

SECTION 11 06 60 - LED DISPLAY SYSTEMS SCHEDULE OF DISPLAYS**PART 1 - GENERAL****1.1 TERMS**

- A. Unique Identification
 - 1. Facility name
 - 2. SUB - Subordinate identification of an element in overall display.
- B. Dimensions
 - 1. HT - Height of Active Display area (excluding, trim, etc.), in feet or pixels
 - 2. WD - Width of Active Display area (excluding, trim, etc.), in feet or pixels
 - 3. TOL - Tolerance, expressed as a percentage of Height or Width (or pixels). Allowable variation to base size.
 - 4. MAX HT - Maximum height of display, including all cabinet, trim, etc. This dimension is generally set by sight lines and cannot be exceeded within base proposal.
- C. TYPE - Technology Type
 - 1. LAMP—Full color, bulb, through hole light emitting diode (LED)
 - 2. SMD—Full color, surface mount, light emitting diode (LED)
 - 3. MONO—Monochrome, light emitting diode (LED)
 - 4. FD—Fixed digit, light emitting diode (LED)
 - 5. BL-Back lit panel
 - 6. FL – Front Lit panel
 - 7. STAT – Static non-illuminated panel
- D. MIN RES - Absolute Minimum Physical Pixel Resolution expressed in mm (higher resolution products are implicitly allowed; within the available power limitations).
- E. USE - Purpose of display
- F. POSITION INFORMATION - Physical location of display.
- G. DRAWING - Architectural drawing reference (for elevation, section and/or location in plan).
- H. NOTES - Special notes

1.2 SCHEDULE OF DISPLAYS

DESC	SUB	HT X WD	TOL	MAX HT	TYPE	MIN RES	USE	POSITION INFORMATION	NOTES
Main LED	South	44' x 150'	2%	44'6"	LAMP	10MM	Video Display, Animation, advertising, crowd prompts, information	South Side	PHASE 1
Fascia LED	North	3' x 160'		3' 6"	LAMP	16mm	Advertising, Crowd Prompts, Information	North fascia of Valley Center	PHASE 1
Fascia LED	West	3' x 418'		3'6"	LAMP	16mm	Advertising, Crowd Prompts, Information	West Side fascia	PHASE 2 - ALTERNATE
Play Clock	South	3' x 4'	2%	3'-6"	FD		Play Clock	Adjacent to Main Display	PHASE 1
Play Clock	North	3' x 4'	2%	3'-6"	FD		Play Clock	Adjacent to Fascia Display	PHASE 1
Valley Center	Back of House Game Clocks				FD		Game Clocks	Existing in Valley Center. (2) Locker Room, (1) Coaches Locker, (1) Official's Locker, (1) Equipment Room Upstairs, (1) Equipment Room Downstairs	PHASE 1 - ALTERNATE
Reser West Side	Back of House Game Clocks				FD		Game Clocks	As shown as "GC" on floor plans	PHASE 2

1.3 OPTIONS AND ALTERNATES

- A. Option 11 06 60 – A: Changes to main display resolution and brightness
1. A1: Base bid at 9000 nits
 2. A2: 12mm at 9000 nits
 3. A3: 15mm interleaved technology at 9000 nits
- B. Option 11 06 60 – B: Changes to north fascia display size and resolution
1. B1: Base Bid 10mm
 2. B2: Base Bid 15mm interleaved technology
 3. B3: Increase length to 277'
 - a. B3a – base bid resolution
 - b. B3b – 10mm
 - c. B3e – 15mm interleaved technology
- C. Option 11 06 60 – C: Add 3' x 418' LED fascia display to west side of stadium. This will be for Phase 2.
1. C1: 10mm
 2. C2: 15mm interleaved technology
- D. Option 11 06 60 – D: Add two (2) 6'6" x 11'6" LED displays in the west side stadium North and South Clubs. This will be for Phase 2. Connect to club AV system provided by the west side stadium project. Resolution with 2% variance.
1. D1 – 2mm
 2. D2 – Packaged, pre-sized, kit product not to exceed 220" diagonal
 - a. D2a – 2mm
- E. Option 11 06 60 – E. If required, replace existing back of house clocks in Valley Center.
- F. Option 11 06 60 – F: Service Contract for parts only for Years 3 through 10 for the scope of work covered under 11 63 10. Pricing shall remain in effect until the end of the warranty period or until the Owner accepts or declines this service contract whichever occurs first.
1. Requirements of service contract.
 - a. All costs for US factory parts repair or replacement shall be included.
 - b. Following expiration of warranty period, owner will remove failed components from display (scoring or video) and ship, at owner's expense, to US repair depot.
 - c. Installer (or installer's Supplier) shall repair or replace components and ship to owner, at installer's expense using next-day delivery for Tuesday to Saturday deliveries at project location. Installer shall ship repair parts, within 24 hours of request of owner, prior to their receipt of failed part.
 - d. Repair and return shipment shall be in a timely fashion to maintain display operation.
 - e. In the event of parts failure of more than 5% of the display(s) or any individual component, the installer shall dispatch to the site, at installer's cost, factory technicians to assess cause, and means of returning to operation. Site visit timing shall be coordinated with owner, and in the event that adequate notice is provided (36-48 hours), shall be provided prior to stadium events where more than 50% of the facilities seating capacity is expected.
- G. Option 11 06 60 – G: Service Contract for parts and labor for entire installation (LED displays, processing and content management electronics, etc.. Years 3 through 10 for the scope of work covered under 11 63 10.. Pricing shall remain in effect until the end of the warranty period or until the Owner accepts or declines this service contract whichever occurs first.

1. Requirements of service contract.
 - a. All costs for US factory parts repair or replacement shall be included.
 - b. Following expiration of warranty period, owner will remove failed components from display (scoring or video) and ship, at owner's expense, to US repair depot.
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 - d. Repair and return shipment shall be in a timely fashion to maintain display operation.
 - e. In the event of parts failure of more than 5% of the display(s) or any individual component, the installer shall dispatch to the site, at installer's cost, factory technicians to assess cause, and means of returning to operation. Site visit timing shall be coordinated with owner, and in the event that adequate notice is provided (36-48 hours), shall be provided prior to stadium events where more than 50% of the facilities seating capacity is expected.
- H. Option 11 06 60 – H: Cost for annual pre-season "health check". Service to include updating of all software, verification of all control and display functions, repair (from owner spare inventory) of all displays and control equipment. The intent is, to the extent possible, bring the system up to as new operating condition and performance. Provide annual cost, guaranteed for years 3 through 10, including expenses.
- I. VOLUNTARY ALTERNATES
 1. Alternate 11 06 60 - VE# The Owner welcomes voluntary alternates that can improve the performance and functionality of the system or remove cost by deleting a requirement of the specifications that can save the Owner significant cost. Describe alternate and consequences, if any, for functionality, reliability or performance. Examples might include: replacement of "oops button", hybrid back-up, use existing cabling, modified training.

1.4 PERFORMANCE STANDARDS (PROVIDE FOR EACH RGB LED DISPLAY ELEMENT)

Base Proposal or Alternate Number: Location:
 Proposer: Model:

Fractional Units (e.g. 18.5 ft.)

Overall Display Size (measured from physical pixel to physical pixel; not including cabinet)	Vertical: <input type="text"/> ft <input type="text"/> pixels
	Horizontal: <input type="text"/> ft <input type="text"/> pixels
OEM LED Module and Processor manufacturer(s)	<input type="text"/>
LED Lamp Die and Packager Make and Model	<input type="text"/>
Physical Display Size (including cabinet)	Vertical: <input type="text"/> ft
	Horizontal: <input type="text"/> ft
Physical Pixel Pitch (not "lines")	Vertical/Vertical: <input type="text"/> mm
	Horizontal/Horizontal: <input type="text"/> mm
Physical Pixel Density (not "lines")	<input type="text"/> pixels/sqft
Virtual Pixel Pitch	"claimed" pixel pitch: <input type="text"/> mm
3 in 1 SMD LED or discrete lamp make and model	<input type="text"/>
Brightness	<input type="text"/> nits
Brightness Level adjustment	<input type="text"/>
Gradation Method	<input type="text"/>
Tonal Gradation	<input type="text"/>
Color Temperature	<input type="text"/> °K
Color Temperature adjustability	<input type="text"/>
Power Consumption	Avg (entire display): <input type="text"/>
	Max (entire display): <input type="text"/>
Normal Power requirements(Voltage, Service, Ø) Include any ventilation (no air conditioning allowed) requirements for entire Display	<input type="text"/>
Entire Display Assembly (ie; total center hung) Weight (Include internal structure)	<input type="text"/>

END OF SECTION 11 06 60

SECTION 11 63 10 - LED DISPLAY AND CONTROL SYSTEMS**PART 1 - GENERAL****1.1 SCOPE OF WORK**

- A. The purpose of this document is to describe the scope of work and options for complete, turn-key design/build LED display and control systems.
- B. Work under this Contract includes all labor, materials, cabling, tools, transportation services, supervision, coordination, etc., necessary to complete the installation of the LED Display and Control Systems as described in these performance specifications and illustrated on the associated drawings. The systems shall be called the "Display System" and the installer the "Display Installer". Any structural/electrical engineering and construction information provided as part of this specification and/or related documents are provided for design intent information purposes only. The drawings included with this specification convey general system concepts. The drawings may not show complete and accurate building details. The Installer is responsible for making field measurements necessary to establish exact locations, relationships, load capacities necessary for the installation of these systems. All maintenance and warranty work shall recognize the appropriate union jurisdictions.
- C. Work includes a number of separate displays. Drawings should be considered to be conceptual in nature, illustrating the features and appearance of the system. It is intended that the Display Installer shall assume full responsibility for final design and engineering for structural and electrical systems, and installation requirements as well as construction information and design/construction coordination required in accordance with the Installer's final design of elements being provided under this contract. Identify and notify Owner at time of proposal if AC power shown on electrical drawings is not sufficient for LED displays. Extension and distribution of AC power and signal raceway from the base project provided point to the displays and within displays is the responsibility of the Display Installer. Any additional raceway/cable management, as required by code or the project general conditions or required for a complete pathway system or to enclose cabling within public view, but not shown on the electrical or AV drawings is to be included the Display Installer's base scope of work.
- D. The systems include the following major items:
1. Removal and disposal of existing LED display assemblies, clocks and control systems.
 2. New south End Zone LED display assembly consisting of:
 - a. LED display
 - b. Enclosure cladding
 - c. Backlit Signage at the top of the display
 - d. Secondary structure to attach modules to primary structure
 - e. New cladding and signage
 - f. Active ventilation as required for proper 12-month operation.
 3. New fascia display assembly on the Valley Center consisting of:
 - a. LED Ribbon Display
 - b. Secondary structure to attach display to primary structure
 - c. Active ventilation as required for proper 12-month operation.
 4. New delay of game/play clocks
 5. Back of house locker room clocks
 - a. Refer to Reser Stadium West Side Renovation Floor Plans and display schedule for locations
 6. Central content management and processing system to generate and mix multi-window content for each display. Refer to drawings for phased installation information.

- a. Control stations to be remote and connect back to the primary content management system over the Owners' dedicated IP network
 - b. This system will also operate the displays at Gill Arena.
 - c. Coordination with campus IT is required.
 - d. Processor to support 3G-SDI 1080P input from the campus video production system for the South End Zone LED Display
7. Central scoring and timing system provided and configured to support NCAA Football. Timing connections to be on at midfield and press box with distribution to play clocks, back of house locker room clocks, central content management system and TV truck dock.
 8. Mounting of displays and secondary structure to existing building structure.
 9. All electrical distribution for displays as required within each system at each installation point.
 10. AV contractor installation drawings to ensure proper conduit provisions for new displays. Extension or addition of conduit to displays is the responsibility of this contractor. Exposed cabling will not be allowed.
 11. Work provided by others:
 - a. Removal of existing south display structure
 - b. New primary structure and catwalk system for south display
- E. The Contract also includes:
1. Pre-Installation meeting on site.
 2. Verification of dimensions and conditions at the job site
 3. Coordination with other contractors and trades.
 4. Preparation of submittal information.
 5. Installation in accordance with the contract documents, manufacturer's recommendations, and all applicable code requirements.
 6. Initial tests and adjustments, written report, and documentation.
 7. Instruction of operating personnel; provision of manuals.
 8. Maintenance services; warranty.
 9. Event attendance as outlined herein.
 10. Field and floor protection when utilizing cranes and/or any other lift mechanism allowed by the project.
 - a. Coordination is required to establish weight load capacity on concourses and field for heavy equipment proposed to be used by installer.
- F. 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.
- G. The Owner reserves the right to make reasonable device and equipment location changes prior to rough installation without claim for additional expense.

1.2 WORK EXISTING OR SPECIFIED ELSEWHERE

- A. Display primary structure
- B. Conduit and Raceway
- C. Steel Coatings
- D. Electrical Power Service for Displays

1.3 REFERENCES

- A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations which will apply to Work in this section where cited below:
1. American Iron and Steel Institute (AISI),
 2. American National Safety Institute (ANSI),
 3. American Society of Mechanical Engineers (ASME),
 4. American Society of Testing and Materials (ASTM),
 5. National Electrical Manufacturer's Association (NEMA),
 6. Occupational Safety and Health Administration (OHSA),
 7. Underwriters Laboratories (UL),
 8. United States Institute of Theatre Technology (USITT).
 9. Entertainment Services and Technology Association (ESTA),
 10. Federal Communications Commission Regulation Part 15
 11. National Electric Code (NEC)
 12. Any or all local, governmental, or other applicable codes.

1.4 DESCRIPTION OF WORK

- A. The project involves a mix of elements and work in two separate phases.
1. Phase 1 – 2022
 - a. Permanent install of main LED display, play clocks, north ribbon display, confidence camera system.
 - b. Temporary install of clock control and cabling, data feeds, MDF cabling, content management system and cabling.
 2. Phase 2 – 2023
 - a. Permanent install of west side back of house clocks, clock control and cabling, data feeds, MDF cabling, content management system and cabling.
- B. LED Display System consists of the following elements:
1. LED displays identified above
 - a. AC power distribution and panels from switchgear location shown on electrical drawings.
 - b. Secondary structure
 - c. All new content management, processing and control system
 - d. Signal cabling, additional conduit required within display assembly or per code but not shown on electrical or low voltage drawings.
 - e. Supply all necessary loads, weights, power and other necessary design, construction and coordination. This includes state registered structural engineer stamped calculations for all structural elements. Installer to be responsible for all substructure required to attach displays to primary structure.
 2. Scoring and timing systems as listed in section 1.1 D above.
 3. Installers to verify all dimensions, locations and attachments.
 4. Confidence Camera System
 5. Connection to existing caption encoder. To be displayed on south display.
- C. All control equipment to operate scoring and timing displays will be located in the Press Box with the ability for event operations control to be operated at field level. Sports control system to provide pre-sets/overlays, etc. to allow easy conversion between sports. Connections and all cabling between displays and control equipment along with interconnection with field side control location shall be included in this installer's scope of work. Scoring software required for the following sports:

1. Football, (NCAA, High School)
 - D. Data input and control computer for Sports Ticker, Stat Crew for each sport listed above, as well as flash results track tournament stats systems and other similar services (i.e., STATS.com, ESPN Gamecast). System to be able to receive data from outside services and update statistical data base in an automated fashion, ready for display within a pre-set graphic format without operator intervention.
 1. Software vendor shall interface to any data service client wishes throughout the warranty period. Vendor may identify any limitations of this service with their response (e.g., XML, 232, or other data interfaces).
 - E. Supply complete assemblies (structure, enclosure, and finish) for LED displays, scoreboards, play/locker room clocks, enclosures for video display included as part of this scope of work as appropriate, including licensed in the jurisdiction of the project registered electrical and/or structural engineer stamped calculations. Attachments to base building structure to be reviewed and approved by the Owner's Structural Engineer as directed by Owner or Owner's Representative.
 - F. Colors of all exposed structure, enclosures, close-out panels, etc., to be determined during submittal process. Submit color samples to Owner's Representative for approval. Exposed cabling and conduit on enclosures, with the exception of removable or portable displays, will not be allowed.
 - G. Field locations of signal and controller connections to be located within enclosures/junction boxes as shown on the AV drawings, where possible. Coordinate cabling pull, panel size and panel location within enclosure with Owner.
 - H. Provide scoring & timing signal distribution to the TV truck parking area. Coordinate location with owner

1.5 RESPONSIBILITIES AND RELATED WORK

- A. Coordinate all work so that a complete and functioning display system and related systems (game/locker/play clocks, etc.) is achieved.
- 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 shall be the responsibility of the Display Installer to supply systems in full working order. The Display Installer shall be required to notify the Owner or Owner's Representative of any discrepancies in part numbers or quantities as between the Contract Documents and what would be required to fulfill these performance specifications. Failing to provide such notification, the Display Installer shall nonetheless be expected to supply items and quantities according to the intent of the Specification and Drawings, without claim for additional payment.
- D. Owner shall obtain all permits necessary for the execution of any work pertaining to the installation, or any operation by the Owner.
- E. If a conflict develops between the Contract Documents and the appropriate codes, the Display Installer shall refer to Contract Documents for a resolution.
- F. Coordinate control area/workstation layout with Owner, Owner's Representative, and other subcontractors installing work in the production room and press box.

- G. The drawings associated with this specification convey general system concepts. The plans do not show complete and accurate building details. The Installer is responsible for making field measurements necessary to establish exact locations, relationships, load capacities necessary for the installation of these systems.
- H. The Installer is responsible for providing all components necessary for a complete and operational system. Any system changes or revisions necessary to make the system conform to the building, walls, structure/rigging/steel, electrical services etc., shall be included at time of bid and installed without claims for additional compensation.
- I. Coordinate work with other trades and building operating schedule to avoid causing delays in construction schedule.
- J. The successful bidder will be required to coordinate final primary structural and catwalk design to conform to display requirements.
- K. Fire Alarm Interface.
 - 1. Provide a fire alarm interface to automatically engage emergency evacuation messages on designated displays. Coordinate with Owner and Fire Marshal/Code Authority as to message text.
 - 2. This interface will connect to existing systems.
 - 3. Acceptable products:
 - a. Daktronics
 - b. DNF Controls
 - c. JL Cooper

1.6 ELECTRICAL

- A. Power is provided as noted on the new drawings, existing electrical drawings and as-builts. The Installer shall be responsible for termination and distribution of electrical power from the demarcation point shown on the electrical drawings to the displays. All distribution equipment as required (including load center, breakers, step down transformers, etc.) is to be included in the display installer's scope. This will include necessary distribution boards, conduit and cabling as required for a complete installation.
- B. The Installer shall be responsible for connecting ground point to all equipment in accordance with NEC code, local codes and standards specified herein.
- C. Connect each LED assembly to the building's grounding/lightning protection network, if present.
- D. Refer to electrical single line diagrams for minimum short ratings of all required equipment.
- E. Provide complete power and branch circuit distribution within the display/enclosure from the existing demarcation point provided by Owner as shown on electrical drawings.
 - 1. Power Distribution: All panel boards or load centers provided with lighting units for power distribution to displays loads shall incorporate main breakers.
 - 2. Provide utility power distribution in all rear service enclosures.
 - 3. Label each breaker as to its function within the scoreboard assembly (i.e., backlit panel #1, etc.)
- F. Panel boards to be located so as not in public view.
- G. Conceal all distribution equipment, transformers, panels, etc., and conduit within enclosures.

- H. Provide lockable load center, breaker panels, and disconnects. Provide minimum of 8 keys per lock.
- I. Power controls to allow each LED display and theme/letter element illumination to be turned off independently of each other and other displays and done so from the control workstations or racks. Programming of power controls should allow for the following options (Mechanical switches for each option will not be accepted.):
 - 1. Entire system on/off
 - 2. Fascia on/off
 - 3. Main LED on/off
- J. All materials shall fully comply with Underwriters' Laboratories or other acceptable testing agencies acceptable to local authorities with jurisdiction.

1.7 DISPLAY SIGNAL CABLING AND CONDUIT

- A. Install signal in conduit, raceway, and cable tray. If additional conduit is required, provide as part of this installation scope. Cabling exposed to public view, or the elements is not allowed.
- B. Do not damage any signal cabling that may be co-located with other low voltage cabling. In the event of damage, bring damage to attention of Owner and propose acceptable repair.
- C. Installation shall include all required and operationally necessary low voltage control and/or fiber optic cabling for all scoring displays from Scoreboard Control location to each display assembly as appropriate.
- D. Provide primary and backup connection cabling (separate overall jacket, not diverse pathways) from each display to control system location and other specified control locations.
- E. All cable whether fiber optic or copper will be run in conduit/cable tray from the Scoreboard Control Room to each scoring/matrix element. This does not relieve this contractor from providing fire stop material, armored cable and/or innerduct if project requires it. If additional conduit is required for a complete system, provide.
- F. Patch panels shall be provided at the Control Room and Video Display to facilitate transfer between primary and back-up cables.
- G. Cable shall carry appropriate fire rating (e.g., CMR, CMP, OFNR, OFNP, etc.) on jacket of cable.
- H. Any timing or clock data signal cable located in cable tray with any audio cable shall have appropriate separation between services and appropriate jacket.
- I. Provide any necessary cable management, vertical ladder tray, j-hooks, etc. in areas without pathway.
- J. Provide, under this contract, any D-rings, hooks, etc. required for cable runs above accessible ceilings that cannot be run in raceways provided. Provide any necessary cable management, vertical ladder tray, etc. in communications closets for vertical risers. Provide appropriate cable management, Wiremold, raceways within scoreboard control areas between base building cable tray and control locations.
- K. Available conduit/raceway/cable tray distribution for display signal/data cabling is shown on RFP documents which may be incomplete and not up to date. Site observation will be required to determine full extent of existing raceway and raceway installed by the Owner for this project. If additional conduit, junction/terminal boxes/enclosures will be required notify Owner/Owner's

Representative for coordination at time of proposal otherwise provide any conduit required for a complete, working, turn-key systems installation.

- L. Hold conduit tight to structure and conceal behind structure away from public view.

1.8 QUALITY ASSURANCE

- A. Project Prime Contractor's Qualifications: Firm experienced in the installation of systems similar in complexity to those required for this project; and meet the following requirements. Proposals will be rejected as unresponsive should the following information not be provided with proposal.

1. At least three years of experience with equipment and systems of the specified types.
2. Experience with at least three NCAA Division 1 stadium projects within the last three years unless the owner waives this requirement.
3. Maintain a fully staffed and equipped service facility.
4. With the bid, the potential Installer shall provide documentation that they have:
 - a. Form of corporation.
 - b. Adequate plant capacity and equipment to complete the work.
 - c. Adequate regional service organization in to meet warranty response requirements for the project—4-hour phone call response, with 24-hour repair window during the season.
 - d. Adequate staff to perform work on schedule proposed with commensurate technical experience. Provide key staff resumes.
 - e. Suitable financial status (i.e., bonding and materials purchase capacity) to meet the obligations of the work.
 - f. Provide references of three or more users for previously furnished and/or installed LED scoring displays (within the last 24 months for similar scale North American project AND references from users that have had vendor's products installed for 10 or more years).
 - 1) References should be for identical display technologies, processors, and most critically graphic user interface used to operate animation and system.
 - 2) If supplier intends to use alternative scoring supplier, references for operations at other facilities for scoring system shall also be supplied.
 - g. List of structural, electrical and other subcontractors intended to do the work. Subcontractors shall be appropriately state licensed in their specialty.
 - h. Completed current version of AIA Contractor's Qualification form.
 - i. Provide with bid, the name and relevant experience of the proposed project manager. Also provide the name and qualifications of the site superintendent.

- B. Sub-contractor requirements

1. LED Display Manufacturer's Qualifications: At least 5 years of experience in the production of specified products unless approved by the Owner. Proposals will be rejected as unresponsive should the following information not be provided with proposal.
 - a. Experience with comparable scale projects within the last three years unless the Owner waives this requirement.
 - b. With the bid, the potential manufacturer shall provide documentation that they have:
 - 1) Adequate plant capacity and equipment to complete the work.
 - 2) Suitable financial status (i.e; bonding and materials purchase capacity) to meet the obligations of the work.
 - 3) Adequate staff to perform work on schedule proposed with commensurate technical experience.
 - 4) Provide references of three or more users for previously furnished and/or installed LED display systems (within the last 36 months for similar scale project).

2. Scoring Supplier's Qualifications: Provider of clock/scoring equipment to have NCAA approval.
 - a. At least 3 years of experience in the production of specified products unless approved by the Owner. Proposals may be rejected as unresponsive should the following information not be provided with proposal.
 - 1) Experience with comparable scale projects within the last three years unless the Owner waives this requirement.
 - 2) Demonstrated ability to:
 - a) Interface with Stat Crew for all sports listed
 - b) Interface with internet hosted data bases
 - c) Ability to create, populate and maintain game statistical database locally within control system.
 - d) Provide video and character generator
 - e) Provide feeds of stats, score and clock information to broadcasters
 - 3) With the bid, the potential manufacturer shall provide documentation that they have:
 - a) Adequate plant capacity and equipment to complete the work.
 - b) Adequate staff to perform work on schedule proposed with commensurate technical experience.
 - c) Suitable financial status (i.e; bonding and materials purchase capacity) to meet the obligations of the work. Provide references of three or more users for previously furnished and/or installed scoring systems for football.
- C. Contractor shall attend pre-installation meetings to coordinate with other trades as required.
- D. With proposal, provide listing with appropriate explanation regarding the status of Manufacturer's or Installer's resolved or unresolved legal disputes within the last six calendar years.
- E. With proposal, provide listing with appropriate explanation regarding any projects within the last 3 years, where the Installer or Manufacturer has failed to meet construction schedules, due Installer or Manufacturer's cause.

1.9 SUBMITTALS

- A. Submit all shop drawings and submittals in accordance with Project Requirements.
- B. All submittals are to be provided in format as outlined herein.
- C. Any electronic submittal for record shall be a PDF with an active clickable table of contents to sections within. Drawings shall have a (Table of Contents) TOC page with links to each drawing page with title of page. Product Data submittals shall have a TOC with link to each product, arranged and identified as in the order and identification established in this specification.
- D. Any submittal for content for the Owner to further maintain, such as functional drawings, calculating or tracking spreadsheets, control software configurations, AV software programming, shall be provided in their native editable format (note that for drawings PDF is not an editable format, DWG, RVT and the like are expected and required by this specification).
- E. All submittals are to include a document control page with information relating to the document control number, date information, and requested action, and leaving room for comments or stamps by reviewing parties as appropriate.
- F. Shop drawings and submittal data shall contain sufficient information to fabricate and install the Work to be performed. Drawings shall be executed at an appropriate scale. Submit the quantity of electronic and bond sets of drawings; and catalog data sheets required by the project general

conditions, neatly bound in sets. Submit all Shop Drawing information sequentially. Information shall include but not necessarily be limited to:

1. LED lamp order inclusive of part numbers
2. A schedule of all submittals identified with a unique control number as ordered in this specification.
3. Elevation and Sections of all displays.
 - a. Overall assembly weights of displays.
 - b. Power consumption of display assemblies and electronics racks.
4. Finishes of all exposed housings with finish samples.
5. Complete drawings showing the connection of the installer supplied equipment to the structure at each different condition. Drawings to indicate nature of disassembly for storage or portable or demountable items.
6. Complete structural drawings showing member sizes, connections, etc. Submit design calculations, bearing the Registered (licensed in the jurisdiction of the project) structural engineer's stamp for review. Review will be for design intent only and shall not be construed as approving the design analysis.
 - a. Schematic Drawings. Provide drawings detailing inter-component and intra-component.
 - b. Conduit and Electrical Drawings. If the system incorporates an electrical or electronic system of any type, provide detailed drawings depicting wiring routing, termination, and sizing schematic, conduit routing and sizing, etc. These drawings shall be floor plan drawings, including all walls, doors, and rooms, showing exact power requirements and conduit routing for each system with the location of all junction boxes. Provide PE stamp, licensed in the jurisdiction of the project, for all AC power drawings for work outside of display enclosures.
 - 1) Indicate location of all access panels. All required access panels are part of this scope of work.
 - 2) Electrical drawings for AC power to include licensed engineer's stamp valid in jurisdiction of the project.
 - c. Equipment Drawings. Provide equipment mounting and location (including racks and workstations in plan view within rooms) details including necessary physical dimensions, clearances, load limits, etc. These shall be floor plan drawings, including all walls, doors and rooms, showing exact locations of devices and equipment, including countertop mounted equipment.
 - d. Structural plan and Section Drawings. Provide drawings showing the exact location of all installed equipment on plans and/or sections. Describe attachment methodology for each component that connects to the building structure.
7. Fabricated Plates, Panels, or Signage Drawings. If plates, panels, or signage is required, provide complete drawings depicting dimensioned locations of components, component types, engraving or printing information, plate material and color, and bill of material
8. 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.
9. Equipment. Location of all equipment in racks, consoles, mill work, enclosures or on Owner provided countertop/tables with dimensions; wire routing and cabling within housings; AC power outlets, terminal strip and UPS locations. These shall be floor plan drawings, including all walls, doors and rooms, showing exact locations of devices and equipment.
10. Schematic drawings of any custom circuitry or equipment modifications, including connector pinouts and component lists.
11. A material list of all equipment to be furnished, arranged in specification order. This list shall be followed by catalog data sheets, arranged in specification order, of all equipment to be furnished. Where a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.

12. Proposed cable labeling technique.
 13. Samples as required in various specification paragraphs.
 14. Power consumption at 50% and 100% illumination levels for each display.
 15. Description of QA/QC procedure.
- G. Final Inspection Notification Report. Three hard copies of a typed, neatly prepared checkout report and electronic copy, 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 including serial number, make, model and manufacturer as well as 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 Installer testing requirements of Part III.
- H. Contract closeout submittals shall be required as follows:
1. Keep a complete set of drawings on the job, note any changes made during installation, and submit copies required by project General Conditions. Electronic files to be in Auto Cad 2014 compatible, Revit 2 dimensional CAD drawing (referred to as bookplan drawings) in a simplified format, and PDF format, showing Work as installed.
 2. Provide all as-built, close out and testing information, manuals, drawings, test results, etc. in electronic form acceptable to the owner. Specification required as-built drawings, commissioning reports, manuals and electronic files to be submitted prior to acceptance testing and final payment.
 3. Submit the following data for review, prepared as indicated, at least one week prior to acceptance testing (exceptions noted):
 - a. System Reference Manual: Furnish electronic files with clickable sections in the table of contents for the following sections:
 - 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) A list of all equipment, indicating manufacturer, model, serial number, and equipment location (i.e., rack/room number). Update following acceptance testing, if changed.
 - 3) Manufacturer's Instruction Manuals for all items of equipment, incorporating or followed by manufacturer's warranty statements. For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item.
 - 4) A list of settings, if applicable, of all semi-fixed controls. This shall include a listing of all software settings required in all operating system areas (e.g., control panel, network, etc.) as well as project specific software programs. Update following acceptance testing. Preferred method of displaying "software" settings is with PC-captured "screen shots".
 - 5) Schematic wiring diagrams of the scoreboard and signage display low and high voltage systems, based on the as-built documentation, at a reduced scale easy to handle but fully legible. Blue-line (or similar diazo process) prints are not acceptable.
 - 6) Maintenance Instructions, including Installer's maintenance phone number(s) and hours; maintenance schedule; description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.

- 7) A legend of acronyms and abbreviations must accompany all documentation.
- 8) Any other pertinent data generated during the Project or required for future service.
 - b. Manufacturer's Service Manuals and parts lists for all equipment. Photocopies are not acceptable. For custom circuits or modifications, complete schematics, and parts lists.
 - c. Photographically reproduced as-built wiring diagrams and overall building wiring diagrams, at a reduced scale easy to handle but fully legible.

1.10 PROJECT CONDITIONS

- A. Verify all conditions on the job site applicable to this work. Notify Owner or Owner's Representative in writing of discrepancies, conflicts, or omissions within three (3) days of discovery.
- B. The Display System/Production/Architectural/Structural/Electrical drawings are intended to 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, Display Installer shall recommend solutions and/or submit drawings to the Owner or Owner's Representative for approval, showing how the work may be installed.

1.11 ACCEPTANCE TESTING

- A. Upon completion of installation and initial tests and adjustments specified in Part 3, acceptance testing shall be performed by the Owner or Owner's Representative.
- B. Provide one person familiar with all aspects of the system to assist the Owner or Owner's Representative during acceptance testing. Individual must have specialized knowledge of the computer control system operating software and function of the system.
- C. Final Acceptance shall occur after the displays have functioned without failure for two home games.
 1. Failure shall be defined as a failure of the display, or a portion of the display equal to 10% of that display's square footage, to meet the project performance specifications for a length of time greater than one minute due to electronic, electrical, mechanical, structural, or other failure of the display. Failure due to Owner, spectators, or force majeure will not be considered event failure.
 2. Failure shall be defined as a failure of the display processing and control system.

1.12 DISPLAY SYSTEMS SOFTWARE LICENSE

- A. INTRODUCTION
 1. All proprietary software provided for the Technical Systems shall be subject to this software license between the Contractor and the Owner as an essential element of the system as defined in the system specification and associated documents, drawings and agreement.
 2. Contractor shall agree that 3rd party (e.g., manufacturer's) proprietary software provided with the system shall be subject to this agreement.
 3. Contractor and owner agree that this software license is deemed to be part of, and subject to, the terms of the Agreement applicable to both parties; and shall supersede any standard manufacturer or Contractor's standard license agreement.

4. Proprietary software shall be defined to include, but not be limited to, device and system specific software and firmware designed to run on conventional computer based operating platforms as well as all microprocessor-based hardware used to program, setup, or operate the system or its components.
5. For sake of this agreement, MS Windows® shall not be considered “proprietary” software, unless a non-public version of Windows® or any of its components are critical to the operation of the system in which case it shall be deemed proprietary.

B. LICENSE GRANT AND OWNERSHIP

1. Contractor hereby grants to Owner a perpetual, non-exclusive, site license to all software for Customer's use in connection with the establishment, use, maintenance, and modification of the system implemented by Contractor. Software shall mean executable object code of software programs and the patches, scripts, modifications, enhancements, designs, concepts, or other materials that constitute the software programs necessary for the proper function and operation of the system as delivered by the Contractor and accepted by the owner.
2. Except as expressly set forth in this paragraph, Contractor shall at all times own all intellectual property rights in the software. Any and all licenses, product warranties or service contracts provided by third parties in connection with any software, hardware or other software or services provided in the system shall be delivered to Owner for the sole benefit of owner.
3. Owner may supply to Contractor or allow the Contractor to use certain proprietary information, including service marks, logos, graphics, software, documents and business information and plans that have been authored or pre-owned by Contractor. All such intellectual property shall remain the exclusive property of Owner and shall not be used by Contractor for any purposes other than those associated with delivery of the system.

C. COPIES, MODIFICATION, AND USE

1. Source code shall be available to owner for a period of not less than 15 years for use only for modifications for this system only.
2. Owner may make copies of the software for archival purposes and as required for modifications to the system. All copies and distribution of the software shall remain within the direct control of owner and its representatives.
3. Owner may make modifications to the source code version of the software, if and only if the results of all such modifications are applied solely to the system. In no way does this Software License confer any right in owner to license, sublicense, sell, or otherwise authorize the use of the software, whether in executable form, source code or otherwise, by any third parties.
4. All express or implied warranties relating to the software shall be deemed null and void in case of any modification to the software made by any party other than Contractor.
5. During the life of the system (defined as a period of not less than 10 years and not more than 15 years), the Contractor shall provide software updates in accordance with all necessary support requirements to maintain the system. This shall include a commitment to provide appropriate patches, fixes, and interface updates as necessary to maintain the operability and security of the system at a level commensurate with the original system.
 - a. In the event that computer and or processor hardware refinements and updates are necessary to support software updates 7 years after substantial completion, said hardware will be provided to owner at the agreed upon terms for change orders of the original contract.
 - b. Labor shall be in accordance with change order rates of the original contract.
6. All hardware supplied shall support software updates for a period of not less than 7 years following substantial completion.

1.13 WARRANTY/MAINTENANCE

- A. Warrant labor and all equipment/materials for twenty-four (24) months following the date of final acceptance or the second, trouble-free, NCAA (as designated by the Owner), regular season game played in the stadium, whichever is later.
- B. 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.
- C. 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.
 - 1. A defect as it applies to a pixel or LED module shall be at any point that the pixel or module fails to be able to meet the performance requirements of this specification.
 - 2. While overall system/contract scope warranty is the responsibility of the prime contractor, the LED display manufacturer/reselling sub-contractor is to be the primary warranty service provider for the LED display equipment and content management/control system.
 - 3. A failure regarding the content management system is loss of any feature or function that was working during a prior event or rehearsal but does not function properly during a public event. The warranty requirement assumes that the system has been demonstrated to be fully functional and has been accepted as substantially complete by the Owner.
- D. Register all manufacturer's warranties (e.g., software, computers, etc.) in Owner's name.
- E. Maintain spare parts inventory on-site during the warranty period and assure availability of all spare parts required for continued operation of the system, as listed in this specification from end of initial warranty period through year 10 of display life. Within 72 hours of notification that spare part has been used, that part (excluding incandescent or fluorescent lamps) shall be replaced by the service representative/manufacturer.
- F. Unless otherwise noted the following is the requirement for spares throughout the Display system:
 - 1. Provide 2% (or one if 2% is less than one) spare parts of lighting units, driver cards, power supplies, lamps, modules, fans, and elements, including cables, jigs and the like.
 - 2. Provide one (2) spare printed circuit card and transmit/receive interface of each type used in the system.
 - 3. Provide 25% spares of any air filters—after final acceptance.
 - 4. Provide extenders where required for service and maintenance of equipment.
- G. Provide a single spare for each transceiver (line driver) type used by the display system.
- H. During the 50,000 hours nominal board lifetime, the Owner may have certified brightness and color temperature measurements made on screen(s) according to the acceptance procedure to verify that the board is operating within brightness level, uniformity and color uniformity specifications. If the board is not capable of meeting specifications, provide price to perform the necessary repair and component replacement to bring the system to operational parameters.
- I. Within the warranty period, Installer shall be required to answer service calls within 4 hours and mitigate the problem within twenty-four hours.
- J. Preventative inspections shall occur 30 days before the beginning of the second and third seasons (one of the inspections occur prior to the expiration of the 2-year warranty period) by not more than 40 days.

- K. Warranty to include written commitment to maintain an inventory and availability of spare parts required to maintain operation of LED displays (LED modules, screen processors, etc., not content management systems) for a period of not less 10 years after substantial completion.

1.14 PRODUCT STABILITY AND LIFE CYCLE DECLARATION

- A. This system is intended to be used by the Owner for 6-10 years holistically, and some key parts may be used in excess of 10 years. This section addresses this concern and project planning to ensure a stable, serviceable system for the Owner.
- B. The Owner may elect to pursue and maintain extended service contracts, warranties, and/or Service-Level Agreements with the Original Equipment Manufacturer (OEM) as outlined in this specification or offered by the OEM directly. Should the Owner execute these agreements, the OEM agrees that it may not sever or otherwise terminate these agreements due to product life cycle issues without providing an alternate solution at no additional cost at the time of issue for a minimum of 6 years. No language in the agreement shall supersede this requirement. If the Owner should not elect these agreements, the OEM agrees to provide no less than 18 months' notice that a product will be discontinued and offer at least the discount structure provided in the original project to the Owner to replace the obsolescing product/system with products fulfilling the same function.
- C. For all products proposed by the Contractor to meet this design specification and associated drawings, produce a report identifying which stage of product life cycle each product is in:
1. Introduction phase
 - a. This phase is defined as: Any products that are unreleased, newly released at bidding time, or scheduled to be released between the time this specification was originally transmitted and the date of integration in the Owners facility. Expected usable life is 10 years and beyond for products in this phase.
 - b. For any products in this phase:
 - 1) Identify unreleased products regardless of when they are scheduled to be released
 - 2) Identify any products for which the Owner will be the first primary user. Do not account for launch partners, test bed sites and the like.
 2. Growth/Maturity phase:
 - a. This phase is defined as: Products in the primary expansion and stable phase of product life. The product should be stable, past initial launch bugs, and be in a routine support system not requiring special effort by initial development teams to find and address Owner issues. Expected usable life is 7-10 years for products in this phase.
 3. Decline phase:
 - a. This phase is defined as: Any product that is anticipated to be off the market in less than 6 years from the date delivered to the Owner.
 - b. For any products in this phase:
 - 1) Identify products at risk of being obsolesced in 6 years or less. Provide suggestions for alternate solutions deployable at time of specification transmittal which would remove this product list.
 - 2) Provide statement of conformance from the original equipment manufacturer that the product proposed will be supported for a minimum of 6 years from the date of first use as defined in the project manual without claim for additional costs beyond standard service costs or extended warranty costs. One statement from each OEM including a list of applicable products is acceptable.

1.15 OPTIONS, ALLOWANCES AND UNIT PRICING

- A. See specification section 11 06 60 for options.

PART 2 - PRODUCTS

2.1 SPECIFIED PRODUCTS AND MANUFACTURERS

- A. Model numbers and manufacturers included in this specification are listed solely as a standard of quality and are not meant to exclude other products and manufacturers if the proposer can establish the quality and reliability thereof, in the sole discretion of the Owner, as described below. Regardless of the length or completeness of the descriptive paragraph herein, each device shall meet all of its published manufacturer's specifications. Proposers are required to verify any such products or manufacturers continued performance is as required herein. Where two or more acceptable products are listed, the Installer may use either at his option. Listing of a specific manufacturer does not imply automatic acceptance of that company's product or submission, nor does it certify that vendor is accepted as qualified to perform work under this contract. Listing is to be considered only as an invitation to provide proposal. Where a manufacturer or vendor rather than a specific product model is listed, that manufacturer is required to meet all performance requirements outlined.
- B. Other qualified manufacturers will be considered subject to approval of technical data, samples, demonstrations and/or results of independent testing laboratory or field tests (if necessary, to verify performance) of proposed equipment, submitted in accordance with project requirements.
1. If 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.
 2. Include a list of previously installed projects using proposed equipment that are similar in nature to specified system.
- C. All equipment supplied shall be new and meet the latest published specifications of that product. In the event that the product is enhanced, or improved, supply the newer product at no additional cost.
1. If product is discontinued or made obsolete due to continuing product development, replace it with manufacturers' equivalent at time of installation at no additional cost.
 2. If product is discontinued or made obsolete due to technology change, substitution will be based on fair market value of accepted and proposed products, upon approval of substitution by Owner or Owner's Representative.
- D. All materials shall fully comply with Underwriter's Laboratories or other acceptable testing agencies acceptable to local authorities with jurisdiction.
- E. Under no circumstances shall the manufacturer's name, logo, or representation be visible to the public.
- F. Suppliers invited to respond to this RFP are done so with no implication or certification that manufacturer's proposed products are approved or meet the technical requirements of this specification. All installation contractors shall be licensed with the Oregon Contractors Board. Potential vendors are invited to prepare prices for more than one display/system type meeting these specifications (i.e., different pixel spacing, software provider, etc.). Suppliers invited to respond to this RFP include:
1. Prime Contractors
 - a. ANC
 - b. Daktronics
 - c. Mitsubishi
 - d. Prismview

- e. As approved
2. LED Displays
 - a. Absen
 - b. Daktronics
 - c. Lighthouse
 - d. Mitsubishi
 - e. Prismview
 - f. As approved
3. LED Lamp Suppliers
 - a. Cree
 - b. Nichia
 - c. Multicolor
 - d. As approved
4. Scoring, Animation/Stats Content Control Software
 - a. ANC VSoft
 - b. Daktronics Show Control
 - c. Ross Xpression
 - d. As Approved
5. Scoring/Timing/Fixed Digit Systems Suppliers
 - a. Daktronics
 - b. OES

2.2 PHYSICAL DESIGN CRITERIA

- A. General: Engineer systems to the most stringent applicable code.
- B. Seismic Loads: Subject to the Building Official's approval, seismic design shall be under the Building Code in use for this project.
- C. Wind Loads: A minimum design pressure as dictated by IBC code (positive or negative) shall be applied to all signage and display surfaces. This also applies to the entire Scoreboard Enclosure. Corner pressures and attachment loads shall be as determined through local Building Code and by applying the project specific criteria. (All attachments, connections and members shall also be capable of withstanding all seismic forces in accordance with the local Building Code.)
- D. Recommended Minimum thicknesses, gauges and standards:
 1. All sheet metal shall have a minimum thickness of 18 gauge.
 2. Structural steel members shall have a minimum flange, web or wall thickness of 1/4 inch. Aluminum must be of size to achieve same structural capabilities.
 3. Where similar connections and members are used in other areas of the facility, every effort shall be made to detail and furnish members in a consistent and uniform manner.
- E. Enclosure and structure. The structure that is available is existing and should be reviewed, as all additional structure, lighting, power distribution, convenience outlets, and other items for installation, operation, maintenance, and repair is this contractor's responsibility.
 1. Installer to submit complete drawings showing the connection of the Installer supplied equipment to the building structure at each different condition.
 2. Installer to submit design calculations, bearing structural engineer's stamp for review. Review will be for design intent only and shall not be construed as approving the design analysis.
 3. The internal module structure, supports, attachment and anchoring members, mounting hardware shall be provided in accordance with engineering standards and governing codes.
 4. Enclosure.

- a. Enclosure to be shop fabricated, anodized aluminum, style and color as shown on the Owner's scoreboard concept drawings. Construction to comply with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other industry standard practice. Form exposed sheet metal work without excessive "oil-canning", buckling and tool marks with exposed edges folded back to form hem. Finish to comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations. For components which are assembled or welded in factory, apply finish after completion of fabrication.
 - b. Finishes shall match adjacent existing elements (such as building exterior metal panels), unless otherwise indicated.
 - c. All welds shall be cleaned, primed and painted.
 - d. Enclosure design and installation to prevent visible gaps in assembly that allow lights to or other visible items to be viewed through the faces or cabinets of assemblies. This does not include openings through the assembly from directly below the center hung display.
 - e. Electrolytic protection shall be provided wherever differing metals come into contact.
 - f. Trim shall be coordinated to be identical in appearance to adjacent advertising or architectural panels (whether provided herein, or by others).
 - g. Finishes shall match adjacent elements, unless otherwise indicated.
 - h. Cabinet depth of adjacent displays shall be within 1" (+/-). Notify Owner's Representative when variance is greater.
 - i. Close out trim panels/bezels are required for all displays to create a unitary appearance to each assembly with no gaps, holes, etc.
 - j. Fascia displays shall not extend out and impede viewing angle of the field from a seated position without prior approval from Owner.
 - k. All display faces exposed to public view to include finished (paint, anodized, trim, etc.) surfaces.
- F. Handrails and Railings: Provide any required handrails and railings in accordance with code requirements.
- G. Provide natural or forced ventilation as required for operation of all components. Provide all necessary dust and dirt filtration for the ventilation system. NC level attributed to this ventilation shall be no more than NC 40 at nearest seat or playing field sound levels from rack mounted electronic equipment in the production room shall be no more than NC 35 at nearest operator location.
- H. Service Requirements
1. Provide front or rear access based on display mounting and access conditions.
 2. Fascia displays to be top access.
 3. All screws and nuts that are required to be removed for access to displays shall incorporate captive screw and nut type designs.
 4. A minimum of one of any specialized or custom tool required for maintenance of the display; including any specialized/custom ladder, bosun's chair, or scaffolding required to service non-center hung displays for maintenance and repair.

2.3 OUTDOOR COLOR LED DISPLAYS

- A. LED Displays
1. Technical Standards:
 - a. The LED Displays shall incorporate direct view technology, utilizing only the following technologies:

- 1) Black face or black package (as specified), RGB, surface mount package, Light Emitting Diode (LED)
- b. Brightness: 16 levels of illumination, including 0%, 25%, 75% and 100%.
- c. Brightness shall not fall below (at 100% white generated by external input):
 - 1) 7500 nits level over 12,000 hours of screen operation after acceptance.
- d. Exterior displays without overall architectural enclosure to achieve IP 65 minimum rating for all exposed elements of display system.
- e. Uniformity of brightness:
 - 1) Adjacent pixels 2.5%,
 - 2) 6% total variation across entire display, brightest to darkest pixel/module.
 - 3) Uniformity standards to apply over entire viewing angle specified with no perceptible color shift.
- f. 140° minimum horizontal angle (defined as 50% brightness) of viewing and 120° (nominal $\square 60 \square$ with screen vertical) of vertical. Color temperature to remain constant over 50% brightness viewing angle range.
- g. Color temperature of display: 7,000-9,300° Kelvin. With a uniformity of 250°K between adjacent pixels and 8% across the entire display. With remote set-up and control to adjustment and balance of any pixel/module in display to match overall display color temperature through 20,000 hours of use.
- h. Flicker-less display
2. Size: as listed in 11 06 60.
3. Pixel spacing: as listed in 11 06 60
4. Compliance
 - a. Entirety of LED displays (not just individual module) must comply with FCC regulations.

B. Display Processors

1. South Endzone Display (and backup)
 - a. The processor shall be configured to support the following inputs:
 - 1) HDMI/AVI/DVI
 - 2) Component Serial Digital input (i.e. ITU-R 601; SMPTE RP-125)
 - 3) HD-SDI input supporting all common Digital Television (DTV) Production standards (e.g. 480p; 720p, 1080I, 1080P).
2. Provide connections, cabling and appropriate backups from control room to board to support the following connections:
 - a. DVI
 - b. Serial Digital (601)
 - c. Digital Television Production standard (e.g. 480p; 720p, 1080I).
3. Video screen electronics remote control system to provide complete screen control of:
 - a. Brightness level
 - b. Video display power on/off
 - c. Video Input Selection
 - d. Image positioning, sizing, and scaling
 - e. Color level
 - f. Hue
 - g. Contrast
 - h. Sharpness
 - i. Remote lighting unit location testing and color display test. This pattern shall display a map that corresponds to the address of each unit's physical address.
 - j. These controls shall be provided for all inputs to control system processor.
4. Minimum Computer Processor Configuration
 - a. CPU: as required to meet specified operating performance.
 - b. Cases: Rack mount
 - c. Monitor: 18" flat screen; active matrix, LCD (e.g. Viewsonic, LG, Samsung, Sony, or Philips).

- d. Mouse: Two button Microsoft Intellimouse with Intellieye mouse.
- e. Keyboard: full size with separate numeric keypad and cursor control.
- f. Keyboard, Mouse and Monitor extenders. Provide as required to support these devices at some distance from the rack mounted CPUs.
- g. 3com PCI, Fast Ethernet 1 g Ethernet adapter
- 5. Remote control system locations:
 - a. Scoreboard Control Room
- C. Un-interruptible Power Supply (UPS). Provide UPS on screen processor(s), computers and monitors, electronics, etc. that may be disrupted by momentary loss of power. UPS shall be designed to support signal processing path (not display) for at least 15 minutes.

2.4 DISPLAY CONTROL/CONTENT MANAGEMENT SYSTEMS

- A. Contractor shall provide all applicable control system software updates for a period of 10 years after substantial completion at no additional cost.
- B. General Configuration
 - 1. Computer based control system hardware shall exhibit sufficient computer processor power and speed to generate images instantly on command without lag, sputter, or stutter during recall, operation, and display.
 - 2. Images must be able to move smoothly through the entire length of the fascia displays and center hung assembly in a continuous circle if programmed to do so. Flicker-less display for both static and moving images. Image control and distribution system to allow the display of smoothly moving images with no flicker, jerking, and "stop motion" around entire display.
 - 3. Software packages and control electronics shall provide specified operational features. Game scoring and clock function data to be provided by Scoreboard control system.
 - 4. System to be capable of:
 - a. Showing Game in Progress (GIP) and stats information on any LED matrix/video display in system including existing display and courtside tables.
 - b. Compositing live video and GIP/Stats/Alphanumeric information on a single, video capable display
 - c. Creation, storage and display of head shots, DVI, AVI, JPEG, etc. files on any LED matrix/video display including existing display and courtside tables.
 - 5. All control system software and messages shall be stored in non-volatile (disk) format.
 - 6. Back-up computing and redundancy.
 - a. Network server and centralized file storage shall incorporate fully on-line, completely redundant processing (or mirror masters), including duplicate storage devices (i.e., RAID arrays).
 - b. All computers, processors, and control panels shall be inter-networked.
 - 7. Computer system shall be fully redundant with back-up, mirror processors on-line.
 - 8. Computer System shall be able to import common computer interchange graphic file formats (e.g., AVI, TIFFs, GIFs, DVI, JPG, MJPG, etc.)
 - 9. All distributed processing computers shall be located in physically accessible spaces (e.g., control room, riser closets). Above ceiling mounting is not acceptable.
 - 10. System to accept trigger/contact closure signal from Venue life safety system to automatically initiate a stored message on the portions of the displays systems on emergency power. Trigger/contact closure to be brought to control system racks by others.
- C. The existing Daktronics Show Control System also controls displays at Gill Arena. The new content management system will also need to have this capability. Coordinate the reloading of this content on the new machine. The University will be responsible for any reformatting of content.

- D. Minimum Workstation specifications.
1. Different configurations which meet these standards are acceptable. All computers in this system to be of same manufacturer, with identical specifications and features. Provide at least 2 user workstations with one being fully mobile with protective transport case.
 2. Acceptable Manufacturers: Dell, Lenovo, HP, Apple, Sony, or approved equal.
 3. Processor: as required to meet specified operating performance without noticeable delays or productivity impediments.
 4. Cases:
 - a. Rack Mount
 5. Memory: 16 gigabytes (minimum), expandable as required; if software requires additional memory to function, provide at no cost to owner. (In other words, we do not expect to have to add memory to get processors to function correctly.)
 6. Hard Disk: Multi-media class, fast access speed; capable of storing 2 seasons worth of material, minimum 3 TB
 7. Removable media:
 - a. CD/ DVD□/R/-R/+R/RW drive 32x DVD speed (minimum)
 8. Monitor: 22" flat screen; active matrix, LCD (e.g., Viewsonic, LG, Samsung, Sony or Philips).
 9. Mouse: Three button Microsoft Intellimouse mouse.
 10. USB: 2 front and 2 rear panel ports, minimum.
 11. Keyboard: full size with separate numeric keypad and cursor control.
 12. Keyboard, Mouse and Monitor extenders. Provide as required to support these devices at some distance from the rack mounted CPUs.
 13. Computer system shall be completely tested by manufacturer prior to delivery.
 14. Ethernet: 1000
 15. Software:
 - a. Operating system appropriate to needs of application and control software. All updates applied.
 - b. All application and control software necessary to interface this computer to scoring system for configuration and operation.
- E. Provide the following controllers, at minimum:
1. Animation Controller; Primary
 2. Animation Controller; Secondary
 3. Fascia/ Controller, Primary
 4. Fascia Controller, Secondary
 5. Primary Server
 6. Back-up, mirroring Server, including storage, i.e.; RAID arrays.
- F. Control System configuration to include on-line redundant backup controller and server as required.
- G. Networked Functions. The following devices should be configured to be shared on a network between individual workstations should more than one workstation be required to control system:
1. Internet gateway: via network connection to complex or Venue operator's computer system
 2. Internal and exterior data ports to support, at a minimum:
 - a. Sports Ticker feed/League statistical service.
 - b. Feed from sports scoring computer/control system.
 - c. Feed from Venue video production system.
 - d. Captioning device on-site or via telephone/internet based remote service.
 3. Network Back-up Requirements:

- a. Each machine shall be able to be backed up over the network to shared storage mediums.
 - b. Back-up software
 - 1) Appropriate network and client software to permit system to be backed up to (and restored from) long term storage device.
 - 2) Software shall permit backup of:
 - a) network servers
 - b) individual workstations
 - 3) Software shall be configured to run at user definable intervals.
 - 4) Software shall permit full or incremental backups.
- H. Hardware Control functions
1. Brightness controls: Provide a minimum of three brightness levels for each matrix display. Base brightness levels shall be 50 to 65%, 75% and 100% of full brightness.
 2. Outdoor displays to have automatic brightness adjustment to compensate for time of day and weather conditions.
 3. Clear (“oops”) Button: Provide a special clear button in addition to the keyboard control that will immediately clear each matrix board. This will override any display in progress and allow the operators to immediately remove any messages or animation.
 4. Emergency message: Provide a special button or “soft” key on keyboard to initiate a minimum of six different stored emergency text messages of Owner’s creation, on all displays capable of text.
- I. Software Control Functions and Features:
1. Character and Animation Features: All control system software and messages shall be installed on the internal hard disk drive with backup systems stored on CD ROM or other Owner approved media.
 2. Character, Animation and Symbol Generation: Generation, control and placement of any display pattern in any area of the Display systems. Patterns to include pre-programmed football/lacrosse/soccer/field hockey/track Game-In-Progress (score, game clock, period, time outs left, team fouls, bonus/penalty, possession, game/match score) display formats. Programming should allow the operator to modify the existing display format or store and recall custom formats generated by operator. Information shall be able to be acquired via Sports Ticker or other third-party services as identified by the team. These feeds to be interfaced directly with scoreboard control system, with automatic, real-time update capability. Contractor to coordinate interface with outside information services with the team.
 3. Game in progress information to be able to be displayed on zoned segment of any display as well as zones created within center hung matrix displays. Display of clock must not show any delay from game clock displayed play clocks.
 4. Animation: Refresh at a minimum of 30 frames per second. Maximum of a one second response to a control system command.
 5. Preview: Preview animations or messages on the control system monitor prior to display on RGB Matrix Displays. Maximum of a one second response to a control system command.
 6. Message formatting requirements:
 - a. Zoning: 16 user definable display zones (separate areas for displaying information) within fascia display with the size and location determined by the operator. Zones to be controlled individually, in groups, or totally at the same time, for all matrix boards, including auxiliary boards.
 - b. Character Fonts: Upper- and lower-case character generation. Include a minimum of ten separate fonts, including double and single characters. In addition, provide the capacity for one additional user definable font for storage and retrieval as a

- standard character set. Provide modification capabilities to all fonts and characters.
- c. Symbols: A minimum of 100-line symbols to assist in operator graphics creation. In addition, provide unlimited number of user definable symbols.
 - d. Advanced message composition, including auto centering, left and right justification. Character by character editing with the ability for font changes of existing text without text retyping.
 - e. Bulk deletion of messages or selected deletion of individual messages or groups of messages.
 - f. Messages shall be able to crawl or roll in predefined zones with a minimum of four separate speeds.
 - g. Time of day and date programming.
 - h. Clocks: Provide capability to define location, size, fonts, and format of clocks on any matrix board segment.
7. Effects: Provide the following effects for characters, messages, symbols and animation:
- a. Operator control of message, including sequencing and timing.
 - b. Continuous, seamless scrolling of selected zones of any matrix board with at least three separate speeds.
 - c. Vertical and horizontal Venetian blind change.
 - d. Horizontal travel with a minimum of three separate speeds.
 - e. Vertical scroll with a minimum of three separate speeds.
 - f. Wipe up/wipe down.
 - g. Wipe left/wipe right.
 - h. Wipe in a random-dot fashion.
 - i. Expand horizontally.
 - j. Expand vertically.
 - k. Transitions inside special effects shall include “dissolve”, and “black hole” effects. Black hole and zoom effects to have user definable directions and origins.
8. Control system to allow designation of “soft” keys for rapid display of standard game conditions.
9. Security Code Access: Passwords shall be available to system users to log into and access the control of the display system.
10. Message Display Procedure: User can develop a display “play list” that can include an unlimited number of files (messages) in a specified order, for a specified period of time, at certain times of the day. Individual files can be given time constraints so that a message can be dropped from the displayed after a given number of times.
- a. Overall display control software to allow scheduled functions to be overridden with content from the Venue control workstations to allow all displays in system to provide integrated content and timing when desired.
11. Offline Programming: New messages, procedures, and displays can be entered and programmed into the system during the display of existing file(s) from any terminal (Network Control Systems).
12. Internet access Message Logging and Recall:
- a. All displayed messages or animations shall be recorded into a Message Log. The Message Log shall be tied into the game controller and statistics memory. Any message or selected number of frames of animation can be retrieved from the Message Log and printed on the system printer.
 - 1) All displayed files, messages or animations shall be recorded into traffic database (log).
 - 2) At a minimum every file, message or animation in the traffic database shall provide:
 - a) a description of the event,
 - b) title of the message or animation,
 - c) dates and times of display,
 - i) date and time of first display.
 - ii) date and time of last display.

- iii) other dates and times of display.
 - d) duration of display, which display(s) received the message,
 - e) Client (e.g., advertiser, agency or network) associated with message or animation.
 - i) sub-client information related to the piece (e.g., identifying a specific advertising campaign,
 - ii) Contact information (e.g., name, phone, address, billing codes, etc.)
 - f) Missed display (e.g., scheduled, but did not occur due to being “pre-empted” by live piece or higher priority material).
 - 3) Traffic reports shall be able to be created based upon user definable fields such as:
 - a) client,
 - b) element (e.g., file, message, animation, etc.).
 - c) daily, weekly, monthly, etc.
 - 4) Traffic reports shall be able to be generated in MS Excel.
 - 5) Traffic reports to display if the asset being played was actively visible and on what portion of the content zone.
- b. Vendor shall provide the ability to host this internet log on a password protected web site specific maintained by vendor for a period of not less than 15 years as part of their base bid proposal.
 - c. Owner shall be responsible for providing internet connection between Venue and vendor’s server.
- 13. Direct Control: Provide direct access and control of game statistics from previously designated remote locations or control room, generated by the operator from both control system locations.
 - 14. Real Time Access: Provide access from any message console to current messages, statistics, game-in-progress and animation.
 - 15. Provide Owner all software updates released by Contractor for other customer use that apply to installed systems for a period of 10 years.
- J. Animation Display Packages:
- 1. University creates their own content and will modify any existing graphics and animations to match the new pixel mapping of the new display. No content creation is required.
- K. As part of the base Display Installer scope of work, provide the following pre-programmed display formats: statistical and timing functions. Include variations of pre-programmed displays for the support of high school and other events as defined by the Owner.
- 1. Football
 - 2. Installer/programming sub-contractor to work on-site, with Owner’s game presentation staff in determining layout and content of pre-programmed displays. Each message shall be capable of being displayed on any matrix board.
 - 3. System to include data interface to allow game in progress information to be provided to broadcasters, without interface to display system control.
- L. External Data Control System: Provide system software related primarily to game statistics. Software shall interact with outside agency statistics ((i.e., ESPN Game Cast, Sports Ticker, Elias, Stats.com, Stock ticker, Stat Crew (Football), via modem, satellite, or internet interface by Scoring system Contractor, or manual entry by operator. Communication connection will be provided to control room under a separate contract. Provide for the system to be interfaced to broadcasters and the Video Replay System’s character generator. Subscription costs for outsidess services are the responsibility of Owner and tenant. Implement any of these statistics interfaces at any time during the warranty period at the Owner’s request.

- M. Diagnostic Software: Provided to assist the Owner in diagnosing, isolating, and repairing deficiencies in the display and control system, including defective lamps.

2.5 GAME IN PROGRESS/STATISTICAL INFORMATION CONTROL

- A. Contractor shall provide all applicable control system software updates for a period of 10 years after substantial completion at no additional cost.
- B. General Configuration
1. Statistics module shall support individual and team data for:
 - a. Football
 2. All control system software and messages shall be stored in non-volatile (disk) format.
 3. Back-up computing and redundancy.
 - a. Network server and centralized file storage shall incorporate fully on-line, completely redundant processing (or mirror masters).
 - b. All game scoring functions (e.g., scoring computers, control panels, etc.) shall be completely backed-up with redundant equipment (not necessarily full-time, on-line).
 - c. All computers, processors, and control panels shall be inter-networked.
 4. Computer system shall be fully redundant with back-up, mirror processors on-line.
- C. Specialty feed support (minimum provision):
1. Sports Ticker feed.
 2. NCAA Statistics plus any other feeds discovered during installation and initial warranty period.
 3. Support feeds to:
 - a. In-House video production
 - b. Broadcaster display interfaces (e.g., Fox Box, CBS av ESPN) at TV truck dock
Provide distribution to at least three (3) users at the truck dock.
 4. Three (3) serial game in progress data feed connections at TV truck dock to be rack panel mounted on front face of rack.
 5. Cabling for any Owner provided game in progress data feed connections to locker rooms to be panel mounted as shown on AV drawings
 6. Serial game in progress data feed connections to in-house video production system to be landed in rack as coordinated with Owner.
 7. Cabling and equipment for game in progress data feed to stats location broadcast junction box. Locate connection on a 1 RU, 19" rack panel within junction box
 8. Data feed to be opto-isolated.
 9. Data input standard stenography (i.e., Stenograph, Cheetah Systems, Eclipse) equipment or web-based services (i.e., Colorado Caption). Coordinate exact system and interface requirements with team after award of contract.
- D. Data Network requirements:
1. Coordinate with Project and Owner IT representatives for data drops, port requirements and any special switch configuration requirements, like QoS, VLANS, etc.
- E. Back-up software
1. Appropriate network and client software to permit system to be backed up to (and restored from) long term storage device.
 2. Software shall permit backup of:
 - a. network servers
 - b. individual workstations

3. Software shall be configured to run at user definable intervals.
 4. Software shall permit full or incremental backups.
- F. Diagnostic Software: Provided to assist the Owner in diagnosing, isolating and repairing deficiencies in the display and control system, including defective lamps.
- G. Spares: Provide one set of back-up disks of all software.
- H. All scoreboard specific software (e.g., scoring, statistics, control electronics, etc.) shall be provided to the Owner with a full site license to allow deployment at Owner's discretion.

2.6 DISPLAY SUPPORT EQUIPMENT

- A. RS 232/485 Fiber Modems
1. Required as necessary to provide data at remote locations such as TV truck dock, video coaching, clubhouses, etc.
 - a. As Approved
- B. Use of existing equipment rack(s) is available, if desired. If not, provide:
1. Type: Frame and panel with locking rear door
 2. Size: To match existing rack footprint.
 3. Construction: Factory assembled 16-gauge cold-rolled steel frames with all corners welded
 4. Black enameled finish
 5. Provide all necessary side panels, trim pieces, tops, and blank panels
 6. Provide Middle Atlantic VBK-W27-W32 Vent Blocker kit(s) and configure for proper airflow and cooling of rack
 7. Acceptable Product:
 - a. Middle Atlantic Products MRK series
 8. Rack Drawer:
 - a. Spring loaded latch
 - b. Black textured finish
 - c. Acceptable Product:
 - 1) Middle Atlantic TD series
 9. Low Profile Keyboard Shelf:
 - a. Sliding black laminate shelf
 - b. Single rack space
 - c. Acceptable Product:
 - 1) Middle Atlantic SSL
 10. Computer Shelf:
 - a. Flanged construction
 - b. 16 Gauge steel
 - c. Black powder coat finish
 - d. Acceptable Product:
 - 1) Middle Atlantic U4
 11. Universal Rack Shelf:
 - a. Black textured powder coat finish
 - b. Acceptable Product:
 - 1) Middle Atlantic RSU-129
 12. Universal Mounting Trays:
 - a. Multiple Devices
 - b. Acceptable Product:
 - 1) Extron RSU 126
 13. Single Device

- a. Acceptable Product:
 - 1) Extron RSB 126
14. Blank Rack Panels:
 - a. Flanged construction
 - b. 16 Gauge steel
 - c. Black powder coat finish
 - d. Acceptable Product:
 - 1) Middle Atlantic SB series
15. Vent Rack Panels:
 - a. Flanged construction
 - b. 16 Gauge steel
 - c. Black powder coat finish
 - d. Acceptable Product:
 - 1) Middle Atlantic VTF series
16. Rack Fan:
 - a. 10" or 4.5" (x4), 115V
 - b. Include cord and hardware
 - c. Acceptable Product:
 - 1) Middle Atlantic FAN10 with GUARD-10
 - 2) Middle Atlantic FAN with GUARD
17. Fan Thermostat Control:
 - a. Switched 15A duplex outlet
 - b. Temperature Range: 50 – 90 Degrees
 - c. On and Stand-by LED indicators
 - d. Integral mounting ears
 - e. Provide for each rack fan assembly
 - f. Acceptable Product:
 - 1) Middle Atlantic FC-4-1C
18. Rack Temperature Display:
 - a. Provide one display in top front panel space of each rack
 - b. Decora mount in 1-RU rack panel
 - c. Digital readout in Fahrenheit or Celsius
 - d. Connect to DAP GPIO for high temperature alarm to the Audio Control Booth
 - e. Acceptable Products:
 - 1) Middle Atlantic TEMP-DEC with DECP-1X1 Panel.
19. Rack Light:
 - a. Provide 60W incandescent or 13W fluorescent work light
 - b. Located in all equipment racks over 36 RU's high
 - c. Acceptable Product:
 - 1) Middle Atlantic WL-60
 - 2) Lowell RL-1
20. Copper Bus Bars:
 - a. Material: Solid copper, 1/8 thick and 2-inches wide with threaded 10/32 holes
 - b. Height: 70-inch for 40-RU or larger racks and 21-inch for racks under 40-RU
 - c. Wire each circuit ground to bus bar and isolated outlet ground
 - d. Terminate two #6 wires between rack and buss bar
 - e. Provide with nylon isolation mounts
 - f. Provide one bus bar in each rack
 - g. Acceptable Product:
 - 1) Middle Atlantic BB-40
 - 2) Middle Atlantic BB-12
21. Equipment Rack Screws:
 - a. Install rack mounted equipment with black 10-32 star post security screws with flat nylon washers
 - b. Quantity as required

- c. Provide one spare bit located in a clear plastic bag attached to the inside of each equipment rack in plain view
- d. Acceptable Product:
 - 1) Middle Atlantic HTX
 - 2) Raxxess PNTX
- 22. Wire Duct:
 - a. Purpose: signal wire routing in rack
 - b. Acceptable Product:
 - 1) Panduit Type E Slotted
- 23. Surface Mount Wire Duct:
 - a. Signal level cabling, loudspeaker level cabling, electrical
 - b. Acceptable Product:
 - 1) Wiremold 4000 Series
- C. Keyboard, Video, Mouse Matrix Switcher
 - 1. As required to operate the system
 - 2. Product to match existing IHSE Draco System
 - 3. Provide transmitters and receivers as required and connect to existing Draco Terra Flex
- D. Ethernet Network Switch. 10/1000 with a gigabit uplink port. Provide 50% unused ports.
 - 1. Coordinate with University IT

2.7 PLAY CLOCKS AND CONTROLLERS

- A. Play clock to be white LED, fixed digit display and enclosure meeting requirements of main scoreboard scoring and enclosure systems. Location of clocks is shown on drawings. Coordinate exact location with Owner/Owner's Representative prior to installation.
 - 1. Character height to be not less than 30".
 - 2. LED lamps to have matte lens, exposed lamps are not acceptable.
 - 3. Enclosure to have white boarder around digits.
 - 4. Power and signal cabling to have "quick disconnect" connectors to allow easy removal of clock for off-season storage.
 - 5. Clock controller to be able to be operated from sideline and press level scoreboard control room.
 - 6. Standard of Quality:
 - a. Daktronics TI-2024
 - b. OES
 - 7. Quantity: Two (2) plus one spare.
- B. Locker Room/Back of House Game Clocks
 - 1. Technical Standards
 - a. Displays provided in locker rooms and select other locations as listed in this specification.
 - b. Display to utilize LED lamps. LCD displays are not acceptable. Control cable to each group of displays (not more than five per group) to be home run to controller interconnect junction box/data distributor.
 - c. Digit sizes to be no less than 4 inches high
 - d. 100% Solid state drivers.
 - e. A minimum of two levels of brightness: 50% to 65% and 100%.
 - f. Electrical and control cabling connections to be made with "quick disconnect" hardware to facilitate removal and replacement or removal of display
 - g. Enclosure to allow flush mounting in wall where possible.

2. Quantity:
 - a. As shown on drawings as indicated by "GC" symbol, plus
 - b. Scoreboard Control room (1)
3. The Standard for locker room clocks shall be:
 - a. Daktronics TI-2031/3031
 - b. OES
 - c. As Approved.

C. Control Consoles

1. Dedicated scoring/clock/statistics (possession, time outs left, etc.) play clock control consoles for use field side. Provide (2) units of each type used with carrying cases.
 - a. Controller input connection to be located at locations showing on AV drawings a both midfield locations as well as the north and south press boxes. Installation to include all cabling and electronics required to extend controller from J-box location to scoring locations. Coordinate final location with owner.
2. Game scoring and clock functions to be controlled, when necessary, from dedicated (non-desktop computer based) control console. Provide spare game function control console. Cabling for console to allow operation from each sideline.
3. Ability to recall information if power is lost.
4. Overlays/Inserts
5. Battery back up
6. Carrying case
7. Standard of Quality
 - a. Daktronics All-Sport 5000
 - b. OES

2.8 CONFIDENCE CAMERA

A. PTZ Camera

1. Remote operated PTZ
2. Outdoor Rated
3. Acceptable Product:
 - a. Bird Dog A200 with
 - b. Bird Dog BD-A200-WM
4. Note: Explore mounting condition prior to bid and include any custom mounting requirement allowances in base bid.

B. PTZ Controller

1. Controls PTZ
2. Supports NDI, Visca, RS-422/232
3. Controls up to 255 cameras over IP network
4. Acceptable Product:
 - a. Bird Dog BDPTZKEY

PART 3 - EXECUTION

3.1 GENERAL

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

- 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 grommets.
- D. Provide event, portable cabling from courtside AV junction boxes to court/ice control operating positions for interconnection and operation of scoring systems.
- E. AC Power and Grounding
 - 1. Adhere to all local and national electrical codes and standards.
- F. 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.
- G. Equipment and Cable Labeling
 - 1. Provide engraved Lamacoid 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. The second line to include the schematic reference of the device. The bottom line to indicate what other devices or areas this equipment controls.
 - 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. 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.

3.2 DEMONSTRATIONS

- A. Provide 28 hours instruction to Owner or Owner's Representative designated personnel/facility staff on the use and operation of the System, scheduled as a minimum of five 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 demonstration with Owner or Owner's Representative.

1. Control system training to be not less than 20 hours
2. Maintenance training to be not less than 8 hours.

B. Training Schedules

1. Training should be assumed to take place on the project site, unless agreed to by the Owner.
2. Training should be scheduled to be non-overlapping, unless agreed to by the Owner.
3. 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 4-to-6-hour increments; perhaps over a period of weeks (or even months).
4. If a portion of the training time is occupied in troubleshooting the equipment installation, then the training time shall be extended an equal amount of time at a time mutually agreed to with owner.

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

1. A general familiarization of each major device.
2. An explanation of how the device interfaces to the rest of the system (including remote controls, data connections; timing requirements and the like).
3. General training on operating the device.
4. Specific training on device operation (e.g., entering statistics; how to access data retrieval sources; how to create repeatable formats and layouts, changing fonts, loading new fonts).
5. Saving information; backing information up (including a review of the proper procedures for backing 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, don't be the first one to try the new software on game day).

D. In addition to training noted above, the software/template trainer shall be present at four games and two other events as designated by the Owner.

3.3 EVENT ATTENDANCE

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 (hardware and software) during critical Four (4) events, as designated by Owner, for the duration of the warranty period. Event support shall begin in a period 24 hours prior to the opening of gates and shall extend to 48 hours for a weekend game.

1. Two days prior to the event; test and review all displays, processors and supporting computers to confirm proper operation; repair and address issues as required.
2. Be available on call after testing.
3. Be present on game day from at least 4 hours before gates open, until the time released by the Owner.

B. At the beginning of each warranty season, provide one (1) full day with Owner reviewing display configurations, operational questions and performance at a time designated by Owner by a manufacturer authorized trainer/Owner/commissioning agent.

C. Provide sufficient manpower to effect repairs as expeditiously as possible. It is expected that both a display technician as well as a control room/control system specialist are present.

3.4 LED INSTALLER TESTS AND ADJUSTMENTS

- A. Verify the following before beginning actual tests and adjustments on the system:
1. Electronic devices are properly grounded.
 2. Powered devices have AC power from the proper circuit and hot, neutral, and ground conductors are connected correctly.
 3. Insulation and shrink tubing are present where required.
 4. Dust, debris, solder splatter, etc. is removed.
 5. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
- B. Preparation for Acceptance, prior to final inspection:
1. Temporary facilities and utilities shall be properly disconnected, removed and disposed of off-site.
 2. All systems, equipment and devices shall be in full and proper adjustment and operation, and properly labeled and identified.
 3. All materials shall be neat, clean and unmarred and parts securely attached.
 4. All broken work, including glass, raised flooring and supports, ceiling tiles and supports, walls, doors, etc. shall be replaced or properly repaired, and debris cleaned up and discarded.
 5. All extra materials, portable equipment, and spares shall be delivered and stored at the premises as directed.
- C. RGB LED testing requirements
1. If Owner believes that a display does not comply with the performance criteria of the specification, the Installer shall contract with a mutually agreed on independent testing agency/consultancy to verify performance of the display or displays. Cost of this testing will be solely born by the installer. At a minimum the following must be tested:
 - a. Overall screen brightness (peak)
 - b. Uniformity testing
 - 1) Separate measurements (brightness and color temperature) shall be made to verify uniformity at:
 - a) Peak/maximum brightness (recommended direct sunlight operating brightness).
 - b) Typical operating brightness
 - c) Evening/nighttime operating brightness
 - 2) Brightness uniformity
 - a) pixel to pixel
 - i) intra-module
 - ii) between modules
 - iii) Sampling techniques are acceptable, provided:
 - a) number of samples is not less than 20% of the total display's pixels.
 - b) samples are spread throughout the screen
 - c) Samples run width of screen
 - b) module to module
 - c) best case to worst case
 - 3) Color temperature uniformity
 - a) pixel to pixel
 - i) intra-module
 - ii) between modules
 - iii) Sampling techniques are acceptable, provided:
 - a) number of samples is not less than 20% of the total display's pixels.

- b) sample is spread throughout the screen
- b) module to module
- c) best case to worst case
- c. Viewing angles:
 - 1) Horizontal
 - 2) Vertical
 - 3) Defined as 50% of peak brightness, or at the point a noticeable color shift occurs.
- d. Tests to be performed in accordance with manufacturer's installation and service manual on displays installed at the site, with a "normal" video signal that is injected at the control room, or at the board. Tests on display elements or modules prior to installation are not acceptable.
- e. Test report shall include full documentation on test procedure, instruments employed (including model number and serial number) and copy of instrument calibration certification.
- f. Meets FCC compliancy. Testing might be required, if requested by Owner, adjacent property owner or government agency.

3.5 TEST EQUIPMENT

- A. The Contract shall require the Installer to provide test equipment 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 or 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: Tektronics.

3.6 ACCEPTANCE

- A. Upon completion of installation and initial tests and report specified in Part 3, acceptance testing shall be performed by the Owner or 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. Assessment of all display images.
 - 2. Provide test pattern on all color matrix and video displays for Owner's Representative to review. Pattern to include:
 - a. A rotation of red, grid, blue, grid, green, grid, white, grid, repeat
 - b. Grids to have letter and/or number or combination of both within each grid box representing module.
 - c. Rotation to be able to be easily accessed and automatic.
 - 3. Physical inspection of displays
 - 4. Review of animations
 - 5. Review of scoring and clock functions.
 - 6. Review of system operation on redundant cabling.

7. Control functions shall be checked for proper operation, from controlling devices to controlled devices.
 8. Adjust, balance, and align equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for each adjustable control with small white, adhesive dots, and record these settings, in the "System Operation and Maintenance Manual."
 9. Provided and loose equipment will be inventoried for correct quantity.
 10. Testing to include demonstration of Stenograph and Sports Ticker data input capability. Provision of stenograph equipment and operator as required, is the responsibility of the Installer.
 11. 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 his 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 or Owner's Representative.
- E. The Owner's fees and costs involved in acceptance testing are not the responsibility of the Scoring and Matrix Display System Installer, except as described in Part 3 of this specification.
- F. Final acceptance will follow the successful control system operation all first season pre-season games and first two regular season games. Should play at the stadium begin mid-season this period shall be a minimum of four games.
- G. If the system is used prior to final acceptance, attendance in support of system usage shall not be construed as acceptance, or as event attendance.

END OF SECTION 11 63 10