acceptable Solutions:
1) Auray RFMS-580
2) As Approved.

f. Quantity: 1

7. Wireless Intercom Control Application
   a. Acceptable Solution:
      1) Riedel BL-ANT-APP-PRO_2.0
   b. Quantity: 1

E. Intercom Interfaces

1. Intercom Interface (ICOM IF) Type A
   a. Convert Dante/AES67 4-wire to 2-wire intercom.
   b. Acceptable Solutions:
      1) Riedel NSA-002A

F. Headsets

1. Provide appropriate XLR connector at end of each unit.
2. Headset (HEADSET) Type 1
   a. Light duty, single muff headset.
   b. Acceptable Solutions:
      1) Riedel AIR-D1
      2) RTS PH-88R5
   c. Quantity: As required plus 10
3. Headset (HEADSET) Type 2
   a. Medium duty, single muff headset.
   b. Acceptable Solutions:
      1) Riedel PRO-D1
      2) RTS HR-1
      3) David Clark 8590
   c. Quantity: As required plus 3
4. Headset (HEADSET) Type 3
   a. Medium duty, dual muff headset.
   b. Acceptable Solutions:
      1) Riedel PRO-D2
      2) RTS HR-2
      3) David Clark 8530
   c. Quantity: 10

2.5 NETWORK SWITCHES

A. Network Switch

1. Network Switch (SWITCH) Type ~~1~~ A
   ~~a.~~ Coordinate final network switch requirements with owner IT.

2.6 GENERAL PURPOSE CONTROL WIRING, FIBER OPTIC AND RF CABLE/CONNECTORS

A. Cabling to be in accordance with Owner standards.

B. Connectors to be in accordance with Owner standards, with the following exceptions/enhancements:

1. Single Mode Fiber Optic ST Connector:
   a. Connector Type: Single Mode Fiber ST connector.
   b. Temperature Cycling: ≤0.3dB change, -40° to +75° C.

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Provide uplink optics in pairs as required by owner¶
(48) 1Gb/S Ports¶
(2) 10Gb/S SFP+ Ports¶
Layer 3 Networking¶
Managed¶
POE+¶
Acceptable Solutions¶
Cisco C9300L-48T-4X-E¶
Netgear GSM4352PB¶
Other Vendors with Acceptable Solutions¶
HP Aruba¶
Juniper¶
Ubiquity¶
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c. Insertion Loss Average: 0.2 dB.
d. Reflectance: ≤ 40 dB typical.
e. Re-matings: minimum of 500.
f. Mechanical splicing not acceptable
g. Acceptable Manufacturers
   1) Belden
   2) Corning
   3) As Approved
h. Provide 25 spare connectors after turn over.

2. Single Mode Fiber Optic LC UPC Connector:
   a. Connector Type: Single Mode Fiber LC connector for use with Neutrik opticalCON connector.
   b. Temperature Cycling: ≤0.3dB change, -40° to +75° C.
   c. Insertion Loss Average: 0.2
   d. Reflectance: ≤ 55 dB typical.
   e. Re-matings: minimum of 500.
   f. Mechanical splicing not acceptable
   g. Acceptable Manufacturer:
      1) Belden
      2) Corning
      3) As approved
   h. Provide 25 spare connectors after turn over.

2.7 DEMONSTRATION AND TRAINING

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A. On Site Training. Integrators trainers to provide operations and service training on the following major equipment components and subject matter to the Operator (this is not commissioning):

1. Provide 12 hours of LED Content Management System instruction to Owner designated personnel on the use and operation of the System, scheduled as a minimum of 2 separate sessions, by an instructor fully knowledgeable and qualified in system operation. The System Reference Manuals should be complete and on site at the time of this instruction. Coordinate schedule of Training with Owner. At direction of Owner, a portion of training time may be deferred to the end of, or at any point during the regular season as follow-up sessions to enhance Owner's ability to maximize performance of system.
2. Provide 8 hours of Intercom instruction to Owner designated personnel on the use and operation of the System, scheduled as a minimum of 2 separate sessions, by an instructor fully knowledgeable and qualified in system operation. The System Reference Manuals should be complete and on site at the time of this instruction. Coordinate schedule of Training with Owner.
3. Trainer's Daily reports shall be emailed to those being trained, the Owner's representative, the manufacturer's training department, Contractor.
   a. Trainer's Daily reports shall be emailed to those being trained, the Owner's representative.
      1) The reports should include information required as part of the submittal; as well as detailed information on setup and operational training specific to the project installation.
      2) The Daily reports should be cumulative and edited as appropriate during the training duration.

B. Intercom Training (8 hours). Training shall be separate from commissioning. Training shall be both technical and operational.

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C. Training shall be scheduled to be non-overlapping, unless otherwise agreed to by the Owner.

D. Actual training schedule shall be by agreement with Owner. Do not assume that training will occur over 8 hour days. It is more likely that training will be scheduled in 2-4 hour increments; perhaps over a period of weeks (or even months).

E. In the event that a portion of the training time is occupied in troubleshooting the equipment installation or, commissioning the equipment, the training time shall be extended by an equal amount of time.

F. The following is a general idea of the training "curriculum":

1. A general familiarization of the architecture of the device.
2. An explanation of how the device interfaces to the rest of the Video Control Room (including data connections; timing requirements and the like).
3. General training on operating the device.
4. Specific training on device operation (e.g. on the CG, entering statistics; how to access data retrieval sources; how to create repeatable formats and layouts).
5. Saving information; backing information up.
6. Basic troubleshooting
7. Specific troubleshooting (this information may be conveyed to personnel other than the device's "operators").
8. How to upgrade software; precautions taken while doing (e.g. backing-up existing software).

2.8 EVENT ATTENDANCE

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A. In addition to training and warranty requirements, this installer shall provide event support services to facilitate troubleshooting and effect repair of the specified systems during critical events.

1. Be present on game day from at least 4 hours before gates open, until the time released by the Owner.
2. During these events, attendance shall begin at the first crew call and conclude when the crew is released. During these events perform such tasks (e.g. assistance with timing, patching, routing, shading, troubleshooting cabling problems, etc.) as requested by user.

B. Event support personnel shall be a project engineer associated with the original system design, configuration and engineering.

C. During warranty, provide these services for 12 events as designated by Owner.

1. In the event that the system is used prior to final acceptance, attendance in support of system usage shall not be construed as acceptance, or as event attendance.

PART 3 - EXECUTION

3.1 GENERAL

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A. All equipment and materials shall be new. Take care during installation to prevent scratches, dents, chips, etc.

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B. Mount equipment and enclosures plumb and square. Permanently installed equipment to be firmly and safely held in place. Design equipment supports to support loads imposed with a safety factor of at least three. Seismic bracing shall be installed on appropriate equipment where local codes require such installation.

C. Cover edges of cable pass-through holes in chassis, racks, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.

3.2 AC POWER AND GROUNDING

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A. For all devices with detachable power cord, provide a “shortened” cable to connect directly to power strip without “bundling”; this power cable is preferred in a color other than black. Provide Owner 15 of the original length power cables.

3.3 SYSTEM WIRING

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A. Take precautions to prevent and guard against electromagnetic and electrostatic hum. For line level audio signals, float cable shields at the output of source device. Shields not connected to be folded back over cable jacket and covered with heat-shrink tubing. Do not cut off unused shields.

B. Exercise care in wiring; damaged cables or equipment will not be accepted. Isolate cables of different signals or different levels; and separate, organize, and route to restrict channel crosstalk or feedback oscillation in any amplifier section. Keep wiring separated into groups for microphone level circuits, line level circuits, loudspeaker circuits, and power circuits.

C. Make joints and connections with rosin-core solder or with mechanical connectors approved by the Architect’s Consultant; where spade lugs are used, crimp properly with ratchet type tool. Spade lugs mounted on 22 gauge or smaller cable to be soldered after crimping.

D. Execute wiring in strict adherence to standard professional practice.

E. Neatly lace vertical and horizontal wiring inside rack with lacing bars. Horizontal wiring in rack to be neatly tied in manageable bundles with cable lengths cut to minimize excess cable slack but still allow for service and testing. Provide horizontal support bars if cable bundles sag. Neatly bundle excess AC power cable from rack mounted equipment with velcro cable ties; where short power cables are not available. Rack wiring to be bundled with velcro cable ties or hoop distribution system. Electrical tape and adhesive backed cable tie anchors are not acceptable.

F. Provide adequate service loops so that equipment mounted on rack slides may be pulled fully out, to their locked position without straining cable.

G. All mini-BNC, mini-DIN and RCA/phono connections shall be made directly to the cable in question; whips and adapters are not acceptable.

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H. Wiring and connections shall be completely visible and labeled in rack. Termination resistors shall be 1% tolerance; fully visible and not concealed within equipment or connectors.

I. Custom rack panels shall be 1/8" thick aluminum, standard rack sizes, brushed black anodized finish unless otherwise noted. (Brush in direction of aluminum grain only.) Custom connector plate (speaker, microphone, etc.) finishes shall be selected from manufacturer's full range of standard finishes. Plastic plates will not be accepted, even if building standard in other areas.

1. All engraving shall be 1/8" block sans serif characters unless noted otherwise. On dark panels or push buttons, letters shall be white; on stainless steel or brushed natural aluminum plates, or light-colored push buttons, letters shall be black.

J. All patch panels shall be wired so signal "sources" (outputs from devices) appear on the upper row of a row pair; all "loads" (inputs to devices) appear on the lower row of a row pair. All patch panel designation strips shall utilize alphanumeric and descriptive labels. The jack positions in each horizontal row shall be numbered sequentially from left to right. The horizontal jack rows shall be lettered sequentially from top to bottom. The alphanumeric identification of each jack shall be included on the functional block drawings.

K. General Equipment and Cable Labeling:

1. Provide engraved lamicoid labels on the front and rear of active equipment mounted in racks. Mount labels in a neat, plumb and permanent manner. Embossed labels are not acceptable. Equipment labels to have at least three lines of engraving with the first line listing the general name of the device, i.e., COMB GENERATOR, or RF SWITCHER. The second line to include the schematic reference of the device, i.e., COMB GEN, or RF SWITCH. The bottom line to indicate what other devices or areas this equipment controls, i.e., FEEDS SPLITTER or MONITOR/RECEIVER.
2. Provide an engraved label over each user-operated control that describes the function or purpose of the control. Label size to be adjusted to fit available space.
3. Engraved labels to have 1/8" high characters minimum. Labels to be black with white characters except where indicated.
4. Cables and wiring to be logically, legibly and permanently labeled for easy identification. Labels on cables to be adhesive strip type covered with clear heat-shrink tubing. Factory stamped heat shrink tubing may be used in lieu of the adhesive strip style label. Hand-written or self-laminating type labels are not acceptable.
5. Wiring designations to be an alpha-numeric code that is unique for each cable. Locate the cable designation at the start and end of each cable run and within 3" of the point of termination or connection. For cable runs that have intermediate splice points, the cable shall have the same designation throughout with an additional suffix to indicate each segment of the run. Cable labels shall identify source and destination codes on each label. Actual cable designation assignments to be determined by Installer. Add cable designation codes to system schematic drawings included with Project Record Drawings.
6. Label each terminal strip with a unique identification code in addition to a numerical label for each terminal. Show terminal strip codes on system schematic drawings included with Project Record Drawings.
7. Provide adhesive labels on the rear of equipment where cables attach to indicate the designation of the cable connected at that point.
8. Provide labels at both ends of equipment power cables with the general name of the device they are powering listed.
9. Provide adhesive labels on the top and bottom of DC power supplies with the general name of the device they are powering.

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10. Provide adhesive labels below each outlet on all power strips indicating which device is being powered.

L. Device labeling shall consist of two types: functional drawing reference and operational naming convention. Device physical labeling shall apply to functional drawings and physical labels on devices, operational naming convention shall allow user to provide flexible labeling between devices and their function (e.g., camera naming/numbering, file server labels).

M. Installation of Cable and Wiring

1. Install cable in a manner to adhere to manufacturer's specifications for maximum cable pulling tension, minimum bend radius, and rigging calculations and restrictions.
2. Provide appropriate support at all horizontal-to-vertical transitions in order to keep the weight of the cable from degrading at the point of transition.
3. Provide splice free wiring and cabling from origination to destination.
4. Make joints and connections with rosin-core solder or with mechanical connectors approved by the Owner's Representative; where spade lugs are used, crimp properly with ratchet type tool.
5. Take precaution to prevent and guard against electromagnetic and electrostatic hum. For line-level audio signal, float cable shield at the output of source device. Shield not connected to be folded back over cable jacket and covered with heat-shrink tubing. Do not cut off unused shield.
6. Isolate cables and wires of different signals or different levels; and separate, organize, and route to restrict channel crosstalk or feedback oscillation in any amplifier section in compliance with ASDI article 12.3.
7. Cover edges of cable and wire pass-through holes in chassis, housings, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.
8. Install cable so that a radius bend of no less than ten times the cables OD is maintained.

N. Housing Cabling and Wiring

1. Provide 1'-6" minimum service loop within junction boxes to enable plates to be removed from the junction box and serviced.
2. Install cable and wire neatly tied in manageable bundles with cable lengths cut to minimize excess cable slack but still allow for service and testing. Provide horizontal support bars if cable bundles sag.
3. Cables should be dressed to permit individual plates and panels to be removed, without disturbing adjacent plates or panels.
4. Neatly bundle excess AC power cable from housing mounted equipment with plastic cable ties.
5. Provide plastic cable ties or lacing twine to bundle cabling and wiring. Electrical tape and adhesive backed cable tie anchors are not acceptable.
6. Install with connections completely visible and labeled.

3.4 INSTALLER TESTS AND ADJUSTMENTS

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A. Verify the following before beginning actual tests and adjustments on the system:

1. All products are installed in proper and safe manner according to manufacturer's instructions.
2. Insulation and shrink tubing are present where required.
3. All Dust, debris, solder splatter, etc. is removed.
4. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
5. All labeling has been provided.

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6. Temporary facilities and utilities have been properly disconnected, removed and disposed of off-site.
7. All products are neat, clean and unmarred and parts securely attached.
8. All broken work, including glass, raised flooring and supports, ceiling tiles and supports, walls, doors, etc. have been replaced or properly repaired, and debris cleaned up and discarded.
9. All extra materials, portable equipment and spares shall be delivered and stored on the premises as directed.

B. Prior to energizing the System verify and perform the following tests and adjustments in compliance with applicable EIA standards. Record the results of each test in the Project Record Manual.

1. Electronic devices are properly grounded.
2. Test each AC power receptacle with a circuit checker for proper hot, neutral and ground connections.
3. Powered devices have AC power from the proper circuit.
4. Measure and record the DC resistance between the technical ground in any equipment rack or console and the main building ground. Resistance should be 0.15 ohms or less.

C. Preparation for Acceptance, prior to final inspection:

1. Verify each individual component is operating properly
2. Verify each individual component's performance meets the manufacturer's published performance for this unit.
3. Verify proper operation from controlling devices to controlled devices.
4. Verify proper adjustment, balance and alignment of equipment for optimum quality and to meet the manufacturer's published specifications.
5. Establish and mark normal settings for each level control, and appropriately record these settings within the "System Operation and Maintenance Manual."
6. Verify that all communications and networking services are installed and in proper working condition (Ethernet, IP addressing)
7. Other tests on equipment or systems as deemed appropriate, such as, but not limited to:
   a. Cameras
      1) Verify Camera power on
      2) Verify all indicators on Camera reflect no short circuit or open circuit conditions
      3) Verify Pan-Tilt-Zoom function smoothly
      4) Verify Pan-Tilt control is connected and working
      5) Verify Zoom control is connected and working
      6) Verify the Video mode is set proper mode (HD/SD)
      7) Verify Aspect Ratio is set to proper mode (16:9/4:3)
   b. CCUs/OCPs
      1) Verify relevant cameras are assigned and connected to respective CCU/OCP.
      2) Verify assigned IP addresses and subnet mask are configured correctly
      3) Verify iris control sensitivity, mode, range and center is setup and joystick is calibrated
      4) Verify shading control is turned on
      5) Verify White Balance is set and parameters stored.
      6) Verify control of camera iris

D. Commissioning. Commissioning shall be performed by a combination of the integrator, the manufacturer or a separate commissioning agent retained by the integrator. The following identifies some, but not all, of the commissioning tasks expected of the commissioning team.

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This list is not intended to be comprehensive and should be considered a general guideline for the integrator without a defined commissioning process statement.

1. Cameras and tripods.
   a. Setup camera in accordance with Manufacturer's procedure
      1) Rain slicker(s), if any
   b. Confirm Remote control panel properly interacts with camera
   c. Confirm tallies function as expected at each CCU and Camera. Provide/plan on green and red tally.
2. Computers, Networking, IP and Data
   a. Coordinate IP address for any equipment supplied herein.
      1) Program Gateways
      2) Program subnets
      3) Coordinate subnets and V-lans with other systems including, but not limited to AV, scoring and video displays, and league statistics.
   b. Coordinate firewall and routing configuration if needed between Digital Media Center and house system
   c. Set all clocks, software and hardware, to listen to local or network NTP server.
   d. If appropriate create auto-logon scripts
   e. Establish logical share names, including, but not limited to, AV, scoring and video displays, and league statistics.
   f. Set startup process to include logging into appropriate services and servers (e.g. establish SQL connection between Character Generator and data service)
   g. Establish a defined back up process and train user
   h. Install all relevant software including, but not limited to:
      1) Clients preference for browser(s)
      2) Word processing, spreadsheet, presentation and general office software
      3) Adobe Acrobat
      4) Software used to control, monitor and troubleshoot any hardware provided herein
      5) Creative/Graphic suites as appropriate
   i. Ghost all boot and configuration hard drives after setup and acceptance, but before the users begin training.
   j. Ghost all boot and configuration hard drives 1 month after acceptance.
   k. Connect all data interlinked devices (e.g., CGs, protocol translators, robotic cameras, etc.) with their sources using appropriate control routing switcher, patches, distribution devices and the like, Confirm
      1) Baud rate, programming speed
      2) Desired operations are functional and reliable
      3) Interconnection with other systems including, but not limited to, AV, scoring and video displays, and league statistics.
   l. Rack and UPS sensors (SENSOR).
      1) Setup all rack and room temperature, humidity and moisture sensors with appropriate alarming, notification, and SNMP alarms.
      2) Setup all UPS alarms with appropriate alarming, notification, and SNMP alarms
3. Intercom
   a. Setup each matrix station with labels as coordinated with the Owner.
   b. Setup each party line circuit with labels as coordinate with Owner
   c. Program each matrix user station in accordance with Owner direction for sources and destinations. Unless otherwise noted, user stations of same type and functional use shall be initially programmed identically.
   d. Test each user station to every other station.
   e. Stress test the system under event standards so that users are located at each station and attempt to communicate as they would for the event.

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f. Setup all wireless communication so that talk/listen is available throughout the covered area. Test with high ambient noise conditions.
g. Balance all users, user station, and intercom sources.
h. Null all party line circuits
i. Test Audio Monitoring Paths using the intercom system; verify appropriate gain structure, adjust as required.

3.5 TEST EQUIPMENT

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A. Provide the following equipment on site for final acceptance testing. Test equipment to be available for the entire period through final system acceptance. Prior to start of testing, provide a list to the Owner's Representative of test equipment make and model numbers that will be used.

1. Dual-trace oscilloscope: 100 MHz bandwidth, 1 mV/cm sensitivity, TV trigger.
2. Multimeter: Measurement range, DC to 20,000 Hz, 100 mV to 300 V, 10 ma to 10A.
3. Television signal generator: Tektronix
4. 75 ohm, 1 percent terminators, connection adapters, test cabling, etc., as required.
5. Fiber Optic Cable Test Kit: Optical Wavelength Laboratories KIT-WT-WSVSDST.
6. Provide two portable VHF or UHF business band radios for use during acceptance testing. Radios should have a transmission range sufficient to cover entire project. Radios to include rechargeable batteries and recharger along with "holster" for wearing on belt. Radios to be available for duration of testing process, including any follow-up visits required prior to final acceptance.

3.6 ACCEPTANCE

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A. Upon completion of installation and initial tests and report specified in Part 3, acceptance testing shall be performed by the Owner's Representative.

B. Acceptance testing will include operation of each major system and any other components deemed necessary. Installer will assist in this testing and provide any test equipment required specified herein. Installer shall provide at least 1 technician available for the entire testing period (day and night), to assist in tests, adjustments, and final modifications. Tools and material required to make any necessary repairs, corrections, or adjustments shall be furnished by the Installer. Testing process is estimated to take a minimum of 3 days.

C. The following procedures will be performed on each System:

1. Video Signal: From all source inputs (for cameras, character generators, video tape units, etc.) through all VDAs, processors, switchers, etc., to all signal destinations. Verification of correct signal timing for each source, via each path will be made using standard test patterns. Each processing device will be checked such that the signal passes through the device in the no processing mode such that unity luminance, chrominance, and signal timing and phasing conditions are achieved.
2. Control functions shall be checked for proper operation, from controlling devices to controlled devices.
3. The audio fidelity test shall consist of driving the system with pink noise and measuring the response in each 1/3 octave band from 40 to 16,000 Hz. Octave, 1/3 octave, or notch filters as specified shall be used to adjust the response as necessary to fit the requirements of the space.

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4. Adjust, balance, and align equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for each level control and record these settings, in the "System Operation and Maintenance Manual."
5. Installed and loose equipment will be inventoried for correct quantity.
6. Any other test on any piece of equipment or system deemed appropriate.

D. In the event the need for further adjustment or work becomes evident during equalization and/or acceptance testing, the Installer will continue their work until the system is acceptable at no addition to the contract price. If approval is delayed because of defective equipment, or failure of equipment or installation to meet the requirements of these specifications, the Installer will pay for additional time and expenses of the Owner's Representative.

E. The Owner's Representative's fees and costs involved in acceptance testing are not the responsibility of the Installer, except as described in Part 3 of this specification.

F. In the event that the Video Production System is used prior to final acceptance, attendance in support of that usage shall not be construed as acceptance, or as event attendance.

END OF SECTION 11 63 50