APPENDIX I

Project Scope of Work/Specifications

SECTION 11 63 10

VIDEO, SCORING AND MATRIX DISPLAY SYSTEMS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This is a design/build project. Work under this Contract includes all labor, materials, tools, transportation services, supervision, coordination, etc., necessary to complete the provision of the Video, Scoring and Matrix Display Systems, as described in these specifications and illustrated on the associated drawings. The systems shall be called the “Display System” and the provider the “Display System Provider”.

B. The work specified herein is performance based. This requires the Provider to provide all subsequent design and engineering, to meet the requirements of this Performance Specification. The drawings included with this specification convey general system concepts. The plans do not necessarily show complete and accurate building details. The Provider is responsible for making field measurements necessary to establish exact locations, relationships, load capacities necessary for the provision of these systems.

C. Work includes a number of separate video/scoring/matrix displays. Drawings should be considered to be conceptual in nature, illustrating the features and appearance of the system. It is intended that the provider shall assume full responsibility for final structural engineering, rigging requirements as well as finished project information and coordination required in accordance with the provider's final design of elements being provided under this contract.

D. This is a phased project, meaning that each venue’s display replacement might not start concurrently. This will affect warranty start/end dates as well as scheduling. Below is an outline of completion dates:
   1. Base bid:
      a. Baum Stadium – January 15, 2016
      b. Bud Walton Arena – October 1, 2015
      c. Tyson Indoor Track – December 1, 2015
   2. Alternates:
      a. Bogle Park – January 15, 2016
      b. John McDonnell Outdoor Track – March 1, 2016
      c. Barnhill Arena – December 20, 2015 (only availability in November)

E. The base systems include the following major items:
   1. Baum Stadium:
      a. One main scoreboard display consisting of:
         1) LED video display
         2) Adhered graphic on rear of assembly
         3) Facility naming backlit, channel cut letters and logo– double sided
         4) Robotic PTZ camera on structure pointing at each bullpen.
            a) Provide mock-up of location prior to mounting in order to get proper viewing angle
      b. Pitch radar gun.
      c. Motorized retractable net in front of display with hoisting capability from ground
   2. Bud Walton Arena
      a. Main center hung assembly consisting of

1) 4 LED video displays
2) Free standing channel cut facility ID lettering and logos

b. Two (2) sets, of two, two-sided basketball goal shot/game clocks mounted to goal assembly'
c. Basketball goal LED time expiration strips
d. Scorer's table time expiration strips
e. Four (4), LED displays, (2) two on basketball goal – one on top to backboard, one on top of stanchion
f. Interface to existing Daktronics back of house game clocks
g. Portable, basketball shot/game clocks, expiration horn, controllers and cabling
h. Control system interface to existing Daktronics' scorer's table
i. Control system interface to existing Daktronics
j. Robotic PTZ "Slam Cams" and basket microphones
k. Robotic PTZ camera under center hung assembly
l. Acoustically transparent textile bottom scrim with 4-color Owner provided copy

3. Bogle Field (Alternate)
   a. One main scoreboard display consisting of:
      1) LED video display
      2) Adhered graphic on scrim on rear of assembly
4. John McDonnell (Alternate)
   a. One main scoreboard display consisting of:
      1) LED video display
5. Tyson Indoor (Alternate)
   a. One main scoreboard display consisting of:
      1) LED video display
6. Barnhill Arena (Alternate)
   a. One main scoreboard display consisting of:
      1) LED video display
      2) Secondary structure and rigging attachments to roof structure
      3) Installation and extension of conduit from processing equipment and power demark to display.
      4) Four (4) Individual LED displays on stands at each event to tie into Owner designated scoring for gymnastics.
7. Components common to all facilities:
   a. All facilities connect to existing fiber components that send/receive signal to/from the central broadcast control room in Bud Walton Arena. The various signal also connect to existing components within the central broadcast control room in Bud Walton Arena. It is recommended that the Scoreboard Contractor contact the control room installer for any questions or assistance during the installation and commissioning.
      1) Comprehensive Technology Group (CTG)
      2) Josh Shibler
      3) josh@ctgatlanta.com
      4) 404-352-3000
   b. Scoring and Display controllers
   c. Development of animations and graphics
   d. Automated statistic update capability from conference, in-house, existing, any third party services along with provided scoring controllers.
   e. Scoring feeds (in data and video) to the TV Truck parking area, video production system and distributed TV system.
   f. Structural provision of signal and power drop cabling for video display modules, module sub-structure and signal cabling. Weight and power consumption in accordance with project requirements.

g. All electrical distribution for displays as required within each system at each provision point. Final electrical and electronic termination for displays by Scoreboard Provider. Power controls to allow any display in the overall system to be turned on/off. Manual switches located at scoreboard are not acceptable. This scope of work to include any contactors, electrical equipment, etc., and the cost to program/integrate control of elements in this scope into the Owner's existing control system should that option be selected.

h. Signal and power conduits t provided for display systems are shown on the electrical and AV drawings. Provider is required to provide coordination services in the preparation of Electrical and signal raceway drawings to ensure proper conduit provisions. Provider is responsible for addition of any raceway not shown on the project documents that is required for completion of work or to meet code requirements. Extension or addition of conduit from electrical rooms to catwalk platforms or auxiliary/fascia displays is the responsibility of this contractor. Exposed cabling will not be allowed.

i. Operations and maintenance training

F. The Contract also includes:

1. Removal and disposal of LED, Scoring and advertising displays that include:
   a. Baum Stadium
      1) Main scoreboard display components
      2) Fixed digit scoring displays
      3) Top decorative steel
      4) Static advertising panels
      5) Display controller and processor
         a) NOTE: Return clock in working condition to Owner
   b. Bud Walton Arena
      1) Center hung display assembly
      2) Goal shot clocks and strips
   c. Bogle Park (Alternate)
      1) Main scoreboard display components
      2) Fixed digit scoring displays
      3) Static advertising panels
      4) Display controller and processor
   d. John McDonnell Outdoor Track (Alternate)
      1) Main scoreboard display components
      2) Display controller and processor
   e. Tyson Indoor Track (Alternate)
      1) Main scoreboard display components
      2) Display controller and processor
   f. Patch/repair/paint (as appropriate) any existing architectural finishes damaged due to display removal in areas in public view.
   g. All disposed items shall be disposed in a proper manner for the material's in question and an affidavit shall be provided to the University that all materials have been properly disposed of.
2. Pre-project meetings on site.
3. Verification of dimensions and conditions at the job sites.
4. Coordination with other contractors and trades.
5. Development of final design drawings. Submission of all information required by public agencies.
6. All necessary permits.
7. State registered Engineers' stamp on all structural, attachment and electrical drawings with any calculations required for stamp.

8. Development of any additional power and signal raceway information with Subcontractors and other responsible trades.
9. Preparation of submittal information.
10. Provision in accordance with the contract documents, manufacturer's recommendations, and all applicable code requirements.
11. Initial tests and adjustments, written report, and documentation.
12. Instruction of operating personnel; provision of manuals.
13. Maintenance services; warranty.
14. Event attendance as outlined herein.
15. Any required seating bowl and/or floor protection when utilizing cranes or any lift mechanism or other equipment.
    a. Obtain approval from the University for any heavy equipment proposed to be used on concourses and playing surfaces.

G. 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.

H. The Owner will consider subjective assessment of image quality, brightness/uniformity and scoring and control/animation software along with user interface as part of the overall evaluation process. The Owner reserves the right to make product selection based on this subjective comparison among vendors providing responsive proposals meeting all technical performance requirements.

1.2 WORK PROVIDED IN CONJUNCTION WITH THIS SPECIFICATION

A. Bud Walton Arena Sound System Upgrade

1.3 REFERENCES

A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations 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. Standard for Electric Signs, UL-48, 13th Edition
11. Standard for Control Centers for Changing Message Type Signs, UL-1433, 1st Edition
12. Federal Communications Commission Regulation Part 15
13. National Electric Code (NEC)
14. Building Industry Consulting Service International (BICSI)
15. Telecommunications Industry Association (TIA)
16. Any or all local, government or other applicable codes.
17. University standards for cable, electrical and conduit

1.4 **DESCRIPTION OF WORK**

A. Baum Stadium
   1. Removal and disposal of existing display, advertising and scoreboard components, top decorative elements and ground level up lighting.
   2. New Outfield Scoreboard Assembly consists of the following elements:
      a. Secondary structure and enclosure
      b. Adhered 4- color graphic on rear of enclosure
      c. LED display
      d. Decorative steel, naming rights and logo
      e. Robotic PTZ cameras on structure pointing at bullpens
      f. Any masonry required to fill in gaps in existing brickwork created by removal of existing equipment
         1) Match existing and submit for approval prior to installation
      g. Provision of new Pitch speed system/radar gun
         1) Connect computer feed to scoring system and store pitch and plate speed information within statistics database.
         2) Weatherized enclosure unless utilized at location noted on floor plans
         3) Provide at least 2 channels of distribution – one to TV truck, one to Central Control Room CG
         4) Provide a minimum pitch speed threshold
         5) Provide a set hold time
         6) Support both MPH and KPH
   3. Interface with existing Daktronics ribbon displays. Desire is to be able to trigger displays from new control equipment.
   4. Removal and remounting of existing Daktronics LED Pace of Play Clock

B. Bud Walton Arena:
   1. Removal and disposal of existing center hung LED display and scoreboard components, processing and control components.
   2. Existing LED courtside cable and fascia display control and processing equipment to remain in PA Booth.
   3. Interface new control/content management system to existing Daktronics ribbon and scorer's table displays. Desire is to be able to trigger displays from new control equipment.
   4. New Center Hung assembly structure and enclosures
   5. LED displays
   6. Rigging of new center hung assembly to existing hoist lift lines.
      a. Existing Hoffend Omni hoist lift capacity is reported to be rated at 23,000 lbs.
      b. This scope of work to include field inspection and report of existing hoist. Inform Owner of any problems found with hoist. Provide price to correct any problems discovered. The following entities can be contacted to assist in reviewing and designing, if needed:
         1) Structural Engineer:
            a) David Campbell
            b) dmc@geigerengineers.com
            c) 845-368-3330
         2) Hoist Inspection:
            a) Dave Delaro
            b) ddelaro@hoistservice.com
            c) 941-554-8127
      c. Owner allowance items:
         1) Speakers – 1,000lbs.

2) PTZ camera – 20lbs

d. Intent is for new center hung assembly, plus owner allowance items to achieve a total weight of not more than 23,000 lbs. In the event that the proposed center hung assembly, with owner allowance items exceeds the lift capacity of the existing hoist, upgrade or replacement of the existing hoist is to be included in this scope of work or provide an alternate, smaller configuration.

7. Provision of robotic PTZ camera located under the display assembly.
8. Basketball Goal Display Assemblies
   a. Provision of robotic PTZ "slam cams" and microphones behind each basket
      1) Cabling and components to be located in control room
   b. Goal Shot/Game Clock Displays
      1) Two (2)Translucent (2) two-sided units per goal assembly with control
         a) One on top of backboard
         b) One on stanchion
   c. Time expiration LED strips for basketball goals including spare goal assembly and scorer's table
   d. One double-sided LED display per goal assembly
   e. NOTE: Provide appropriate power and signal distribution and cable management on each goal assembly to achieve a clean appearance.
9. All control equipment to operate LED video displays will be located in the Central Control Room. Basketball scoring operations control to be operated court side. Sports control system to provide pre-sets/overlays, etc. to allow easy conversion to between sports. Connections and all cabling between displays and control equipment along with interconnection with court side control location, shall be included in this provider's scope of work. Scoring software required for the following sports:
   a. Basketball (NCAA, NBA-D, WNBA and high school)
   b. Volleyball (NCAA, high school)
10. Clock time expiration horns located on the catwalk. Existing horns and cabling may be reused if warranted as new.
11. Locker Room/Back of House Game clocks at locations indicated on floor plans.

C. Tyson Indoor Track (ALTERNATE)
   1. Removal and disposal of existing display.
   2. Assembly consists of the following elements:
      a. Secondary structure and enclosure
      b. Provision of new LED display
      c. Fiber TX/RX electronics are utilized via a mobile production cart. Coordinate connection/testing of signals to mobile cart in the scoreboard/PA room of the facility. Display processing equipment will reside in this room.

D. Bogle Park (ALTERNATE)
   1. Removal and disposal of existing display, advertising and scoreboard components, processing and control components
   2. New Outfield Scoreboard Assembly consists of the following elements:
      a. Secondary structure and enclosure
      b. Adhered graphic on rear of enclosure
      c. Provision of LED display
      d. Existing fiber TX/RX electronics are located in the scoreboard/PA booth of Bogle. Display processing equipment will reside in this room.

E. John McDonnell Outdoor Track (ALTERNATE)
   1. Removal and disposal of existing display, processing and control components.
   2. Outfield Scoreboard Assembly consists of the following elements:

a. Secondary structure and enclosure
b. Adhered graphic on rear of enclosure
c. Provision of new LED display
d. Fiber TX/RX electronics are utilized via a mobile production cart. Coordinate connection/testing of signals to mobile cart in the scoreboard/PA room of the facility. Display processing equipment will reside in this room.
e.

F. Barnhill Arena (ALTERNATE)
1. Removal and disposal of existing LED display and scoreboard components.
2. Provision of new dead hung structure and enclosure
a. The following entities can be contacted to assist in reviewing and designing of structural elements, if needed:
1) Structural Engineer:
a) Frank Allison
b) fallison@ecilr.com
c) 501-376-3752
3. Provision of LED displays
4. Provision of signal cable and electrical conduit from equipment and power demarcation point to display.
5. All control equipment to operate LED video displays will be located in the Central Control Room. Basketball scoring operations control to be operated court side. Sports control system to provide pre-sets/overlays, etc. to allow easy conversion to between sports. Connections and all cabling between displays and control equipment along with interconnection with court side control location, shall be included in this provider's scope of work. Scoring software required for the following sports:
a. Volleyball (NCAA, high school)
b. Interface with University's existing Gymnastics scoring system
c. Existing fiber TX/RX electronics are located in a rack on the wall of Section Q of the facility. Display processing equipment will reside in a rack in this area.
d. Provide signal cable and necessary conduit from location to display.
e. Provide new rack adjacent to existing fiber transport equipment.

G. Requirements common to all facilities:
1. All control equipment to operate LED video displays will be located in the Central Control Room located in Bud Walton Arena. Scoring operations control to be operated from Scoreboard/PA room at each facility as designated by Owner. Sports control system to provide pre-sets/overlays. Connections and all cabling between displays and control equipment along with interconnection to existing fiber transport equipment to Bud Walton Arena shall be included in this provider's scope of work.
2. Data input and control computer for Sports Ticker, SEC database or as directed and other similar services (i.e. ESPN Gamecast, etc.). 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. System to allow input of "open captioning" information generated on or off site by computer, steno and specialized captioning equipment. Control system to allow zoning of any display surface for real time display of this information.
3. Data output, compatible with character generators (e.g. Chyron) as well as ability to provide feed to regional sports networks scoring displays (aka Fox box). Provide connectivity at TV Truck parking area.
4. Supply all necessary loads, weights, power and other necessary design and coordination for Owner/Owner's Representative to provide adequate mounting structure for displays. This includes state registered structural engineer stamped

calculations for all structural elements. Provider to be responsible for all structure required to attach displays to structure. The Owner will supply necessary structural engineering reports on existing vertical elements where available. The provider to submit structural attachment between display assembly, requirements for secondary steel and existing structure for review and approval by project structural engineer.

5. Supply complete assemblies (structure, enclosure, and finish) for Displays, and ad panels included as part of this scope of work as appropriate, including State registered structural engineer stamped calculations. Attachments to base vertical structure to be reviewed and approved by the project Structural Engineer as directed by Owner/Owner's Representative.
6. Colors of all exposed structure, enclosures, close-out panels, etc., to be determined during submittal process. Submit color samples to Owner for written approval.

1.5 RESPONSIBILITY AND RELATED WORK

A. Coordinate all work so that a complete and functioning scoreboard assembly and related systems (scoreboard, game/locker/shot 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 is the responsibility of the Scoreboard Provider to supply systems in full working order. Notify the Owner/Owner's Representative of any discrepancies in part numbers or quantities before bid. Failing to provide such notification, supply items and quantities according to the intent of the Specification and Drawings, without claim for additional payment.

D. Obtain all permits necessary for the execution of any work pertaining to the provision, or any operation by the Owner.

E. If a conflict develops between the contract documents and the appropriate codes, refer to project general conditions for a resolution.

F. Coordinate equipment and control room equipment/rack locations with Owner/Owner's Representative, and other subcontractors in the rooms.

G. Electrical:
   1. Power is provided as shown on electrical as-built documents for displays, locker room clocks, play clocks and shot clocks. It is recommended that this contractor review and note on-site conditions. Conduit from electrical rooms to displays for both signal and power is existing. It is this provider's responsibility to provide any additional conduit required if existing infrastructure is insufficient.
   2. The Provider shall be responsible for distributing electrical power as required, including breakers. This will include necessary distribution boards, conduit and cabling as required for a complete provision.
   3. Provide individual circuits/breakers for each system matrix display, one for all scoring displays, one for all advertising displays and one for all video displays.
      a. Label each breaker as to its function
      b. Conceal branch conduit within the assembly and not outside.
      c. Hold conduit tight to structure and paint to match existing structure where visible to public.
   4. Provide complete power and branch circuit distribution within the enclosure from a demarcation point near displays.

a. Provide independent remote power control for each of the following elements:
   1) Each LED display
   2) Facility naming and/or backlit ad panels

H. Display Signal Cabling and Conduit
   1. Provision 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.
   2. Provide primary and backup connection cabling (separate overall jacket, not diverse pathways) from each display to control system location and other specified control locations.
   3. Existing cable may be used provided it is fully warranted as new
   4. All cable whether fiber optic or copper may 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. Cable exposed to public view and through inaccessible areas is to be in conduit. If conduit is required for a complete, code compliant system, provide as part of this scope fo work.
   5. If available, provide back-up to any cabling sufficient to maintain game in progress clock functions/displays. Provide one spare cable of each type to each display. It is not acceptable to use spare pairs within the same cable.
      a. Patch panels shall be provided at the Control Room and Video Display to facilitate transfer between primary and back-up cables.
   6. Cable shall carry appropriate fire rating (e.g. CMR, CMP, OFNR, OFNP, etc.) on jacket of cable.
   7. Do not damage any signal cabling that may be co-located with video and scoring cabling. In the event of damage, bring damage to attention of owner and propose acceptable repair.
   8. Provide any necessary cable management, vertical ladder tray, j-hooks, etc. in areas with pathway.
   9. 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. Fire stopping for cabling penetrating rated partitions as required by code is also included.
   10. Available conduit/raceway/cable tray distribution for display signal/data cabling is shown on Owner's drawings which may be incomplete and not up to date. Site observation will be required to determine full extent of existing raceway and raceway provided 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 provision.
   11. Hold conduit tight to structure
   12. Remove and dispose of cabling that is abandoned as part of the project.

I. Coordinate work with other trades to avoid causing delays in schedule in accordance with Owner's direction.

J. Coordinate product and materials delivery, offloading, staging, security and transportation with Owner/Owner's Representative.

K. Fire Alarm Interface. Provide a fire alarm interface to automatically engage emergency evacuation messages on designated displays. Coordinate with Owner and Fire Marshall/Code Authority as to message text.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications: At least 5 years experience in the production of specified products.

B. Provider's Qualifications: Firm experienced in the provision of systems similar in complexity to those required for this project; and meet the following:
   1. At least five years experience with equipment and systems of the specified types.
   2. Experience with at least two comparable scale professional or collegiate sports projects within the last three years.
   3. Maintain a fully staffed and equipped service facility.

C. Required Proposal Technical Documentation with Bid Return
   1. With the proposal, the potential Provider shall provide:
      a. Proof of adequate plant and equipment to complete the work.
      b. Scoring software appropriate for NCAA games and automated statistical record keeping. Provide print outs of representative software screens and identify third party services (e.g. Sportsticker, Fox Sports, etc.) that have been successfully integrated in past projects.
      c. Provide locations where electronic captioning equipment has been successfully integrated in past projects with photos of displays. Spanish captioning is a requirement of the system.
      d. Adequate staff with commensurate technical experience. Provide
      e. Suitable financial status to meet the obligations of the work.
      f. Hourly fee for software/animation programming.
      g. References from three (3) or more users of stadium similar display and software control systems provided by Provider.
      h. Regional service presence.
      i. List of structural, electrical and other subcontractors intended to do the work.
      j. Proposed project schedule
      k. Concept renderings of displays, structures and enclosures with elevations and sections if available.
      l. Proposed equipment
      m. Completed display form included in Part VII

1.7 SUBMITTALS

A. Submit all shop drawings and submittals in accordance with Project Requirements. Quantities listed herein are the minimum; in all conflicts with the General Conditions, the more stringent requirement shall prevail.

B. Shop drawings and submittal data shall contain sufficient information to describe the Work to be performed. Drawings shall be executed at an appropriate scale. Submit (3) electronic sets of drawings and catalog data sheets, in .pdf form and One hard copy. Submit all Shop Drawing information at one time. Information shall include but not necessarily be limited to:
   1. Elevation and Sections of all displays.
      a. Note that sections that span expansion joints, bends/corners in the precast should be studied for any seams and obstructed viewing angles.
   2. Naming Rights panel.

3. Color options (with photographs of examples) for all fixed digit and monochrome LED displays. Include white as a color option wherever possible.
4. Finishes of all exposed housings with finish samples.
5. Connection of the provider supplied equipment to the actual project structure at each different condition. Drawings to indicate nature of disassembly for storage.
6. Coordinate with project structural engineer and pre-cast fabricator for all necessary structural accommodations (embeds, attachment locations, structural requirements) for integrated railing fascia display system.
7. Complete structural drawings showing member sizes, connections, etc. Submit design calculations, bearing the state registered structural engineer's stamp for review. Review will be for design intent only and shall not be construed as approving the design analysis.
8. 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.
    a. Indicate location of all access panels. All required access panels are part of this scope of work.
9. Equipment Drawings. Provide equipment mounting and location 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.
10. Structural plan and Section Drawings. Provide drawings showing the exact location of all provided equipment on plans and/or sections. Describe attachment methodology for each component that connects to the building structure.
11. 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
12. 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.
13. Equipment. Location of all equipment in racks, consoles, mill work, enclosures or on Owner provided counter top/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.
14. 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.
15. Viewing angle calculations for Bud Walton Arena and Barnhill Arena:
    a. For horizontal viewing angles submit:
        1) Facility seating plan closest to board (in elevation). Plan should include vomitories, radial column lines, and other identifying characteristics (e.g. camera platforms, aisles, steps, etc.).
        2) Lines radiating from center of display intersecting with rear of facility at 5° increments. 0° reference shall be perpendicular to board. Lines shall be marked at no less than 15° increments.
    b. For vertical viewing angles submit:
        1) Section through board and stadium indicating identifying points on the field.

2) Horizontal measurements from board.

c. Lines radiating from center of display intersecting with rear of facility at 5° increments. 0° reference shall be perpendicular to board. Lines shall be marked at no less than 15° increments

16. Proposed cable labeling technique.
17. Samples as required in various specification paragraphs.
18. Power consumption at 50% and 100% illumination levels for each display.
19. QA/QC procedure.
20. Final Inspection Notification Report. Six (6) electronic copies on disc. Checkout report for each piece of equipment and the entire system shall be prepared and submitted; it shall include:
    a. A complete listing of every piece of equipment including serial number, the date it was tested and by whom, the results and date re-tested (if failure occurred during any previous tests).
    b. The final report shall indicate that every device tested successfully.
    c. A performance test report indicating that the system meets all of the Provider testing requirements of Part III.

C. Training and Event Attendance Submittals:
1. All Operations and Maintenance manuals, as well as as-built drawings must be on site for all sessions of training.
2. Following discussions with Owner, formally submit a Training and Event Attendance submittal 2-4 weeks prior to first training. Submittal shall:
    a. Include a separate page/entry for every training session.
    b. Indicate date, time, and approximate length of training session.
    c. Indicate person(s) conducting training.
    d. Indicate whether training will be video recorded.
    e. Intended curriculum and most appropriate attendees (e.g. engineer, operations, IT, etc.)
    f. Include signature and title lines for
        1) Owner acknowledging and accepting training schedule. Include both an accepted and rejected box. An alternate schedule time should be suggested by the Owner in the event the schedule is rejected.
        2) Countersigning by trainer indicating that training actually occurred.
        3) All persons attending training. Where attendees do not stay for the entire session, this should be noted on the form and initialed by Owner's representative attending training.
        4) Owner's representative attending training at the end of the session shall initial that:
            a) Training Occurred.
            b) Training Materials were provided and left with owner
            c) Training was not interrupted or shortened by equipment or system troubleshooting. If it is, then there should be a line where Owner and Contractor can indicate when make-up training will be provided and how long it should be.
            d) Training was generally sufficient for the proposed curriculum.
        5) Include Notes section for Owner and Contractor to note any issues during training (areas requiring further development, etc.)
    g. Following training occurrence, submit completed training records no later than 5 days following end of training. When training is conducted over a period of weeks, completed training submittals shall be consolidated into a single submittal and submitted every 2 weeks.

D. Contract closeout submittals:
   1. Keep a complete set of drawings on the job, note any changes made during provision, and submit 1 corrected set of hard copy drawings and electronic files in Auto Cad format, showing Work as provided.
   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 copies, in 3, 3- ring binders, sized to hold the two (2) hard copies and six (6) sets of electronic files on disc. Hard copies to be complied in binders with material plus 50% excess, with clear vinyl pockets on cover and spine for project title. Provide tabular dividers with permanent legends 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) Photographically reproduced schematic wiring diagrams of the scoreboard and advertising display low and high voltage systems, based on the as-built documentation, at a reduced scale easy to handle but fully legible. Blueline (or similar diazo process) prints are not acceptable.
         6) Maintenance Instructions, including Provider'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. In titled ring binders sized for material below, plus 50 percent excess; 3 copies:
         1) Manufacturer's Service Manuals and parts lists for all equipment. Photocopies are not acceptable. For custom circuits or modifications, complete schematics and parts lists.
         2) As-built wiring diagrams and system block diagrams showing nominal input and output levels. (Submit within two weeks after Acceptance Testing.)
         3) Duplicate copies of reduced-scale wiring diagrams.
      c. Photographically reproduced as-built wiring diagrams and overall building wiring diagrams, at a reduced scale easy to handle but fully legible. Blueline (or similar

diazo process) prints are not acceptable. Mounted behind clear acetate and located with the equipment racks.

1.8 PROJECT CONDITIONS

A. Verify all conditions on the job site applicable to this work. Notify Owner/Owner's Representative in writing of discrepancies, conflicts, or omissions within three (3) days of discovery.

B. The bid drawings are intended to show equipment configurations. Provider to attend project design coordination meetings to provide design assist in preparation of infrastructure (conduit, power, etc.) drawings to ensure that Providers work can be completed as intended. References to these drawings and requirements for additional conduit or cable management/raceway over what is shown on drawings prepared with assistance of scoreboard provider are included in this scope of work.

C. If conditions exist at the job site which make it impossible to provide work as shown, recommend solutions and/or submit drawings to the Owner/Owner's Representative for approval, showing how the work may be provided.

1.9 ACCEPTANCE TESTING

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

B. Provide one person familiar with all aspects of the system to assist the Owner/Owner's Representative during acceptance testing. One of the available individuals must have specialized knowledge of the computer control system operating software and function of the system.
   1. Final Acceptance shall occur after the displays have functioned without failure for two separate consecutive home stands.
      a. 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's operators, spectators, or force majeur will not be considered event failure; failure due to provider's operators will be considered a failure.
      b. Failure shall be defined as a failure of the display processing and control system.

1.10 VIDEO AND SCORING 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 supercede 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 micro-processor 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.
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 hard ware 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, as adjusted for inflation in accordance with project General Conditions.

6. All hardware supplied shall support software updates for a period of not less than 7 years following substantial completion.

D. WARRANTIES AND REPRESENTATIONS
   1. Contractor represents and warrants to Owner that:
      a. it has all necessary rights and authority to execute and deliver this Software License and perform its obligations hereunder and to grant the rights granted under this Software License to owner;
      b. the goods and services provided by contractor under this Software License, including the software and all intellectual property provided hereunder, are original to Contractor or its subcontractors or partners; and
      c. the software, as delivered as part of the system, will not infringe or otherwise violate the rights of any third party, or violate any applicable law, rule or regulation.
   2. Contractor further represents and warrants that, throughout the System Warranty Period, the executable object code of software and the system will perform substantially in accordance with the System Specifications and Agreement. If the software fails to perform as specified and accepted all remedies are pursuant to the policies set forth in the Specification and in the Agreement. No warranty of any type or nature is provided for the source code version of the software which is delivered as is.
   3. Except as expressly stated in this Agreement, there are no warranties, express or implied, including, but not limited to, the implied warranties of fitness for a particular purpose, of merchantability, or warranty of no infringement of third party intellectual property rights.

1.11 **WARRANTY/MAINTENANCE**

A. Warrant labor and materials for twenty four (24) months following the date of final acceptance or the fourth, trouble-free, regular season game played in EACH facility, whichever is later. This means that warranty periods will be staggered per project timeline at each facility.

B. System to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Repair or replace defects occurring in labor or materials within the Warranty period without charge.
   1. A defect as it applies to:
      a. A pixel shall be at any point that the pixel fails to be able to meet the performance requirements of this specification.
      b. Animation and control processors fail to be able to meet performance requirements of this specification.

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

D. Within the warranty period, answer service calls within 8 hours, and correct the problem within twenty four hours. Provide local representation with service personnel available upon call within 3 hours prior to an event and throughout the time of the event.

E. Register all manufacturer's warranties in Owner's name.

F. Provide alternate price as requested for maintenance contract.

G. Maintain spare parts inventory on-site as listed in this specification from end of initial warranty period through year 5 of display life. Within 72 hours of notification that spare part has been

used, that part (excluding bulbs) shall be replaced by the service representative/manufacturer.
1. Maintain spares at each facility at direction of Owner

H. Unless otherwise noted the following is the requirement for spares throughout the Scoring and Matrix system:
1. Provide 2% of LED modules/lighting units and 2% (or one if 2% is less than one) spare parts of power supplies, fans, and elements, including cables, jigs and the like.
2. Provide one (1) 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.
5. Provide a single spare for each transceiver (line driver) type used by the scoring/matrix system.
6. Provide written affidavit that proposed LED display equipment will be supported and spare parts available to Owner for at least 10 years.

I. During the minimal 20,000 hour 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 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. This new work shall be warranted for at least 20,000 hours effective from the original Owner acceptance date. Manufacturer warrants that equipment, spare parts and components required to effect any repairs will be available for a period of 10 years after substantial completion.

J. Preventative inspections and cleaning:
1. Clean or wash displays prior to first use.
2. Preventative inspections shall occur 30 days before the beginning of the second and third seasons (one of the inspections will be occurring immediately preceding the expiration of the 2 year warranty period).
3. As part of the inspection, clean or wash all LED displays provided under this scope, if required.

1.12 OPTIONS, ALLOWANCES AND UNIT PRICING

A. As Noted in Part 6

PART 2 PRODUCTS

2.1 SPECIFIED PRODUCTS AND MANUFACTURERS

A. Model numbers and manufacturers included in this specification are listed as a standard of quality. Regardless of the length or completeness of the descriptive paragraph herein, each device shall meet all of its published manufacturer's specifications. Verify performance as required. Where two or more acceptable products are listed, the Provider may use either at his option.. Invitation to proposed does not necessarily imply that vendor has met all qualification requirements.

B. 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 provision 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/Owner's Representative.

C. All materials shall fully comply with Underwriters Laboratories or other acceptable testing agencies acceptable to local authorities with jurisdiction.

D. Manufacturer's name, logo, or representation shall not be visible to the public.

E. Suppliers invited to respond to this RFP are done so with no implication or certification that manufacturer's proposed products meet the technical requirements of this specification. Suppliers invited to respond to this RFP include:
1. ANC
2. CBS Outdoor/OptoTech
3. Daktronics
4. LSI
5. Mitsubishi
6. Panasonic
7. Yesco
8. As Approved

F. Approved LED Lamp suppliers
1. Cree
2. Nichia
3. Multicolor
4. As Approved

G. Approved LED Display Control systems suppliers as follows.
1. Sound Creations Crossfire/Blaze
    a. NOTE: Click Effects is the preferred display control system for all venues. There is one existing unit currently operating in the Central Control Room for Soccer and one located in the Press Box of the football stadium.
    b. Provide two (2) more Click Effects Crossfires and one (1) back-up along with a Click Effects Master Controller. These are to reside in the Central Control room at Bud Walton Arena and connect to the existing fiber TXRX equipment designated to each venue and the existing KVM system.
    c. Provide (3) Ross Carbonite DB Panels for trigger of Click Effects units via production switchers. Include any in-person or on-line training with unit as well as connectivity within the master broadcast control room space.

H. Approved Scoring/Timing/Fixed Digit systems suppliers as follows.
1. Daktronics
2. OES
3. As Approved

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. 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 arena, every effort shall be made to detail and furnish members in a consistent and uniform manner.
   4. All enclosure surfaces subject to fan abuse shall have a minimum thickness of 16 gauge.
   5. All sheet metal shall have a minimum thickness of 18 gauge

D. Enclosure and structure.
   1. The existing vertical structure that is available for attachment is at the following venues:
      a. Baum Stadium
      b. Bogle Park
      c. John McDonnell Track and Field
      d. Tyson Indoor Track
      e. All additional structure, lighting, power distribution, and other items for provision, operation, maintenance, and repair is this contractor's responsibility.
   2. New structure or assemblies are required at the following venues:
      a. Bud Walton Arena
      b. Barnhill Arena
   3. Provider to submit complete drawings showing the connection of the Provider supplied equipment to the structure at each different condition.
   4. Provider to submit design calculations, bearing structural engineer's stamp for review by Owner's structural engineer, if requested. Review will be for design intent only and impact to base building structure and shall not be construed as approving the design analysis.
   5. The internal module structure, supports, attachment and anchoring members, mounting hardware shall be provided in accordance with engineering standards and governing codes. Design to space displays off wall the distance required to allow for proper ventilation.
   6. Exposed steel to be painted. Coatings to be in accordance with project exterior coating specifications
   7. Enclosure.
      a. Enclosure to be shop fabricated, anodized aluminum, style and color as shown on the Owner's scoreboard concept drawings. Fabrication to comply with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other industry standard practice.
      b. Form exposed sheet metal work without excessive "oil-canning", buckling and tool marks with exposed edges folded back to form hem.
      c. 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.
      d. Finishes shall be directed by the Owner during the submittal process. Provide color/finish samples with submittals.
      e. All welds shall be cleaned, primed and painted.
      f. Cabinet depth of adjacent scoring, matrix and or video displays shall be within 1" (+/-). Notify Owner when variance is greater.
      g. The structure, supports, attachments and anchoring members, mounting hardware shall be provided in accordance with engineering standards and governing codes.
      h. Electrolytic protection shall be provided wherever differing metals come into contact.

i. Trim shall be coordinated to be identical in appearance to adjacent advertising panels scoring displays and architectural elements.
j. Close out trim panels/bezels are required for all displays to create a unitary appearance to each assembly with no gaps, holes, etc.
k. Rear Graphics or scrim on:
1) Baum Stadium display – adhered graphic on existing enclosure
2) Bogle Park display - scrim
l. It is not a requirement of the specification that the display enclosure modifications be water tight, however the back side of display (IP 54 rating minimum), electrical equipment (NEMA 4 rating minimum), etc., are to be rated for use in the projected environment. If no representations are made as to water resistance of the enclosure, all equipment to be rated for fully exposed, outdoor operation.

E. Catwalks, Stairs, and Hoist way
1. Are either existing or not required as displays will be front serviced.

F. Patch/repair any existing architectural finishes and or structure damaged due to display provision in areas in public view.

G. Electrical
1. Provide complete power and branch circuit distribution at accessible areas within catwalk system, void space behind display or within the enclosure from the existing power service locations.
a. Power Distribution: All panel boards or load centers provided with lighting units for power distribution to displays loads shall incorporate main breakers.
b. Panel boards to be located so as not in public view.
c. Provide utility power distribution as noted herein.
2. Conceal conduit and distribution within enclosure.
3. Provide task lighting and utility outlets on each catwalk level. Switch for task lighting to be in main entry into assembly.
4. All materials shall fully comply with Underwriters's Laboratories or other acceptable testing agencies acceptable to local authorities with jurisdiction.
5. Provide remote power on/off for all displays provide herein.
6. Within the rack location that houses scoreboard processing and control equipment, provide UPS as appropriate.

H. Ventilation
1. Provide natural or forced ventilation as required for operation of all components.
2. Provide all necessary dust and dirt filtration for the ventilation system.
3. Filters shall be easily removable and changeable.
4. NC level attributed to this ventilation shall be no more than NC 40 at nearest seat.
5. Any louvers or other openings in enclosures required for the proper operation of the displays are to be included in this scope of work. This includes coordination of location, type, color or size that are exposed to public view.

I. Service Requirements
1. All displays to be front service type.
2. All screws and nuts that are required to be removed for access to displays shall incorporate captive screw and nut type designs.
3. A minimum of one of any specialized or custom tool required for maintenance of the display required for maintenance and repair.

J. Lightning Protection

1. Tie into existing system at McDonnell Outdoor Track.
2. Provide option to have at other facilities, as listed in Options section, with the following requirements:
    a. The contractor shall furnish all labor, materials, equipment and services to provide a complete lightning protection system for the exterior scoreboard structure(s) included in this contract. The system(s) shall include strike termination devices, interconnecting conductors, a proper grounding system, interconnection with other building grounded systems, and surge suppression at service entrances. The system design shall comply with the National Fire Protection Association (NFPA) Standard # 780, the Lightning Protection Institute (LPI) Standard # 175, and Underwriters' Laboratories, Inc. (UL) Standard # 96A. The manufacturer of the material components shall be a manufacturer member of the Lightning Protection Institute, and all materials shall be listed and labeled in accordance with the requirements of UL Standard # 96. The system provision shall be made under the watch of an LPI Certified Master supervisor. Upon completion the contractor will deliver to the owner an as-built drawing and the appropriate system Certification documents under the UL & LPI programs.

2.3 VIDEO AND RGB LED MATRIX DISPLAYS

A. Outdoor Video and RGB LED Display
    1. Typical of Baum Stadium, Bogle Park, John McDonnell Outdoor Track
    2. Color LED Displays shall incorporate direct view technology; currently recognized technologies:
        a. Light Emitting Diode (LED)
    3. Brightness: 16 levels of illumination, including 0%, 25%, 75% and 100%.
        a. These illumination levels shall be able to be preset to simultaneously switch brightness and gamma correction to accommodate the following common game conditions:
            1) Direct Daylight
            2) Indirect daylight/overcast days
            3) Night (with field lighting)
            4) Night (without field lighting)
        b. A method of accommodating automatic brightness control shall be supported.
        c. Brightness shall not fall below (at 100% white generated at external input):
            1) 6,500 nits within first 20,000 hours of operation after acceptance.
        d. Uniformity of brightness:
            1) Adjacent pixels 2%,
            2) 7% 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.
        e. 140° minimum horizontal angle (defined as 50% brightness) of viewing and 50° (nominal +10/-40° with screen vertical) of vertical.
        f. Color temperature of display: 7,000-9,300° Kelvin. With a uniformity of 250°K between adjacent pixel 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. Color temperature to remain constant over 50% brightness viewing angle range.
        g. Joints, seams or modules out of plane with the rest of the display, due to mechanical alignment of modules, units, louvers, secondary seals or artifacts will not be acceptable.

h. Gaps in displays shall not be larger than 125% of the pixel spacing of the displays. Sections spanning expansion joints to feature “slip joints” attachments to minimize or eliminate gaps.
i. Provide top, front or rear access as required by mounting conditions.
j. Display shall be flicker less, and free of all image processing artifacts such as image stuttering, frame dropping or skipping of any portion of the image display.
k. Images must be able to move smoothly throughout the entire length and width of the display.
l. Physical Pixel spacing:
1) As indicated in Display Schedule and drawings
m. Size:
1) As indicated in Display Schedule and drawings

B. Indoor Video and RGB LED Matrix Display
1. Typical of Bud Walton Arena, Barnhill Arena and Tyson Indoor Track
2. Technical Standards:
a. The RGB Matrix Display shall incorporate LED direct view technology.
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) 2000 nits within first 4,000 hours of operation after acceptance.
2) 1500 nits level over 10,000 hours of screen operation after acceptance.
d. Uniformity of brightness:
1) Adjacent pixels 2.5%,
2) 5% 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.
e. 160° minimum horizontal angle (defined as 50% brightness) of viewing and 70° (nominal ±35° with screen vertical) of vertical. Color temperature to remain constant over 50% brightness viewing angle range.
f. Color temperature of display: 7,000-9,300° Kelvin. With a uniformity of 250°K between adjacent pixel with remote set-up and control to adjustment and balance of any pixel/module in display to match overall display color temperature through 10,000 hours of use.
g. Physical Pixel spacing:
1) As indicated in Display Schedule and drawings
h. Size:
1) As indicated on Display Schedule and drawings

C. Video/Scoreboard Processor
1. The processor shall be configured to support the following inputs:
a. Component Serial Digital input (i.e. ITU-R 601; SMPTE RP-125)
b. Digital Television (DTV) Production standards (e.g. 480p; 720p, 1080I).
c. DVI
1) With HD/SDI being the primary signal type
d. Processor shall be able to support having 3 simultaneous sources on screen, while transitioning to 2 sources and back again without glitch, stutter, shimmer, black frames etc.
2. Provide connections, cabling and appropriate backups from control room to board to support the following connections:
a. SMPTE 292, HD-SDI (e.g. 480p; 720p, 1080I).
b. SMPTE 424M; 3G-SDI is desirable. If this adds significant cost, please identify removal as a VE.

c. Shall be capable of using an input of the type specified (e.g. HD-SDI) as a chroma key.
d. Remote operation.
    1) Preferred method of operation will be for a processor which responds to the existing Ross Carbonite protocol which allows for effects (in this case processor transitions) to be queued, run, and rewound. Refer to 2.1 G for additional information. Alternate method of operation will require the processor to respond to contact closures from the production switcher to achieve the same effects. (Assume need for 8-12 contact closures to recall specific preset configurations, and then exercise the transition).
e. Processor shall output an HD-SDI signal to video control/video replay system which represents a composite of the same "feed" which is being sent to the video display.
    1) If these requirements place significant cost burden on the processor, indicate savings achieved with a more limited approach within the VE portion of the proposal form.
    2) If computers are employed as part of the LED Video display system, they shall meet these specification requirements as well as:
    3) Provide with a 15 minute UPS (Uninterruptible Power Supply).
    4) If a computer is used as part of the processor—or used for remote control or any other functions of the video board—provide a complete backup computing system running in a full-time, on-line backup mode with appropriate disk mirroring.

D. Gymnastics Scoring Displays (Barnhill)
1. Tri-color LED
2. Two lines with at least twelve (12) characters per line
3. Alphanumeric
4. Character height no less than 4" high
5. Able to interface with Owner provided scoring system
6. Include adjustable stand per display
7. Quantity: 4

E. Basketball Goal Stanchion LED Displays (Bud Walton)
1. Units to be double-sided
2. Coordinate cabinet color during submittal process
3. Technical Standards:
    a. The RGB Matrix Display shall incorporate LED direct view technology.
    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) 2000 nits within first 4,000 hours of operation after acceptance.
        2) 1500 nits level over 10,000 hours of screen operation after acceptance.
    d. Uniformity of brightness:
        1) Adjacent pixels 2.5%,
        2) 5% 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.
    e. 160° minimum horizontal angle (defined as 50% brightness) of viewing and 60°
    f. Color temperature of display: 3,000-10,000° Kelvin. With a uniformity of 250°K between adjacent pixel with remote set-up and control to adjustment and balance of any pixel/module in display to match overall display color temperature through 10,000 hours of use.
    g. Physical Pixel spacing:

1) As indicated in Display Schedule

h. Size:

1) As indicated on Display Schedule

F. Scorer's Table (ALTERNATE)

1. Table structure to be NBA approved portable model with locking casters and padded vinyl on ends and top.
2. Provide facility/team logos on pads for each end of display.
3. Total 40 ft. length of table to be composed of not less than four sections
   a. Sections to be configured to allow connections for seamless display image.
   b. Provide electrical and signal connections to "daisy chain" sections together
   c. Sections to physically interlock and be on locking casters and leveling feet.
   d. Overall depth of table assembly (counter plus display) not to exceed 36".
   e. Overall height of display not to exceed 36".
      1) Provide 24 in (minimum) counter depth.
      2) Provide 4 in. x 4 in cable trough long front edge of counter. Trough to have hinged lid.
         a) As an alternate to a trough, provide AC power, and data distribution on "back splash" vertical surface at front of counter.
      3) Provide AC power connections and data connections every 30' in along entire length of table and interconnections for service to connect between table sections.
      4) Coordinate location of control computer/workstation and data/power disconnects at floor with owner.
         a) Power to access display on one location. Provide "snake" of multiple AC power circuits with "fan out" or distribution at power connection end as required. Multiple runs from "wall to display" are not acceptable.
      5) Acceptable vendors:
         a) ANC
         b) Daktronics
         c) Panasonic
         d) Yesco
         e) LSI
         f) Mitsubishi

2.4 DISPLAY CONTROL COMPONENTS

A. Provide all applicable control system software updates for a period of 10 years after substantial completion at no additional cost.

B. Control electronics.

1. Noise level attributed in any operating mode of control/processing/server equipment shall be no more than NC 40 at the nearest operator location.
   a. Video screen electronics remote control system to provide complete screen remote control of:
      1) Brightness level
      2) Display power on/off (from control computer/console/processor)
      3) Video signal on/off
      4) Video Input Selection
         a) (including remote activation and deactivation by a contract closure from the video replay system production switcher)
      5) Image positioning, sizing, and scaling

6) Color level
7) Hue
8) Contrast
9) Sharpness
10) Color display test, and address location. This pattern shall include a map that corresponds to the address of each unit's physical address as well as a red, green, blue and white color scroll for all inputs over the entire display. Typical pattern:
    a) Red – Map, Green – Map, Blue – Map, White – Map
11) These controls shall be provided for all inputs to control system processor.

C. 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. The specific requirements listed below are minimums. All computers in the system to include identical motherboards, CPU and memory configurations.
2. Images must be able to move smoothly through the entire area of the display. 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."
3. Displays to be programmed to show football, soccer, lacrosse, basketball and volleyball game in progress statistics (period, time outs left, possession, score, clock, shots, saves, etc.).
4. Software packages and control electronics shall provide specified operational features. Game scoring and clock function data to be provided by Scoreboard control system.
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 (ie; 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, 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. Computer and control equipment sound levels at any operator or control position shall not exceed NC 40.

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.
2. Processor: as required to meet specified operating performance without noticeable delays or productivity impediments.
3. Cases:
    a. Rack Mount
    b. Distributed Processing Computers
        1) As agreed to with Owner's Representative—goal is to provide reasonable durability and flexibility.
4. Memory: 8 gigabytes (minimum), expandable to 16 GB required; if software requires additional memory to function optimally, provide at no cost to Owner.
5. Hard Disk: Multi-media class, fast access speed; 2 TB in Raid 5 or 6
6. Removable media: CD/ DVD±/R/-R/+R/RW drive 8x DVD speed (minimum)

7. Video: 64 bit graphics accelerator capable of 32 bit colors at 1920 x 1080. Refresh rate to be at least 72 Hz.
8. Monitor: 22" LCD from: Dell, HP, Viewsonic, LG, Samsung, Sony, or approved equal. Mount on articulating arm
9. Mouse: Wired optical tracking three-button scrolling mouse (e.g. Microsoft, Logitech).
10. Keyboard: full size wired with separate numeric keypad and cursor control.
11. Keyboard, Mouse and Monitor extenders. Provide as required for distant computer operation.
12. Computer system shall be completely tested by manufacturer prior to delivery.
13. Ethernet Adapter: 100/1000 Mbs.
14. Provide with a 15 minute UPS (Uninterruptible Power Supply) for computer and monitor. Provide rack mount UPS for rack mounted computers.
15. Software:
    a. All software necessary to interface this computer to scoring system for configuration and operation.
    b. Provide latest version of Windows® software on all computers that is compatible with scoring/animation software system.
    c. Provide MS Office Professional, latest version or earlier version, depending upon tenant's office standard or preference on at least two (2) workstations.
    d. Provide with Microsoft Internet Explorer or Firefox, depending upon facility's office standard or preference.

E. Provide the following workstations in Central Control Room:
1. (2) Animation Controllers; Primary and back-up
2. (2) Display Controllers; Primary and back-up
3. Primary Server and back-up
4. Back-up, mirroring Server, including storage, i.e.; RAID arrays.

F. Configuration to include on-line redundant backup controller and server as required.

G. Networked Functions. The system devices should be configured to be shared on a network between individual workstations should more than one workstation be required to control system.

H. Existing switches can be utilized in the Central Control Room and at ancillary facilities if enough ports are available. If not, University standard is Juniper 3300ex (1G) or 4550ex (10g series)
1. Internet gateway: via network connection to complex or arena 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. Feeds from arena video production system.
    d. Captioning device on-site or via telephone or 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. storage mediums:
        1) Long Term
        2) 800GB capacity (compressed)
    c. 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

d. Software shall be configured to run at user definable intervals.
e. Software shall permit full or incremental backups.

I. Un-interruptible Power Supply (UPS). Provide UPS on screen processor(s), electronics, etc. that may be disrupted by momentary loss of power. UPS shall be designed to support signal processing path (not display) for 180 seconds.

J. Hardware Control functions
1. Brightness controls: Provide a minimum of three brightness levels for each matrix display. Brightness levels shall be 50 to 65%, 75% and 100% of full brightness.
2. Provide separate ON/OFF controls for each display
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. If this adds significant cost, provide as VE deduct.
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.

K. Software Control Functions and Features:
1. Character and Animation Features: All control system software and messages shall be placed on the internal hard disk drive with backup systems stored on floppy diskettes, or CD ROM. Provide the following features:
a. Ability to be used as clips player with audio and video
2. Character, Animation and Symbol Generation: Generation, control and placement of any display pattern in any area of the RGB Matrix Display systems. Patterns to include pre-programmed basketball Game-In-Progress (score, game clock, period, time outs left, team fouls, bonus/penalty, possession) 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. Provider 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 fascia display north and south ends, as well as zones created within center hung matrix displays. Display of clock must not show any delay from game clock displayed on goal clocks.
4. Animation: Matrix animation. Refresh at a minimum of 30 frames per second.
5. Maximum of a one second response to a control system command.
6. Preview: Preview animations or messages on the control system monitor prior to display on RGB Matrix Displays. Message formatting requirements:
a. Zoning: 8 user definable display zones (separate areas for displaying information) within displays with the size and location determined by the operator. Provide 4 zones within each center hung advertising ring. 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. Temperature, time of day and date programming including outdoor temperature sensor.
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. Repetitious 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.
11. Off Line 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).
    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.
    b. A summary of the Message Log shall provide a description of the event, title of the Advertising/Sponsor display, message or animation, date, time and duration of display, which matrix board(s) received the displayed, and which particular quarter (or other moment of the event) the message occurred.
12. 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.
13. Real Time Access: Provide access from any message console to current messages, statistics, game-in-progress and animation.

L. External Data Control System: Provide system software related primarily to game statistics. Software shall interact with outside agency statistics (ie; Elias, NCAA, Sports Ticker or Stock ticker) via modem or satellite interface by Scoring system provider, 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.

2.5 LED GRAPHICS AND ANIMATION

A. Animations
   1. Provide, for EACH venue, a minimum of:
      a. 6 minutes of moving crowd prompts, situational animations, other sports and sponsor animation sequences which are conceived to be completely custom.
   2. Provide, for EACH venue, a minimum of 10 minutes of stock or catalog sports and event animation sequences. Owner to make selection of desired images from available catalog.
   3. Provide color animations of team logo for EACH venue's display.
      a. Note: Animations will be both continuous (simultaneously displayed on all displays) as well as local to a specific display.
      b. Animations shall be able to be displayed on each sign, at appropriate pixel ratio. In the event that animations must be re-rendered or converted to function on different size displays, provide that as part of this package. Multiple renderings of same animation shall not be construed as more than 1 animation.

B. Graphic images
   1. Create templates, working on-site with Owner, of at least three different video/stats/ game-in-progress/ alpha numeric information "screens" for EACH venue's displays, in addition to an emergency message scenario. Include variations of pre-programmed displays for the support of each venue's sports pre-programmed display formats (including statistical displays), or the ability to store and retrieve operator generated formats. Provider to work on site with Owner and tenants' staff in determining layout and content of pre-programmed displays. Each message shall be capable of being displayed on any matrix board. System to include data interface to allow game in progress information to be provided to broadcasters, without interference to display system control.
   2. Provide thirty team/conference/sponsor/advertiser logos. Provide programming and "animation" (ie; rotating) of static graphic images and logos.

C. Proofing Process
   1. It is anticipated that the development of these animations and graphics will be something of an iterative process, working with the team to arrive at a suitable graphic appearance and look.
   2. Where multiple versions are noted, it is likely that some of the additional versions may be sponsored.
   3. Some animations will require multiple reviews to arrive at finished, playable product.
      a. Video display animations shall be delivered at full 1920x1080 resolution and possibly in at least two codecs based on team preference. Verify preferences for delivery.
      b. Software rights
         1) Provide each graphic and animation in an editable, layered file format (e.g. Photoshop and After Effects, etc.) so that team can make corrections during the season (e.g. add players as the season progresses.

D. All animations must be accepted by the owner or owner's authorized marketing agent.
   1. As with all custom animations, it is expected that the review process will be iterative and that 2-3 submittals might be required to arrive at final accepted animations.

2.6 GAME IN PROGRESS/STATISTICAL INFORMATION CONTROL

A. Provider 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. Dedicated scoring/clock (game/play/shot)/statistics control consoles for use court and field side. Provide (2) units of each type used at each facility. System to include wireless control (ie; Precision Time system) for referee control of game and shot clock.
   2. Computer based control system hardware shall exhibit sufficient computer processor power and speed to generate images instantly on command. Software packages and control electronics shall provide specified operational features. 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 both court side and scoreboard control room.
   3. Game in Progress statistics module shall support each sport played at each venue
   4. All control system software and messages shall be stored in non-volatile (disk) format.
   5. 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.
   6. Computer system shall be fully redundant with back-up, mirror processors on-line.
   7. Control computers to consist, at a minimum, of the following workstations:
      a. Scoring consoles
      b. Sports Ticker/steno input/Statistics computer/program input.
      c. Main Server
      d. Back-up, mirroring Server, including storage, ie; RAID arrays.

C. Networked Functions. The systems scoring devices should be configured to be shared on a network between individual workstations,
   1. Troubleshooting modem for communication with Scoring Systems factory. V.90 compatible modem (or access via ISDN router—if provided by Scoring Systems contractor).
   2. Network switch: 10/100 Base T.
      a. Ports: as required with 100% spare (to be used by Video Production and Video Display suppliers as required)
   3. Internet gateway: via network connection to facility's network
   4. Internal and exterior data ports to support, at a minimum:
      a. Sports Ticker feed.
      b. Sports tenants' league Statistics feeds (e.g. NBA-D, NCAAetc.).
      c. Serial data feeds of all controller information (clock, score, etc.) to network display interfaces (e.g. Fox Box and ESPN) Cabling to be run to TV truck dock cable termination racks, to video production equipment in scoreboard room.
      d. Statistics and game in progress information data as an NTSC or SDI (as directed) video feed to the distributed TV system and TV Truck Parking area.

e. Data input standard stenography (ie; Stenograph 800-228-2339, Cheetah Systems 800-829-2287) equipment. Coordinate exact system and interface requirements with team after award of contract. On-site caption location expected to be on press level, near control workstations.

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

E. Spares: Provide one set of back-up disks of all software.

F. 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.

2.7 PLAY CLOCKS, SHOT CLOCKS, GOAL LIGHTS, AND CONTROLLERS

A. Two Sided Goal Shot Clocks
   1. Technical Standards
      a. Direct View, translucent, two Sided Fixed Digit numerical displays with minimum brightness equal to 1,200 nits. LED units to be covered with lens or overall display element cover to create seven segment digit display. Bare lighting elements are unacceptable.
      b. System to include wireless control (ie; Precision Time system) for referee control of game clock.
      c. Technology: monochrome LED.
      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 of damaged display
   2. Clocks to allow display both game and shot of 1/10 second increments per NBA requirements. Game clocks to be in strict synchronization with the other game clocks.
   3. Size: minimum as required by NBA regulations/standards. In absence of regulations shot clock digits to be a minimum of 14" high for unit mounted above backboard, 10" for unit mounted on arm of goal assembly
   4. Install clocks on /Owner provided goal assemblies. Installation hardware to include a frame around entire perimeter of display mounted above backboard sufficient to allow mounting of broadcast camera attachment hardware.
   5. Quantity:
      a. Three sets (all mounted) for main arena
      b. Four set, (top of goal only) for practice court
   6. The Standard for goal mounted shot/game clocks shall be:
      a. Daktronics TI-2140
      b. OES equivalent
      c. As approved

B. Portable shot clocks for use should main arena shot clocks fail.
   1. Clocks to have identical features and size as large goal mounted clocks, but need not be translucent. Provide cabling to control point to clock with "quick disconnect" terminations.
   2. Provide legs or base for clock cabinet to maintain stability when set on floor. Solution must allow for clock to fall over when hit by a player. Provide handle on enclosure for transport.
   3. Technology: monochrome LED— Color as directed by University.
   4. 100% Solid state drivers.

5. A minimum of two levels of brightness: 50% to 65% and 100%.
6. Electrical and control cabling connections to be made with “quick disconnect” hardware to facilitate removal and replacement of damaged display. Portable equipment to assume use of different AC power source (extension cords are acceptable) and portable data distributor in the event of electronic equipment/connector failure of permanently mounted clocks. Signal cabling to wall J-box is assumed to be used in portable clock deployment scenario.
7. The Standard for portable shot/game clocks shall be:
    a. Daktronics TI-2115
    b. OES equivalent
    c. As approved

C. NBA/NCAA LED time expiration strip on backboards
1. Quantity: three (two mounted)

D. Single Sided Goal Shot Clocks
1. There is an existing Daktronics unit in the TV truck tunnel. Provide interface to them. If not capable, provide new.
2. Technical Standards
    a. Direct View, single sided, Fixed Digit numerical displays as described above, with minimum brightness equal to 1,200 nits. LED units to be covered with lens or overall display element cover to create seven segment digit display. Bare lighting elements are unacceptable.
3. Clocks to allow display both game and shot of 1/10 second increments per NBA requirements. Game clocks to be in strict synchronization with the other game clocks.
4. Units are required at the following locations:
    a. Master Broadcast Control Room area
    b. Truck dock clock to be located in same location as existing clock.
        1) Coordinate exact location with arena technical staff. Provide wall penetration and any conduit/cable management required from tray to clock along with sealant or caulk (fire rated, if required by code) on any partition penetration.
5. The Standard for Shot/game clock shall be:
    a. Daktronics TI-2115
    b. OES Equivalent
    c. As approved

E. Locker Room/Back of House Game Clocks
1. Are Existing Daktronics units. Provide interface to them. If not capable, provide new.
2. Technical Standards
    a. Displays provided in locker rooms and select other locations as listed above to allow team members and officials to view game clock at all times. Coordinate location with Owner/Owner’s Representative.
    b. Clock enclosure to allow flush mounting (rather than surface mount) in wall. Should site conditions prevent flush mounting, provide surface mount enclosures at direction of Owners Representative.
    c. Display may be LED, incandescent lamp or other directly illuminated source. LCD displays are not acceptable. Control cable to each display to be home run to controller interconnect junction box.
    d. Digit sizes to be no less than 4 inches high
    e. 100 percent Solid state drivers.
    f. A minimum of two levels of brightness: 50 percent to 65 percent and 100 percent.

g. Electrical and control cabling connections to be made with “quick disconnect” hardware to facilitate removal and replacement or removal of display

3. Quantity:
   a. Coordinate final locations with Owner.
4. The Standard for Matrix Display Equipment shall be:
   a. Daktronics TI-2028/TI-2013
   b. OES
   c. As Approved.
5. Time Expiration Horn - Provide single driver horn instrument for audible signaling of time expiration. Initiations of horn to be able to be automatically linked to game clock, as well as manually triggered or stopped.

2.8 SPEAKER AND GRAPHICS SCRIM (BOGLE, BUD WALTON)

A. Images to be included as part of this scope of work. Graphics to be minimum four color and warranted to maintain colorfastness for not less than four years.

B. Custom colors, may be required to meet University standards.

C. Speaker scrim to have acoustical transparency at least equal to Snyder Manufacturing 1018 fabric or Ultraflex “Speaker Mesh”.

D. Speaker scrim support to not have any supports in front of any speaker components with maximum dimension in excess of 2.0 inches. Any such structure to have a round section. Square corners can be achieved with attachment of appropriately sized angle to outer edge round structure. Ideally no support structure will be required in front of speakers.

E. Detailed coordination with Sound Systems Contractor

2.9 CHANNEL CUT LETTERS/LOGOS (BUD WALTON, BAUM)

A. LED illuminated; closed face, channel-cut logo/letters.
   1. Illumination
      a. White, high brightness LED.
      b. Lighting and logos shall be addressable to allow color changes
   2. Letters:
      a. Depth: dependant on indoor or outdoor layout with aluminum returns and backs of a sufficient thickness to prevent buckling, oil-canning or visible warping.
      b. Height: as shown on schedule and renderings
      c. Front Face to be as dictated by University
      d. Sides of the letters are likely to be project color, but this needs to be reviewed from mockups.
      e. Transformers mounted either within letters inside assembly, or on catwalks.
      f. UL connectors and toggle disconnects with neoprene boot- Outdoor
      g. Drain Holes out the rear of the letter (not across front) – Outdoor
      h. Bud Walton Arena – Letters and logo to be one-sided
      i. Baum Stadium – Letters and logo to be two-sided
   3. Supporting Structure—to match depth and appearance of entire assembly.
   4. Controls: from scoreboard/PA room of each venue.
      a. Able to set an automatic off and on timer based on day of the week, day of the year, season of the year with a special holiday schedule for override.

2.10 RETRACTABLE NET (BAUM)

A. Provide retractable protective netting including catch basket/arms, upper support arms with pulleys, nylon rope and tie-off cleats.

B. Retractable protective netting and collection tray for front of scoreboard. Netting, when lowered to rest on arms or within catch basket, at bottom if display, not ground. Additional arms to be included as necessary to allow net to be held in a straight line below the bottom edge of the active display so as to not affect sightlines from the field.

C. Preference is to have this function motorized. If this adds significant cost, please note on proposal.

2.11 ROBOTIC CAMERAS

A. PTZ Robotic Camera Type 1 (Baum)
   1. Remote operated 16x9 POV.
      a. Acceptable Product:
         1) Canon BU-47H
   2. POV Transceiver, stand alone, camera end, HD/SDI video, 2 fibers, 1300nm TX.
      a. Acceptable Product:
         1) Harris OP+VTX+D with Harris OP+SFP1+TR13 with FR6800+MB.
            a) NOTE: Provide in waterproof enclosure
   3. Pan and Tilt cable termination end:
      a. 2-gang enclosure. NEMA 6 and 6P rated; Indoor/outdoor use; Gasket sealed cover. Accepts (4) cable glands and (1) 1" conduit gland.
         1) AMP P/N 1479655-1
      b. Cable Gland
         1) AMP P/N 1479657-1
      c. Conduit Gland
         1) AMP P/N 1479659-1
      d. Duplex LC fiber optic receptacle
         1) AMP P/N 182861 9-2
      e. Duplex LC receptacle dust cap
         1) AMP P/N 191 8177-1
      f. Duplex LC plug; Equipped with epoxy/polish connector
         1) AMP P/N 18 28618-2 (single-mode)
      g. Duplex LC plug dust cap
         1) AMP P/N 182 8740-1
   4. Base Station End (CCU)
      a. POV Transceiver, rack mount, base station end, HD/SDI video, 2 fibers
      b. Acceptable Product:
         1) Harris OP+VTX+D with Harris OP+SFP1+TR13
      c. Rack Mount Chassis
         1) Acceptable Product:
            a) Harris FR6822+QXFE+S

B. PTZ Control (Master Broadcast Control Room)
   1. Telemetrics DS-4 Device Server-Ethernet
   2. Cables
      a. Telemetrics Serial
      b. Telemetrics Camera-Control Panel
         1) Quantity: 3 each

3. Baum Stadium
    a. Cables
        1) Telemetrics Serial
            a) Quantity: 2
4. Contact John Pattnosh 201-848-9818 ext. 131
5. NOTE: Coordinate connectivity within Rack Room and Shade Room at Master Broadcast Control Room.
6. NOTE: Coordinate connectivity at remote venues

C. Goal Assembly Slam Cams (Bud Walton Arena)
1. HDMI
2. Acceptable product
    a. GoPro4 Black
    b. Quantity: 2
        1) With mounting arm
        2) With spare battery (Qty: 4)
        3) With dual battery charger (Qty: 2)
        4) With Smart Remote
        5) With BacPac extension cable
        6) With Battery BacPac
3. HDMI-SDI Converter
    a. Aja HA5
4. SDI to Fiber TX/RX
    a. Belden/Telecast Rattler
    b. Mutli-Dyne
    c. Joseph Electronics
    d. NOTE: Coordinate and connect video feeds to existing router

D. PTZ Robotic Camera Type 2 (Bud Walton – Center Hung Assembly)
1. Acceptable Product:
    a. Sony BRC-Z330
        1) With Sony BRBKSF1
        2) With Mounting bracket
    b. Sony BRU-SF10
        1) With Sony BRBKHSD2
    c. NOTE: Coordinate and connect video feeds to existing router

2.12 GOAL MICROPHONES

A. Omni Directional electrets condenser lavalier microphone
1. Sony ECM55B
2. Mount two per basketball goal.
    a. One centered on underside of backboard padding
    b. One on side on underside of backboard padding
3. Goal is for the two mics to pick up court sound and basket “swish” and “thump” To accomplish this, run must be run out of phase.
4. Lines run to Audio Room mixers in Broadcast Control Room
5. NOTE: If new 2-pair audio lines are not possible, connect microphones to Mic-Line Converter and connect to Fiber TX/RX noted in 2.11 C. 3.
6. Mic-Line Converter
    a. Art CleanBox Pro

2.13 GENERAL EQUIPMENT

A. Equipment Rack(s) for units placed in the Central Control Room at Bud Walton Arena are existing and have rack space available for mounting.

B. For Equipment Rack(s) needed at ancillary venues, they are to be frame and panel type with a height appropriate for components plus 30% capacity for future growth. Panel space constructed of 16-gauge cold-rolled steel. Racks to have locking doors mounted on the frame (not the rails). Empty mounting panel spaces to be filled with blank or vent panels, in a finish to match rack. Provide end panels and top panels as required. Provide shelving as required for equipment mounting within racks. Provide rack supports as required. Provide seven rack keys of each type. Rack color to be flat black. Provide an LED gooseneck, magnetically mounted lamp in a locally switchable fixture in the top rear of each rack. Include extra set of mounting rails in each rack for rear support of panels or equipment. Verify exact rack space required.
   1. Support Equipment
      a. Blank Panels
      b. Vent Panels
      c. Miscellaneous equipment shelving
      d. Rack screws
      e. Power distribution
      f. Rack light
   2. Scoring and Matrix Display System Racks to be:
      a. Middle Atlantic racks, doors, sides, and top panels. (Quantity: As required for system)
      b. Other manufacturers should be submitted for approval. (Quantity: As required)
      c. Coordinate location, orientation and exact type.
      d. It is anticipated that the following locations will need a new rack:
         1) Barnhill Arena (adjacent to existing wall rack in Section Q
         2) Bogle Park – verify if existing can be utilized
      e. It is anticipated that the following locations can utilize existing racks:
         1) Bud Walton Arena (control room)
         2) Tyson Indoor Track (Scoreboard/PA booth)
         3) John McDonnell Outdoor Track (Scoreboard/PA booth)
         4) Baum Stadium (Scoreboard/PA booth)

C. Keyboard, Video, Mouse Matrix Switcher/Extender
   1. Match existing and connect to existing matrix
   2. Computer Interface (EXT)
      a. Avocent HMIQHDD
   3. Type 1 Data Monitor ($GPXM_1$)
      a. 19" flat screen, rack mountable, with integral keyboard and touchpad.
      b. Acceptable Suppliers
         1) Rose RV2-CKVT19
         2) As approved

D. Ethernet Network Switch
   1. University Standard is:
      a. Juniper 3300ex (1G) or 4550ex (10g) series

PART 3 EXECUTION

3.1 GENERAL

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

B. Mount equipment and enclosures plumb and square. Permanently placed 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 placed 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/field side AV junction boxes to 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.
   2. Label power distribution equipment (e.g. breaker panels, disconnects, and load centers) as to what portion of what module is being served by that device (e.g. breaker).

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 lamicoid labels on the front and rear of active equipment mounted in racks. Mount labels in a neat, plumb and permanent manner. Embossed labels are not acceptable. Equipment labels to have at least three lines of engraving with the first line listing the general name of the device. 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 provider. 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 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 displays shall be cleaned. If project conditions prevent cleaning of displays, clean prior to first event.
   4. Calibration of all LED and LCD TV displays.
   5. All materials shall be neat, clean and unmarred and parts securely attached.
   6. 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.
   7. All extra materials, portable equipment, and spares shall be delivered and stored at the premises as directed.
      1) Verify each component is working properly
      2) Verify each individual component's performance meets manufacturer's published performance for this unit.
      3) Verify proper operation from controlling devices to controlled devices.
      4) Verify proper adjustment, balance and alignment of equipment for optimum quality and to meet the manufacturer's published specifications
      5) Verify that all communications and networking services are provided and in proper working condition
      6) Establish and mark normal settings for each level control and properly record these settings within the "Systems Operation and Maintenance Manual.
         a) For software controls, "screen shots" of the relevant menus, pages or dialog boxes shall be made. Additionally software presets shall be recorded to "disc" permitting full recall.

C. RGB LED testing requirements
   1. In the event that owner believes that a display does not comply with the performance criteria of the specification, the provider 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 provider. 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 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
      (1) intra-module
      (2) between modules
      (3) 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
      (1) intra-module
      (2) between modules
      (3) 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 percent of peak brightness, or at the point a noticeable color shift occurs.
d. Tests to be performed in accordance with manufacturer's recommendations on displays provided 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 provision 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.

3.3 TEST EQUIPMENT

A. 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/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: Tektronik.

3.4 ACCEPTANCE

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

B. Acceptance testing will include operation of each major system and any other components deemed necessary. Provider will assist in this testing and provide any test equipment required specified herein. Provider 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 Provider.

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.
      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 Provider.
   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 Provider 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 provision to meet the requirements of these specifications, the Provider will pay for additional time and expenses of the Owner/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 Provider, 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 arena begin mid-season this period shall be a minimum of four games.

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

3.5 DEMONSTRATIONS

A. Provide 25 hours instruction to Owner/Owner's Representative designated personnel/facility staff on the use and operation of the base bid system, scheduled as a minimum of five separate sessions, by an instructor fully knowledgeable and qualified in system operation.

B. Provide additional hours for each alternate selected.

C. The System Reference Manuals should be complete and on site at the time of this instruction. Coordinate schedule of demonstration with Owner/Owner's Representative.

D. 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. The following is a general idea of the training "curriculum":
      a. A general familiarization of the Owner's Representative of the device.
      b. An explanation of how the device interfaces to the rest of the system (including data connections; timing requirements and the like).
      c. General training on operating the device.
      d. 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).
      e. Saving information; backing information up (including a review of the proper procedures for backing up.
      f. Basic troubleshooting
      g. Specific troubleshooting (this information may be conveyed to personnel other than the device's "operators").
      h. 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).

E. Any time spent troubleshooting, shall not count towards fulfilling this requirement and shall be extended an equal amount of time.

3.6 EVENT ATTENDANCE

A. In addition to training noted above, be present at:
   1. (8) eight games for Baum Stadium
   2. (8) eight games for Bud Walton Arena
   3. (1) one event for Tyson Indoor Track
   4. (1) one event for McDonnell Outdoor Track
   5. (6) six games for Bogle Park
   6. (4) four games/events at Barnhill
   7. Attendance to occur during first season, as selected by the Owner, following final acceptance, to assist with operation of system. Technician to be fully knowledgeable of LED display and processing system, scoring and timing systems and animation/graphics control systems.
   8. Each venue counts as one event
   9. Production call times to be as dictated by the Razorback Sports Network

B. Provide one (1) follow-up visit at the Owner's request prior to the end of the first year of operation. Site trip to include at least three, eight (8) hour days on site, at Owner's direction.

PART 4

4.1 DEFINITIONS AND TERMS

A. Unique Identification
   1. LOC—Location of Display
   2. QTY—Quantity of units

B. Dimensions
   1. HT—Height of Active Display area (excluding, trim, etc.), in inches.
   2. WD—Width of Active Display area (excluding, trim, etc.), in feet.
   3. TOL—Tolerance, expressed as a percentage of Height or Width. Allowable variation to base size.
   4. MAX HT—Maximum height of display, including all cabinet, trim, etc. (inches unless otherwise noted). This dimension is generally set by sight lines and cannot be exceeded within base proposal.

C. TYPE—Technology Type
   1. RGB—Full color, light emitting diode (LED)
   2. MONO—Monochrome, light emitting diode (LED)
   3. FD—Fixed digit, light emitting diode (LED)
   4. BL-Back lit panel
   5. FL – Front Lit panel

D. MIN RES—Absolute Minimum Physical Pixel Resolution expressed in mm (higher resolution products are implicitly allowed; within the available power limitations).
   1. USE—Purpose of display
   2. Position Information

E. Position Information; physical location of display.

F. Notes—

PART 5 SCHEDULE OF DISPLAYS

LOC	QTY	HT X WD	TOL	MAX HT	TYPE	MIN RES	Use	Position Information	Notes
Baum	1	24’ x 72’	2%	24’	RGB	16mm	Video Display, Animation, advertising, crowd prompts, information	Main scoreboard assembly	With channel cut lettering and rear graphic
BWA	2	17’ x 30’	2%	17’	RGB	10mm	Video Display, Animation, advertising, crowd prompts, information	Main	Goal is to get as large as possible within 23,000lb hoist capacity
BWA	2	17’ x 23’	2%	17’	RGB	10mm	Video Display, Animation, advertising, crowd prompts, information	Sides	Goal is to get as large as possible within 23,000lb hoist capacity
BWA	2	1’ x 3’	2%	1.3’	RGB	6mm	Advertising	Goal Stanchion	Two-sided units
BWA	2				FD		Shot Clock and goal strips	Basketball goal assemblies	One transparent unit on top of each backboard, one unit on each goal stanchion, one time expiration strip in each backboard
Tyson	1	13’8” x 21’8”	2%	14’	RGB	10mm	Video, Advertising, Game in Progress, Crowd Prompts, Information	Main Scoreboard Assembly	ALTERNATE
Bogle	1	14’x43’	2%	14’	RGB	16mm	Video, Advertising, Game in Progress, Crowd Prompts, Information	Main Scoreboard Assembly	ALTERNATE

LOC	QTY	HT X WD	TOL	MAX HT	TYPE	MIN RES	Use	Position Information	Notes
McDon	1	20’ x 37’	2%	20’	RGB	16mm	Video, Advertising, Game in Progress, Crowd Prompts, Information	Main Scoreboard Assembly	ALTERNATE
Barn	1	16’x 44’	NA	16’	RGB	10mm	Video, Advertising, Game in Progress, Crowd Prompts, Information	New Assembly	ALTERNATE

PART 6 OPTIONS

A. Option A – Baum Stadium Options to Base Bid
   1. A1 - Change base bid resolution to a virtual/pixel sharing product.
   2. A2 – Change base bid resolution to tighter physical pixel pitch (12mm-14mm) depending on manufacturer’s offering
   3. A3 – Provide complete lightning protection system at display

B. Option B – Bud Walton Arena Options to Base Bid
   1. B1 – Change base bid resolution to 6mm
   2. B2 – Replace existing 3’ x 902’ ribbon display at 16mm
   3. B3 – Replace existing scorer’s table with 36” x 40’ 10mm unit.
   4. B4 – Replace existing scorer’s table with 36” x 40’ 6mm unit

C. Option C – Bogle Park
   1. C1 – Remove existing components and provide 14’ x 43’ 16mm LED display
   2. C2 - Change resolution to a virtual/pixel sharing product
   3. C3 – Change resolution to tighter physical pixel pitch (12mm-14mm) depending on manufacturer’s offering.
   4. C4 – Provide complete lightning protection system at display

D. Option D – John McDonnell Outdoor Track
   1. D1 – Remove existing components and provide 20’ x 37’ 16mm LED display
   2. D2 - Change resolution to virtual/pixel sharing product

E. Option E – Tyson Indoor Track
   1. E1 – Remove existing components and provide 13’8” x 21’8” 10mm display
   2. E2 – Change resolution to a virtual/pixel sharing product
   3. E3 - Remove existing components and provide 21’ x 36’ 10mm display.
   4. E4 – Change resolution to a virtual/pixel sharing product

F. Option F – Barnhill Arena
   1. F1 – Provide 15’ x 38’ 10mm display and structure
   2. F2 - Provide 15’ x 38’ 6mm display and structure

G. Option G – Provide Base Bid and Alternate venue displays as one packaged cost.

H. Option H – Provide Game/Shot Clocks at Bud Walton Arena
   1. H1 - Back of House Locker Clocks

I. Option I – Cost to trade in Football Stadium’s existing Click Effects Crossfire for a new system. NOTE: Call out for trade in discount with Greg Stocker.
   1. Cost should also include any labor and materials to transfer existing files and provide new.

J. Option J - Service Contract for parts and labor for Years 3 through 10 for the scope of work covered under in 11 63 10. Since this is a phased project, warranty periods shall begin with each venue’s completion date. 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. Provider (or Provider’s Supplier) shall repair or replace components and ship to owner, at Provider’s expense using next-day delivery for Tuesday to Saturday deliveries (in Fayetteville, AR). Provider 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), the Provider shall dispatch to the site, at provider’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.
   2. Individual Costs of years 3 through 10.
      a. Year 3 costs.
      b. Year 4 costs.
      c. Year 5 costs.
      d. Year 6 costs.
      e. Year 7 costs.
      f. Year 8 costs.
      g. Year 9 costs.
      h. Year 10 costs.
      i. Provide sum of years 3-10 and indicate if discount is given for selecting all years.
         1) Note if Options increase or decrease these values, indicate savings (or additional cost)

K. Option K – Cost to provide annual pre-season “health check” for display systems for years 3 through 10 for the scope of work covered under 11 63 10. The intent, to the extent possible, is to bring the system up to as new operating condition and performance. Pricing shall remain in effect until the end of the warranty period of until the Owner accepts or declines this service contract whichever occurs first.
   1. Requirements of the contract:
      a. Inspection and preventative maintenance on all components in the system.
      b. Washing or cleaning of displays (if required)
      c. Updating system software
      d. Verification of all control and display equipment

e. Repair (from Owner's spare inventory) all displays and control equipment.
   1) Individual Costs for years 3 through 10.
      a) Year 3 costs.
      b) Year 4 costs.
      c) Year 5 costs.
      d) Year 6 costs.
      e) Year 7 costs.
      f) Year 8 costs.
      g) Year 9 costs.
      h) Year 10 costs.

L. Option L – Value Engineering, Voluntary Alternates, Voluntary Savings
   1. This is an area where a vendor may suggest alternate resolutions, sizes, value engineering opportunities or deviate from technical specifications. Attach a separate description and enumeration of items.

PART 7 PEFORMANCE STANDARDS – LIST FOR EACH DISPLAY TYPE

7.1 **RGB LED BOARD DETAILS**

Option Number: _____ Location: _____

Manufacturer: _____ Model: _____

		Fractional Units (e.g. 18.5')
Overall Display Size (measured from pixel to pixel; not including cabinet)	Vertical	_____ feet
	Horizontal	_____ feet
PHYSICAL Pixel Pitch	Vertical/Vertical	_____ mm
	Horizontal/Horizontal	_____ mm
TOTAL NUMBER OF **PHYSICAL** LEDs		_____ LEDs/each display
TOTAL NUMBER OF **PHYSICAL** PIXELS		_____ Pixels/each display
Manufacturer/Supplier of 3-in-1 LEDs		_____
Brightness		_____ Nits
	Brightness Level adjustment	_____
	Color Temperature	_____ °K
Viewing Angle	Vertical	_____ degrees V
	Horizontal	_____ Degrees H
Power Consumption	Average (each video display)	_____
	Maximum (each video display)	_____
Normal Power requirements(Voltage, Service, Ø) Include any air conditioning requirements for entire Display		_____
Entire Display Weight (Includes internal structure; and secondary structural steel attachments)		_____

END OF SECTION